Arroyo Seco Canyon Project Areas 2 and 3 Draft Environmental Impact Report

Modification to Conditional Use Permit No. 6222

State Clearinghouse No. 2014101022

Prepared for:

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AB	Assembly Bill
ACHP	Advisory Council on Historic Preservation
ACM	asbestos-containing material
ADT	average daily traffic
AGR	Agricultural Supply
ANF	Angeles National Forest
APE	Area of Potential Effect
APN	Assessor Parcel Numbers
AQMP	Air Quality Management Plan
ARR	Archaeological Reconnaissance Report
ASCP	Arroyo Seco Canyon Project
BMP	best management practices
BRTR	Biological Resources Technical Report
CAAQS	California Ambient Air Quality Standards
Cal-EPA	California Environmental Protection Agency
CAP	Climate Action Plan
CARB	California Air Resources Board
CCC	Civilian Conservation Corps
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFC	chlorofluorocarbon
CFR	Code of Federal Regulations
CGP	Construction General Permit
CH_4	methane
CHRID	California Historical Resources Inventory Database
CHRIS	California Historic Resources Information System
CIP	Capital Improvement Program
CMP	Congestion Management Program
CNDDB	California Natural Diversity Database
CNEL	Community Noise Exposure
CNRA	California Natural Resources Agency
CO	carbon monoxide
CO_2	carbon dioxide
COLD	Cold Freshwater Habitat
CRHR	California Register of Historic Resources
CUP	Conditional Use Permit
CUPA	Certified Unified Program Agency
CWC	California Water Code

Acronym/Abbreviation	Definition
DEIR	Draft Environmental Impact Report
DOT	U.S. Department of Transportation Federal Transit Administration
DPM	diesel particulate matter
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EIR	Environmental Impact Report
EO	Executive Order
EPA	Environmental Protection Agency
ESM	engineered streambed material
FEIR	Final Environmental Impact Report
FEMA	Federal Emergency Management Agency
FESA	federal Endangered Species Act
FHWA	Federal Highway Administration
GHG	greenhouse gas
GSA	groundwater sustainability agency
GSP	groundwater sustainability plan
GWP	global warming potential
GWR	Ground Water Recharge
HA	Hydrologic Area
HAER	Historic American Engineering Record
HAP	hazardous air pollutant
HCFC	hydrochlorofluorocarbon
HEC-RAS	Hydrologic Engineering Center River Analysis System
HFC	hydrofluorocarbon
HRA	health risk assessment
HSA	Hydrologic Sub-Area
HU	Hydrologic Unit
HUC	hydrologic unit code
HWP	Hahamongna Watershed Park
IND	Industrial Service Supply
IS/MND	Initial Study/Mitigated Negative Declaration
ITE	Institute of Transportation Engineers
JPL	Jet Propulsion Laboratory
LACDPW	Los Angeles County Department of Public Works
LACFCD	Los Angeles County Flood Control District
LACM	Natural History Museum of Los Angeles County
LARWQCB	Los Angeles Regional Water Quality Control Board
LCFS	Low Carbon Fuel Standard
LID	low impact development

Acronym/Abbreviation	Definition
LMP	Land Management Plan
LOS	Level of Service
LST	localized significance threshold
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
MCY	million cubic yards
MHTS	Monk Hill Treatment System
MMRP	Mitigation Monitoring and Reporting Program
MMT	million metric tons
MS4	Municipal Separate Storm Sewer Systems
MT	metric tons
MUN	Municipal and Domestic Supply
MWD	Metropolitan Water District of Southern California
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NEPA	National Environmental Policy Act
NF_3	nitrogen trifluoride
NHTSA	National Highway Traffic Safety Administration
NO	nitric oxide
NO_2	nitrogen dioxide
NOD	Notice of Determination
NOI	Notice of Intent
NOP	Notice of Preparation
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Parks Service
NRHP	National Register of Historic Place
NWP	Nationwide Permit
O_3	ozone
OGAI	Oak Grove Area Improvements
OHWM	ordinary high-water mark
OPR	Office of Planning and Research
OS	Open Space
PCE	Passenger Car Equivalency
PFC	perfluorocarbon
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PRC	Public Resources Code

Acronym/Abbreviation	Definition
PRD	Permit Registration Document
PRIMP	Paleontological Resources Impact Mitigation Program
PROC	Industrial Process Supply
PWP	City of Pasadena Department of Water and Power
RBMB	Raymond Basin Management Board
RCNM	Roadway Construction Noise Model
REC-1	Contact Water Recreation
REC-2	Non-contact Water Recreation
RI	Remedial Investigation
RSA	Regional Statistical Area
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SAM	Sediment Analysis Methods
SB	Senate Bill
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCCIC	South Central Coastal Information Center
SCCWRP	Southern California Coastal Water Research Project
SCE	Southern California Edison
SCH	State Clearinghouse
SCS	Sustainable Communities Strategy
SF_6	sulfur hexafluoride
SGMA	Sustainable Groundwater Management Act of 2014
SHPO	State Historic Preservation Officer
SLF	Sacred Lands File
SMMNRA	Santa Monica Mountains National Recreation Area
SO_2	sulfur dioxide
SRA	Source receptor area
SSC	Species of Special Concern
ST	short-term noise measurement location
SVP	Society of Vertebrate Paleontology
SWP	State Water Project
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	toxic air contaminant
TMDL	total maximum daily load
TPZ	tree protection zone
USACE	U.S. Army Corps of Engineers

Acronym/Abbreviation	Definition
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plans
VOC	volatile organic compound
VT	vehicle trips
WARM	Warm Freshwater Habitat
WDR	Waste Discharge Requirement
WET	Wetland Habitat
WILD	Wildlife Habitat
WIRP	Water Integrated Resources Plan
WSE	water surface elevation
WSRP	Water System and Resources Plan
WTP	Water Treatment Plant

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ES EXECUTIVE SUMMARY

In accordance with the California Environmental Quality Act (CEQA) Guidelines Section 15123, this section provides a summary of the Environmental Impact Report (EIR) for the proposed Arroyo Seco Canyon Project Areas 2 and 3 (Project or proposed Project) and its environmental effects. Included in this summary are areas of known controversy and issues to be resolved, a summary of Project alternatives, a summary of all Project impacts and associated mitigation measures, and a statement of the ultimate level of significance after mitigation is applied.

ES.1 Document Purpose

This Draft EIR was prepared by the City of Pasadena (City), as lead agency, to inform decision makers and the public of the potential significant environmental effects associated with the Project. This Draft EIR has been prepared in accordance with CEQA (California Public Resources Code, Section 21000 et seq.) and the CEQA Guidelines for Implementation of the California Environmental Quality Act (CEQA Guidelines; 14 CCR 15000 et seq.) published by the Public Resources Agency of the State of California.

As described in Section 15121 (a) and 15362 of the State CEQA Guidelines,[1] an EIR is an informational document which will inform public agency decision-makers and the public of the potentially significant environmental effects of a project, identify possible ways to mitigate any significant environmental effects, and identify and evaluate a reasonable range of alternatives to the Project that have the potential to reduce or avoid the project's potential significant environmental effects, while feasibly accomplishing most of the Project' basic objectives.

ES.2 Project Location

The Project site is located in the City of Pasadena within and at the base of the Arroyo Seco Canyon at 3420 and 3500 North Arroyo Boulevard[2], City of Pasadena. The proposed Project consists of two primary areas, as shown on Figure 2-1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements. These areas are connected by the North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road), which serves as a recreational trail and the access road for City of Pasadena and U.S. Forest Service (USFS) vehicles heading into the Arroyo Seco Canyon. The Arroyo Seco is a natural drainage that conveys flows from the Angeles National Forest (ANF) and other adjacent lands into the downstream Devil's Gate Dam and Reservoir.

Regional access to the Project site is via Interstate (I) 210, exiting Windsor Avenue and traveling northward for approximately 0.8-mile to the intersection of Windsor Avenue and Ventura Street. From this intersection, the Project site can be accessed via either Explorer Road, which is a publicly accessible roadway that leads to the City's open area (i.e., former Jet Propulsion Laboratory [JPL] East Parking Lot), or via a locked/gated entrance to North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road), which is only accessible to the public for non-motorized use, and occasional vehicle use by the City.

[1] California Code of Regulations Title 14, Chapter 3, Sections 15000-15387.

[2] Also known as "Arroyo Seco Road".

ES.3 Background

Settlement Agreement

On October 9, 2014, the City circulated the Arroyo Seco Canyon Project (ASCP) Initial Study/Mitigated Negative Declaration (IS/MND), State Clearinghouse (SCH) Number 2014101022, for a 30-day public review period from October 9, 2014, to November 8, 2014. The City was seeking approval of a Conditional Use Permit (CUP) No. 6222 for the ASCP, which involved improvements to three areas: Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, Jet Propulsion Laboratory (JPL) East Parking Lot.

The ASCP and associated IS/MND were approved at a public hearing held by the City's Hearing Officer on January 7, 2015. The approval was upheld by the Board of Zoning Appeals on March 4, 2015, and again at City Council on June 1, 2015 by unanimous vote. On July 2, 2015, a lawsuit (Court Case No. BS156207) was filed against the City by petitioners Spirit of the Sage Council and Project Soliton challenging the approval. On March 20, 2017, the Los Angeles Superior Court issued its decision and on June 26, 2017, entered a Judgment that partially favored the petitioners. The Court found that the elements of the ASCP related to increased diversions of surface water (i.e., greater taking of stream water from the Arroyo Seco beyond its current withdrawal) required evaluation through the preparation of an EIR. The Court also ruled that the elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP and the ASCP IS/MND shall remain intact for these components, allowing them to move forward without any additional environmental review pursuant to CEQA.

As such, this Draft EIR is being prepared by the City in accordance with the terms and provisions of the Judgment and Peremptory Writ of Mandate, the City's Declaration in Support of the Judgment, the Statement of Decision on Petition for Writ of Mandate, and the Settlement Agreement (see Appendix A-2 of this Draft EIR). Because several components of the ASCP were allowed to proceed without any additional environmental review pursuant to CEQA, the proposed Project boundaries of Area 2 and Area 3 have been refined from those shown in the 2015 ASCP IS/MND to reflect the activities subject to review under this Draft EIR.

ES.4 Project Objectives

Section 15124 of the State CEQA Guidelines requires the Project Description of an EIR to include a statement of the objectives sought by the proposed Project, which is intended to help the Lead Agency to develop a reasonable range of alternatives to evaluate in the EIR and the preparation of Findings of Fact and a Statement of Overriding Considerations, if necessary. The statement of objectives may include the Project benefits. The objectives that have been established for the proposed project are listed below.

Objective 1: Fully divert and utilize the City's 25 cubic feet per second surface water rights while operating in a manner objectively consistent with the Raymond Basin Judgment.

Objective 2: Increase the capacity and functionality of the spreading basins to increase PWP's ability to recharge the groundwater basin, as envisioned by the 2011 Water Integrated Resources Plan with its recommendation to maximize the value of the groundwater basin and non-potable supplies.

Objective 3: Provide opportunities for increased aquatic biological functions within the Arroyo Seco by: (1) protecting aquatic animals from passing into the conveyance system, and (2) reducing existing impediments to fish passage at the diversion weir structure.

Objective 4: Increase PWP's ability to rely upon local water for its potable water supply to reduce reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD).

ES.5 Project Description Summary

The proposed Project includes improvements in two primary areas: Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements. These areas are connected by the Gabrielino Trail/Access Road, which includes three bridge crossings over the Arroyo Seco in the vicinity of the Project site. The proposed Project involves construction activity and water infrastructure facility improvements in both areas, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road.

The Project is being proposed to repair and replace water infrastructure facilities in the Upper Arroyo Seco that were damaged by debris flows caused by storms following the 2009 Station Fire. Damage to these structures has greatly reduced the City's capacity to divert water from the Arroyo Seco for spreading and pumping credits. The proposed improvements would allow for increased utilization of the City's pre-1914 surface water rights from the Arroyo Seco and maximize the beneficial uses of this important local water resource. The proposed Project would also improve biological functions within the Arroyo Seco. For any future fish populations that may establish in the Arroyo Seco, the new intake would include a fish screening feature to prevent fish populations from passing into the intake and conveyance system, and a roughened channel would be constructed directly downstream of the new weir to allow for future fish passage upstream during certain conditions (See Section 3, Project Description for additional details).

In Area 2, the proposed Project would demolish and remove the following structures: (1) existing concrete diversion weir, associated masonry abutments, and rock wall built over concrete dam that extends under the trail; (2) intake structure, metal ladder and platform, and trash racks; (3) concrete slab adjacent to the Gabrielino Trail/Access Road, and (4) excavations of soil/sediment, rocks, debris, and vegetation within the upstream diversion pool, downstream streambed, and on the adjacent slopes on the downstream side of the diversion weir.

The Project involves the construction of a new diversion weir and intake in the same location within the Arroyo Seco as the current facility. The proposed reinforced concrete diversion control structure would span the entire width of the existing channel and a 30-foot long operable weir crest gate would be located in a notched section of the structure and would be mechanically operated. Operation of the crest gate would be controlled by water depth measurements from a transducer located immediately upstream of the diversion. The crest gate would be raised to create a pool of water for diversion to the intake structure, and lowered to bypass diversions. During high flow conditions, the weir would be lowered to move sediment downstream and periodically restore the streambed elevation to the crest of the notch. The new intake would be equipped with a trash rack and fish screens to prevent future fish from entering the conveyance system to the spreading basins in Area 3. The proposed Project would also be protective of the potential for future fish populations in the Arroyo Seco with the inclusion of an engineered roughened channel downstream of the diversion structure that would allow return passage upstream when the weir crest gate is lowered.

In Area 3, the proposed Project includes the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of stream flows for infiltration into the Raymond Basin. Existing Ponds 1 and 2, and Basins 1 and 2, would be replaced with Basin A and six new/expanded spreading basins. Stream flows from the existing conveyance system would outlet to the new sedimentation basin (Basin A) or to new spreading Basin E located over the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's open area (i.e., former JPL East Parking Lot). Each new basin would have an access ramp for maintenance. The new basins would remain connected to the remaining existing downstream basins within the City's spreading basin system.

A structural evaluation of Bridge No. 3 was conducted in 2018, subsequent to the placement of the temporary structural bridge overlay, which determined that the condition of Bridge No. 3 continues to deteriorate and is no longer safe for use (TJC 2018). Upon completion of the proposed Project, the City intends to keep the Bridge No. 3 overlay structures as-is, with the understanding that the reconstruction/replacement of Bridge No. 3 will eventually be required if the City wishes to maintain the bridge. The temporary structural bridge overlay allows for the safe passage of vehicles and pedestrians along the Gabrielino Trail/Access Road and to the USFS facilities and allows access to large vehicles, including fire trucks, that were previously restricted due to the loading limitations of the original bridge even before it was damaged. Since the temporary structure is constructed of steel elements and concrete, and will experience relatively light traffic, its expected service life is estimated to exceed 50 years. There may be safety risks associated with the continued deterioration of Bridge No. 3 if structural members fail and fall, and therefore the City may need to remove dangerous elements to protect public safety. Because there are no plans for the future reconstruction/replacement of the Bridge No. 3 at the time of the preparation of this Draft EIR, it is anticipated that the existing bridge may continue to deteriorate, and although not anticipated at this point, may even be removed to protect public safety.

During construction of the proposed Project, there may be times when portions of the Altadena Crest Trail, Gabrielino Trail/Access Road, Arroyo Seco Trail, and the unnamed trails/maintenance roads would be partially or fully closed to the public due to construction activities. Upon completion of the proposed Project, the temporarily disrupted trail network would be restored.

Long-term operations in Areas 2 and 3 would not be substantively different than the current conditions. No new employees or operations would be required to continue maintenance on the proposed facilities.

ES.6 Areas of Known Controversy

Section 15123(b) (2) of the CEQA Guidelines requires that areas of controversy known to the lead agency must be stated in the EIR summary. Issues of interest to the public and public agencies were identified during the 30-day public comment period of the Initial Study and NOP, which began on November 4, 2019 and concluded on December 6, 2019. Comments were received from public agencies and interested parties in response to the circulated Notice of Preparation (NOP). The City received nine comment letters in response to the Initial Study/NOP. Table 1, Notice of Preparation and Scoping Comment Letter Summary provides a brief overview of the NOP comments received by the City on environmental issues and identifies the appropriate section of the Draft EIR that addresses the topic. In compliance with CEQA Guidelines, the City held a scoping meeting on Thursday, November 21, 2019, at Robinson Park Recreation Center (1081 North Fair Oaks Avenue, Pasadena) from 6:00 PM to 8:00 PM. Comments received during the public review period were considered during preparation of this Draft EIR. The Initial Study/NOP is included as Appendix A-1 and NOP comment letters are included as Appendix A-2 of this Draft

EIR. In summary, known areas of concern include, but are not limited to: impacts to biological resources, including downstream resources that may be affected due to the diversion of additional flows from the Arroyo Seco into the spreading basins; cumulative impacts related to the ongoing sediment removal project being conducted by the County of Los Angeles Flood Control District at the adjacent Devil's Gate Reservoir; and consideration of alternatives that would rely more on the natural stream hydrology.

ES.7 Summary of Project Alternatives

Section 15126.6 of the CEQA Guidelines identifies the parameters within which consideration and discussion of alternatives to the Project should occur. As stated in this section of the guidelines, alternatives must focus on those that are reasonably feasible and that attain most of the basic objectives of the Project. Each alternative should be capable of avoiding or substantially lessening any significant effects of the Project. The rationale for selecting the alternatives to be evaluated and a discussion of the No Project Alternative are also required, per Section 15126.6.

ES.7.1 Alternatives Considered and Eliminated

Two alternatives for the Project were considered, but ultimately rejected from further analysis in the Draft EIR, consistent with Section 15126.6(c) of the CEQA Guidelines. A brief summary of the potential alternatives considered, but not carried forward, is provided below (see Section 6, Alternatives for additional details).

Reduced Diversion with In-Stream Spreading

Several of the letters received during the NOP public review period suggested that the proposed Project not be implemented in favor of an alternative approach that involves in-stream spreading and percolation. This proposed alternative set forth in the NOP comment letters was for the City to consider either: (1) leaving the flows in the "natural stream" and allowing them to be naturally absorbed within the stream, with the City taking credit for up to the calculated natural stream percolation capacity, and diverting the remainder into the spreading basins to achieve the 25 cfs surface water rights; or (2) installing a low berm facility within the Arroyo Seco near Johnson Field that would "spread" the flows within the stream bed and slow water to allow percolation.

Consolidated Facility Below JPL Bridge

A version of this potential alternative was preliminarily evaluated in the Upper Arroyo Seco Watershed Integrated Spreading Grounds Concept Report prepared by CDM Smith in 2012. This potential alternative would demolish the existing facilities in Area 2 and abandon the conveyance system and would restore that portion of the Arroyo Seco in Area 2. Stream flows would be captured behind the new consolidated diversion dam located just downstream of the JPL Bridge adjacent to Area 3 and diverted into the expanded spreading basins, as set forth in the proposed Project.

ES.7.2 Alternatives Evaluated in this EIR

This Draft EIR includes an evaluation of the following alternatives:

- Alternative A- No Project/No Action
- Alternative B- Redesigned Spreading Basins in Area 3
- Alternative C- Historic Bridge Rehabilitation

Alternative A – No Project/No Action

Under Alternative A, the proposed Project would not be implemented as discussed in Section 3 of this Draft EIR. The Areas 2 and 3 of the Project site would remain unchanged, and no development activity would occur.

Alternative B – Redesigned Spreading Basins in Area 3

Under Alternative B, all activities proposed within Area 2 would continue to be implemented, as set forth in the proposed Project. The alternative design of Area 3 would mimic the primary design objectives and operational characteristics of the proposed Project; however, Alternative B would provide an improved design for the spreading basins with more appeal for recreational users. The alternative would eliminate the rectangular shapes of the existing condition, as well as the proposed Project design, in favor of curvilinear basin features that more closely resemble natural channel and stream functions. The recreational amenities would be further improved through selective plantings around the basins. The Alternative B basin layout and landscaping would have the added benefit of enhancing the proposed trail network for pedestrians and equestrian usage, with incorporation of benches, interpretive signage, and shade structures adjacent to the spreading basins along the proposed pedestrian trails/maintenance roads. Alternative B would also include a slight realignment of Explorer Road to reflect the more curvilinear contours of the spreading basins and to allow for the future Explorer Well site to be east of the recreational trail amenities. Relocating the well site to the east would make it less prominent when viewing the area from the Gabrielino Trail above.

Alternative C – Historic Bridge Rehabilitation

Under Alternative C, all activities proposed within Areas 2 and 3 would continue to be implemented, as set forth in the proposed Project. Alternative C also includes the implementation of the recommendations of the Arroyo Seco Bridge (B3) Assessment Deterioration Comparison prepared by TJC Associates Inc. in 2018 (TJC 2018) as they relate to the reconstruction or replacement of primary structural features on historic Bridge No. 3, which is located within the Project's study area along the Gabrielino Trail/Access Road. All of the primary structural elements of the bridge; specifically, the joists below the bridge deck, the heavy timber support element at mid-span, the A-frame trusses on the east and west sides of the bridge, and the steel elements of the bridge are deteriorated and subject to failure, and would be replaced.

ES.7.3 Environmentally Superior Alternative

Alternative C would result in slightly increased short-term construction impacts to most environmental topics. For long-term impacts, Alternative C would not provide the protections related to wildfire preparedness as it pertains to the City's ability to accommodate firefighting equipment into and out of the Arroyo Seco Canyon and the ANF. However, this Alternative would eliminate the significant unavoidable impact related to historic resources and would be considered to be the environmentally superior alternative to the proposed Project.

ES.8 Discretionary Actions

The City of Pasadena, as lead agency, must consider the following discretionary actions:

- Project Approval and Certification of the Environmental Impact Report
- Modification to Conditional Use Permit No. 6222 to allow for utility improvements within the Open Space Zone
- Tree Removal Authorization

The following additional permits, approvals, and discretionary actions may be necessary as part of Project approval:

- U.S. Army Corps of Engineers – A Section 404 Nationwide Permit would be needed in order to allow the proposed project to discharge dredge and fill material into a "water of the United States."
- Regional Water Quality Control Board, Los Angeles Region – 401 Water Quality Certification – Any discharge from the Project will be required to comply with applicable provisions of the Clean Water Act and regulated under the State's Waste Discharge Requirement order.
- California Department of Fish and Wildlife (CDFW) – Section 1600 Streambed Alteration Agreement to authorize changes to the natural flow or the bed, channel, or bank of any river, stream, or lake and associated impacts to biological resources (needed for temporary and permanent disturbance of Arroyo Seco in Area 2 and for temporary impacts due to spreading basin expansion in Area 3).
- Los Angeles County Flood Control District – Encroachment Permit to authorize construction activities within the Altadena Storm Drain Easement.

ES.9 Summary of Environmental Impacts and Mitigation Measures

Table ES-1, Summary of Environmental Impacts and Mitigation Measures, provides a summary of the impact analysis related to the proposed Project and identifies the significant environmental impacts resulting from the Project pursuant to the CEQA Guidelines Section 15123(b)(1). For more detailed discussion, please see Sections 4.1 through 4.9 of this Draft EIR.

Table ES-1 also lists the applicable mitigation measures related to identified significant impacts, as well as the level of significance after mitigation is incorporated. As stated in Section 3, Project Description, of this Draft EIR, the Initial Study (IS) prepared and circulated with the NOP for public review on the Project (see Appendix A-1, Notice of Preparation and Initial Study) concluded that the Project would not result in significant impacts to Aesthetics, Agricultural and Mineral Resources, Energy, Geology and Soils (with the exception of impacts to paleontological resources, which is assessed under Cultural Resources for the purposes of this Draft EIR), Hazards and Hazardous Materials, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, Utilities and Service Systems, and Wildfire. Therefore, these topics are not addressed in this Draft EIR and not summarized in Table ES-1.

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
Air Quality			
4.1a. Would the project conflict with or obstruct implementation of the applicable air quality plan?	Less Than Significant	None	Not Applicable.
4.1b. Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard	Less Than Significant	None	Not Applicable.
4.1c. Would the project expose sensitive receptors to substantial pollutant concentrations?	Less Than Significant	None	Not Applicable.
Biological Resources			
4.2a. Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	Potentially Significant	**MM-BIO-1** Prior to commencement of any earthmoving activities or the pre-construction staging of equipment on the Project site, the City shall develop a Preconstruction Survey and Relocation Plan for terrestrial reptiles, including the California newt, two-striped gartersnake, Southern California legless lizard, and coastal whiptail. The Preconstruction Survey and Relocation Plan shall be submitted to the California Department of Fish and Wildlife (CDFW) for review prior to any ground-disturbing activities within potentially occupied habitat. The Plan shall include at a minimum, the following: (1) protocols for pre-construction surveys to flush out and/or move identified special status wildlife within the study area, as feasible; (2) the timing, frequency, and locations where surveys should be conducted; (3)	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		the habitat and conditions in the proposed relocation site(s); (4) the methods that would be used for trapping and relocating identified species; (5) protocols for documentation/recordation of the species and number of animals relocated; and (6) protocols for notifying CDFW in the event that identified species cannot be relocated. The Plan shall require that a Biological Monitor be present during initial vegetation clearing activities within Areas 2 and 3, as well as twice weekly until ground disturbing activities are completed. The Biological Monitor shall also be familiar with least Bell's vireo and shall conduct pre-clearing non-protocol surveys for this species while onsite. If a least Bell's vireo or other State of federally listed species is detected, work activity within 200 feet of the detected occupied habitat will be temporarily halted and the City will consult with the appropriate wildlife agencies. With authorization from these agencies, which may include a 'take' permit, the project will proceed in accordance with conditions developed in the consultation. Conditions will include avoidance and minimization measures to prevent or minimize impacts on the listed species(s) occurring on or adjacent to the site. The Plan shall require that any individual special-status terrestrial wildlife species observed within the study area during the pre-construction survey(s) shall be flushed out and/or moved out of harm's way to avoid direct impacts to these species, and if special-status species are detected, the Biological Monitor shall capture and relocate individuals to nearby undisturbed areas with suitable habitat outside of	

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		the construction area, but as close to their origin as possible. The final recordation/documentation of any wildlife relocated during Project activities shall be made available to CDFW for confirmation that construction activities were executed in compliance with the approved Preconstruction Survey and Relocation Plan.	
	Potentially Significant	**MM-BIO-2** Project construction shall be conducted in compliance with the conditions set forth in the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code with methods approved by the California Department of Fish and Wildlife (CDFW) to protect active bird/raptor nests. To the maximum extent feasible, vegetation removal shall occur during the non-breeding season for nesting birds (generally late September to early March) and nesting raptors (generally early July to late January) to avoid impacts to nesting birds and raptors. If the Project requires that work be initiated during the breeding season for nesting birds (March 1–September 30) and nesting raptors (February 1–June 30), in order to avoid direct impacts on active nests, a pre-construction survey shall be conducted by a qualified Biologist for nesting birds and/or raptors within 3 days prior to clearing of any vegetation and/or any work near existing structures (i.e., within 300 feet for nesting birds and within 500 feet for nesting raptors). If the Biologist does not find any active nests within or immediately adjacent to the impact areas, the vegetation clearing/construction work shall be allowed to proceed. If the Biologist finds an active nest within or immediately adjacent to the construction area and determines that the nest may be	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		impacted or breeding activities substantially disrupted, the Biologist shall delineate an appropriate buffer zone around the nest depending on the sensitivity of the species and the nature of the construction activity. Any nest found during survey efforts shall be mapped on the construction plans. The active nest shall be protected until nesting activity has ended. To protect any nest site, the following restrictions to construction activities shall be required until nests are no longer active, as determined by a qualified Biologist: (1) clearing limits shall be established within a buffer around any occupied nest (the buffer shall be 100–300 feet for nesting birds and 300–500 feet for nesting raptors), unless otherwise determined by a qualified Biologist and (2) access and surveying shall be restricted within the buffer of any occupied nest, unless otherwise determined by a qualified Biologist. Encroachment into the buffer area around a known nest shall only be allowed if the Biologist determines that the proposed activity would not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest or the nest has failed.	
	Potentially Significant	**MM-BIO-3** A Biological Monitor shall conduct a pre-construction bat habitat assessment of buildings and trees marked for potential removal. Potential for roosting shall be categorized by 1) potential for solitary roost sites, 2) potential for colonial roost sites (10 bats or more). If the potential for colonial roosting is determined, those trees shall not be removed during the bat maternity roost season (March 1 – July 31). Trees potentially supporting colonial roosts outside of	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		maternity roost season, and trees potentially supporting solitary roosts may be removed via a two-step removal process, whereby some level of disturbance (such as trimming of lower branches) (at the direction of Biological Monitor) is applied to the tree on day one to allow bats to escape during the darker hours, and the roost tree shall be removed two days later (i.e., there shall be no less or more than two nights between initial disturbance and the grading or tree removal). When feasible, trees will be dropped slowly and a Biological Monitor will monitor the activity. If buildings are determined to be occupied, one-way exclusionary devices will be placed over bat access points and left in place for two nights prior to building removal.	
4.2b. Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	Potentially Significant	**MM-BIO-4** Direct impacts to sensitive vegetation communities white alder–California sycamore woodland association and California sycamore woodlands alliance shall be mitigated through a combination of on-site and/or off-site measures. Mitigation for impacts to sensitive vegetation communities shall consider and overlap with compensation for jurisdictional waters (MM-BIO-6) since the sensitive vegetation is associated with the jurisdictional limits of Arroyo Seco. Mitigation for direct impacts to sensitive vegetation communities shall be implemented through on-site creation/enhancement, program funding, mitigation bank credits, and/or creation/enhancement of native vegetation communities on City lands. Mitigation acreages shall be implemented as shown in the Table below.	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

<table>
<tr><th>Environmental Topic</th><th>Impact?</th><th>Mitigation Measure(s)</th><th>Level of Significance After Mitigation</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>Sensitive Vegetation Community</th><th>Direct Impacts (acres)</th><th>Mitigation Ratio</th><th>Mitigation (acres)</th></tr>
<tr><td>white alder–California sycamore woodland association</td><td>0.47</td><td>3:1</td><td>1.41</td></tr>
<tr><td>California sycamore woodlands alliance</td><td>0.04</td><td>3:1</td><td>0.12</td></tr>
<tr><td>Totals:</td><td>0.51</td><td>—</td><td>1.53</td></tr>
</table>

On-site Mitigation. Prior to the issuance of a grading permit or any earthwork on the Project site, PWP shall prepare a Habitat Mitigation and Monitoring Plan (HMMP) for habitat enhancement and creation activities. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. The HMMP shall include restoration of the following habitats:

Riparian Woodlands. Impacted areas of (white alder–California sycamore woodland association and California sycamore woodlands alliance) shall be created/restored within and adjacent to the same on-site areas that the woodland currently existed prior to Project implementation, as well as other areas deemed to have appropriate soils and topography for successful establishment. Understory areas shall be revegetated with a diversity of locally-collected seeds.
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Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		Temporary irrigation shall be established and maintained, with irrigation suspensions in times of rainfall. Successful establishment of the woodland shall be determined only after removal of irrigation system and confirmed ability of the woodland to survive in the absence of irrigation. It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the City, CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the City and the three agencies. **Off-site Mitigation.** If mitigation is implemented through mitigation program funding and/or mitigation bank credits, the Project Applicant shall work with the City, CDFW, USACE, and RWQCB to ensure the mitigation program funding and/or mitigation bank credits are appropriate to offset permanent impacts. Mitigation lands shall be comprised of similar or higher quality riparian woodland and preferably located in the vicinity of the site or watershed. If mitigation is implemented through offsite enhancement of City-owned lands, PWP shall prepare a HMMP that details the location and existing conditions of the offsite lands. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. It is anticipated that a one-time restoration	

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the City, CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the City and the three agencies.	
		MM-BIO-5 To prevent inadvertent disturbance to sensitive vegetation communities outside the limits of work, the construction limits shall be clearly demarcated (e.g., installation of flagging or temporary high visibility construction fence) prior to ground disturbance activities. All construction activities including equipment staging and maintenance shall be conducted within the marked disturbance limits. A qualified biologist shall be present during initial ground-disturbing activities within the Project site to ensure that Project activities stay within the demarcated limits.	Mitigated to Less Than Significant
		MM-BIO-6 Mitigation for direct impacts to jurisdictional waters shall be implemented through on-site enhancement of remaining jurisdictional waters and/or off-site acquisition, program funding, and/or mitigation bank credits. Mitigation ratios for each type of jurisdictional waters is shown in the Table below. Mitigation for temporary and permanent impacts to jurisdictional wetlands and waters shall consider and overlap with compensation for sensitive vegetation communities (MM-BIO-4).	Mitigated to Less Than Significant

Jurisdictional Waters Type	Direct Impacts (acres)	Mitigation Ratio	Mitigation (acres)a
USACE waters of the United States	0.20	1:1	0.20
RWQCB waters of the state	2.58	1:1	2.58
CDFW streambed and bank, with riparian vegetation[b]	0.49	3:1	1.47
CDFW streambed and bank, with non-riparian habitat[c]	2.41	1:1	2.41

Notes:

[a] Mitigation areas for each jurisdictional type may overlap

[b] white alder–California sycamore woodland (0.48 acres) and coast live oak woodland (<0.01 acres)

[c] California sagebrush–California buckwheat–laurel sumac scrub (<0.001 acres); urban/developed (0.03 acres); disturbed habitat (2.38 acres); laurel sumac scrub (<0.01 acres)

On-site Mitigation. Prior to the issuance of a grading permit or any earthwork on the Project site, PWP shall prepare a HMMP for habitat enhancement and creation activities. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. The HMMP shall include restoration of the following habitats:

Riparian Woodlands. Impacted areas of (white alder–California sycamore woodland association and coast live oak woodland) shall be created/restored within and adjacent to the same on-site areas that the woodland currently existed prior to Project implementation, as well as other areas deemed to have appropriate soils and topography for successful establishment. Understory areas shall be revegetated with a diversity of locally-collected seeds. Temporary irrigation shall be established and maintained, with irrigation suspensions in times of rainfall. Successful establishment of the woodland shall be determined

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		only after removal of irrigation system and confirmed ability of the woodland to survive in the absence of irrigation. It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the three agencies. **Off-site Mitigation.** If mitigation is implemented through mitigation program funding and/or mitigation bank credits, PWP shall work with the CDFW, USACE, and RWQCB to ensure the mitigation program funding and/or mitigation bank credits are appropriate to offset permanent impacts. Mitigation lands shall be comprised of similar or higher quality riparian woodland and preferably located in the vicinity of the site or watershed. If mitigation is implemented through offsite enhancement of City-owned lands, PWP shall prepare a HMMP that details the location and existing conditions of the offsite lands. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the three agencies.	

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
4.2c. Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	Potentially Significant	See MM-BIO-5 and MM-BIO-6	Mitigated to Less Than Significant
4.2d. Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	Less Than Significant	**MM-BIO-7** Prior to the commencement of earthmoving within Area 2 for the demolition of the existing diversion/weir structure, the City shall develop a Native Resident and Migratory Fish Monitoring Plan (Monitoring Plan), in consultation with CDFW. This Monitoring Plan shall set forth annual monitoring requirements to determine if native fish species or migratory fish populations are present within an approximate 3,500-foot section of the stream (about 1,500 feet upstream of the diversion/weir structure to the abandoned headworks (Area 1) and 2,000 feet downstream to the JPL Bridge at the mouth of the canyon). Annual survey protocols shall be established to the satisfaction of CDFW and set forth in the Monitoring Plan. If the results of the annual surveys reveal a positive presence of native fish, the Monitoring Plan shall set forth thresholds for determining the permanency of the population, and whether or not connectivity both upstream and downstream of the diversion structure is appropriate and in the best interest of the long-term survival of an established native or migratory fish population, given hazards associated with stranding downstream. Until passage for steelhead is restored to the Arroyo Seco, the City shall implement a program to rescue fish between the diversion	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		structure and the JPL Bridge. If rescue is determined to be ineffective or impractical, then the City shall modify its operations to accommodate passage. At such time as steelhead passage is restored, the City shall alter either the design of the diversion/weir structure, the operational methods of the diversion/weir structure, or both to satisfy Fish and Game Code Sections 5901 and 5937.	
4.2e. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	Potentially Significant	**MM-BIO-8** A qualified biologist shall be present during initial ground-disturbing activities within the Project site to ensure that Project activities stay within the demarcated limits, as required in MM-BIO-5. This qualified biologist shall identify the number of City-protected trees that are removed as a result of Project construction activities, as well as trees that would be encroached upon. This inventory of trees shall be used to determine an appropriate tree replacement program that shall be, at a minimum, consistent with the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code) and the Ordinance's administrative guideline replacement matrix, as it relates to tree replacement of protected trees. Trees within approximately 15 feet of proposed construction activity shall be temporarily fenced with chain-link fencing in accordance with the City's Tree Ordinance and Tree Protection Guidelines. The fencing shall be installed to the extent of the tree's dripline plus four (4) radial feet and be minimum six (6) feet high with an access gate of minimal width. The fenced area shall be considered the Tree Protection Zone (TPZ) unless proximate construction required temporary removal.	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		All trees that have been substantially root pruned (30% or more of their root zone) during construction within the TPZ shall be monitored by an International Society of Arboriculture Certified arborist for the first five years after construction completion. The arborist shall submit an annual report, photograph each tree and compare tree health and condition to the original, pre-construction baseline. For trees that do not survive the five-year monitoring period, such trees shall be replaced in accordance with the requirements of this measure.	
Cultural Resources			
4.3a. Would the project cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines Section 15064.5?	Potentially Significant	**MM-CUL-1** Prior to the commencement of construction vehicle and truck traffic along the Gabrielino Trail/Access Road north of the JPL Bridge, the City shall ensure that Bridge No. 2 and all identified arroyo stone wall features along the affected portions of the Gabrielino Trail/Access Road are properly protected for the duration of construction activities. The City shall install temporary protective barriers in the form of concrete k-rails along the decorative railings of Bridge No. 2 on both sides of the road to protect the railings from further deterioration and damage from vehicles. The concrete k-rails shall be removed once the Project is completed leaving Bridge No. 2 intact. The concrete k-rails shall be installed parallel to the Bridge's existing baluster railings, with approximately 2 feet of separation between the k-rail and the resource. The k-rails shall be positioned to ensure that the Bridge railings are protected from daily construction traffic. The k-rails shall not be permanently attached to	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		the bridge. All arroyo stone wall features adjacent to the Gabrielino Trail/Access Road shall be protected by concrete k-rails wherever feasible; however, in areas where k-rails would create an impassable or bottleneck situation for vehicles, the City shall utilize other reasonable protections, including cones and flagging, to ensure that the arroyo stone walls are not inadvertently damaged during construction vehicle movement and equipment transport. The plans for the temporary barriers shall be reviewed by a qualified architectural historian prior to Project implementation. In order to ensure that the bridge and stone walls are adequately protected during Project activities, the City shall ensure completion of pre-construction and post-construction surveys by a qualified historic preservation consultant to ensure that adverse effects or significant impacts have not occurred to Bridge No. 2. If the pre-construction survey identifies deficiencies in the protections for Bridge No. 2 or the stone walls, recommendations for additional physical barriers or visual warnings shall be provided and implemented prior to initiation of construction activities. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning – Historic Preservation for review and approval.	
	Potentially Significant	**MM-CUL-2** Prior to construction completion, the City shall ensure preparation of Historic American Engineering Record (HAER) documentation for Bridge No. 3 in accordance with the Secretary of the Interior's Standards for Architectural and Engineering Documentation. Documentation shall be completed by a qualified historic preservation professional who meets the	Significant and Unavoidable

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		Secretary of the Interior's Professional Qualifications Standards for architectural history. The documentation shall capture the physical description of the existing bridge with: 1) existing as-builts/drawings (where/if available); 2) a written narrative that includes a detailed history and architectural description of the bridge and a discussion of its historical significance; 3) photographs of the bridge with large format negatives to demonstrate its current condition; and 4) provide other photographs of the bridge prior to installation of the current overlay. Upon approval of the final HAER package, the City shall offer one original copy of the final HAER package to the City of Pasadena Historic Preservation Program, the South Central Coastal Information Center at California State University, Fullerton, and the Angeles National Forest Administrative Office. Prior to construction completion, the City shall conduct a review of the bridge overlay design on Bridge No. 3 and construction materials used in the bridge overlay to determine improvements that can be made to conform with the City's Arroyo Seco Design Guidelines. Examples of potential improvements include, but are not limited to, evaluation of appropriate paint colors that reflect the natural character of the Arroyo Seco, and replacement of components with more natural materials (e.g. wood, concrete, brick, arroyo stone piers, unpainted weathering steel or other natural materials, such as copper and wrought iron). The proposed design improvements shall be submitted to the City of Pasadena Department of Planning – Historic Preservation for review and approval.	

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
	Potentially Significant	**MM-CUL-3** Prior to commencement of Project construction activities that would require equipment staging at the Behner Water Treatment Plant (WTP), the City shall ensure that the exterior of the WTP building is adequately protected from equipment and vehicle staging activities. The northwest and southwest exterior elevations of the WTP shall, at a minimum, be protected by construction fencing and signage to ensure that none of the major exterior character-defining features of the building are inadvertently damaged. Fencing shall be placed at a minimum distance of five (5) feet from the exterior of the building, and crews working in the immediate vicinity should be alerted to the presence of an historical resource and instructed to avoid it. The City shall ensure that Project-related equipment and materials are not in contact with the exterior or the building, including absolute avoidance of leaning materials and equipment against exterior walls. The temporary fencing, signage, and barriers shall be removed at the conclusion of construction activities.	Mitigated to Less Than Significant
4.3b. Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?	Potentially Significant	**MM CUL-4** Prior to commencement of earthmoving activities, the City shall retain a qualified Archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for Archaeology. The Archaeologist shall be present at the pre-grade conference; shall establish procedures for archaeological resource surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts, as appropriate. At a minimum, in the event archaeological resources are exposed during construction activities, all construction work occurring within 100	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		feet of the find shall immediately stop until a qualified archaeologist can evaluate the significance of the find and determine whether or not additional study is warranted. The Archaeologist shall first determine whether it is a "unique archaeological resource" pursuant to the California Environmental Quality Act (CEQA, i.e., Section 21083.2[g] of the California Public Resources Code) or a "historical resource" pursuant to Section 15064.5(a) of the State CEQA Guidelines. If the archaeological resource is determined to be a "unique archaeological resource" or a "historical resource", the Archaeologist shall formulate a mitigation plan in consultation with the City of Pasadena that satisfies the requirements of the above-referenced sections. The Archaeologist shall prepare a report of the results of any study prepared as part of a testing or mitigation plan, following guidelines of the California Office of Historic Preservation, and s/he shall record the site and submit the recordation form to the City of Pasadena and the California Historic Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton. Work may proceed in other areas of the site, subject to the direction of the Archaeologist.	
4.3d. Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	Potentially Significant	**MM-PALEO-1** Prior to commencement of any grading activity on-site, the City shall retain a qualified Paleontologist per the Society of Vertebrate Paleontology (SVP) (2010) guidelines. The paleontologist shall prepare a Paleontological Resources Impact Mitigation Program (PRIMP) for the Project. The PRIMP shall be consistent with the SVP (2010) guidelines. Minimum requirements to be set forth in the PRIMP include: (1) attendance at the preconstruction meeting and	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		worker environmental awareness training, where monitoring is required within the proposed Project site based on construction plans and/or geotechnical reports; (2) procedures for adequate paleontological monitoring and discoveries treatment, and paleontological methods, including sediment sampling for microvertebrate fossils, reporting, and collections management; (3) mandatory monitoring on-site during all rough grading and other significant ground-disturbing activities, including augering in previously undisturbed, fine-grained Pleistocene alluvial deposits; (4) mandatory actions in the event that paleontological resources (e.g., fossils) are unearthed during grading, including the requirement for the paleontological monitor to temporarily halt and/or divert grading activity to allow recovery of paleontological resources, and roping/fencing off of the discovery with a 50-foot radius buffer; and (5) if resources are discovered, methods for coordination between the qualified paleontologist and the City for appropriate exploration and/or salvage, as well as final disposition of the resources in an accredited institution or museum, such as the Natural History Museum of Los Angeles County.	
Greenhouse Gas Emissions			
4.4a. Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	Less than Significant Impact	None	Not Applicable

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
4.4b. Would the project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	Less than Significant Impact	None	Not Applicable
Hydrology and Water Quality			
4.5b. Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	Less than Significant Impact	None	Not Applicable
4.5c. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces in a manner which would: (i) result in substantial erosion or siltation on- or off-site; (ii) substantially increase the rate or amount of surface the rate or amount of surface runoff in a manner which would result in flooding on- or off-site; (iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or (iv) impede or redirect flood flows?	Less than Significant Impact	None	Not Applicable

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
Noise			
4.6a. Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?		**MM-NOI-1** The City and/or their Construction Contractor shall implement the following noise reduction measures during all construction activities: • Equip all construction equipment (fixed or mobile) with properly operating and maintained mufflers, consistent with or exceeding manufacturers' standards. • Ensure that construction equipment engine enclosures and covers as provided by manufacturers shall be in place during operation. • Place all stationary construction equipment so that the equipment is as far as feasible from noise-sensitive receptors and so that the emitted noise is directed away from the noise-sensitive receptors. • Locate equipment and materials staging in areas that will create the greatest distance between staging area noise sources and noise-sensitive receptors during Project construction. • Ensure that construction equipment is shut down when not in use. • Limit haul truck deliveries to the same hours specified for the operation of construction equipment.	Mitigated to Less Than Significant
4.6b. Would the project result in generation of excessive groundborne vibration or groundborne noise levels?	Less than Significant Impact	None	Not Applicable

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
Recreation			
4.7a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.	Potentially Significant	**MM-REC-1** Prior to the closure of recreational trails for public use, the City of Pasadena shall post signs providing at least one week of advanced notice of the dates and times of planned trail closures at the following locations: • Intersection of Ventura Street and Windsor Avenue • Sunset Overlook • Altadena Crest Trail (adjacent to the North Arroyo Boulevard) • Arroyo Seco Trail • West Rim Trail/East Rim Trail In addition to the closure notice signage, the City shall provide the locations of nearby trails and recreational facilities in the surrounding area that would be open for public use at the times when the trails are closed. This information shall also be posted on the City's Parks, Recreation and Community Services website.	Mitigated to Less Than Significant
Transportation			
4.8a. Would the project conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	Potentially Significant	**MM TRA-1** During the peak phase of construction activities (i.e. during the demolition phase requiring haul truck trips) in Area 3, all Construction Contractors shall schedule the arrival and departure of the sediment export haul trucks to be outside the AM peak hours of 7:30 AM to 8:30 AM and the PM peak hours of 4:30 PM to 5:30 PM.	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
	Potentially Significant	**MM TRA-2** During construction activities in Areas 2 and 3, use of the North Arroyo Boulevard or Gabrielino Trail/Access Road by hikers, bicyclists and equestrians shall be limited or prohibited when temporary partial or full closures of the Gabrielino Trail/ Access Road, Explorer Road, hiking trails or maintenance roads is necessary. In addition to the requirements for notification set forth in the City's Supplements and Modifications to the Greenbook, flagpersons and/or other safety procedures shall be used as necessary to ensure the safety of recreational users.	Mitigated to Less Than Significant
	Potentially Significant	**MM TRA-3** Prior to the start of construction, the City and/or their Construction Contractor shall provide written notice to the USFS and residences at the Ranger Station of the anticipated construction schedule, stating that access may be temporarily obstructed on an intermittent basis and providing a schedule of anticipated closures. In order to ensure that emergency vehicles would not be obstructed at any time, any temporary obstructions to the Gabrielino Trail/Access Road that could hinder emergency vehicular access shall be mobile and able to be removed from the roadway immediately upon notice from emergency responders.	Mitigated to Less Than Significant
Cumulative 4.8a. Would the project conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	Potentially Significant Cumulative Impact	**MM CUML-1** The City and/or their Construction Contractor shall coordinate with the Los Angeles County Department of Public Works and/or their contractor for the sediment removal activities at Devil's Gate Reservoir regarding the schedule of trucks to and from landfills that would require the use of Interstate 210 eastbound ramps/Arroyo Boulevard intersection. If it is determined that activities would overlap and Project traffic and cumulative traffic including the Devil's Gate project traffic would have vehicle queues at Caltrans facilities that exceed available storage	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		lengths, then the City and/or their contractor shall implement construction vehicle/hauling restrictions that disallow the proposed Project's truck traffic during the AM and PM peak hours of 7:30 AM to 8:30 AM and 4:30 PM to 5:30 PM.	
Tribal Cultural Resources			
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is: a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)? b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set	Potentially Significant	**MM-TCR-1** Prior to commencement of any ground-disturbing activities, the City of Pasadena shall retain a Native American Monitor approved by the Gabrieleño Band of Mission Indians-Kizh Nation – the tribe that consulted on this project pursuant to Assembly Bill AB 52 (the "Tribe" or the "Consulting Tribe"). The Tribal monitor shall only be present on the Project site during the construction phases that involve ground-disturbing activities. Ground disturbing activities may include, but may not be limited to, pavement removal, potholing or auguring, grubbing, tree removals, boring, grading, excavation, drilling, and trenching within the Project area. The Tribal Monitor shall complete daily monitoring logs that provide descriptions of the day's activities, including construction activities, locations, soil, and any cultural materials identified. The on-site monitoring shall end when all ground-disturbing activities on the Project site are completed, or when the Tribal Representatives and Tribal Monitor have indicated that all upcoming ground disturbing activities at the Project site have little to no potential for impacting Tribal Cultural Resources. Upon discovery of any Tribal Cultural Resources, construction activities shall cease in the immediate vicinity of the find (not less than the surrounding 100 feet) until the find can be assessed. All Tribal Cultural Resources unearthed by Project activities shall be evaluated by	Mitigated to Less Than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)		Level of Significance After Mitigation
forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?			the qualified archaeologist (as required in MM-CUL-4) and the Tribal Monitor approved by the Consulting Tribe. If the resources are Native American in origin, the Consulting Tribe will retain it/them in the form and/or manner the Tribe deems appropriate, for educational, cultural and/or historic purposes.	
	Potentially Significant	MM-TCR-2	If human remains and/or grave goods are discovered or recognized at the Project Site, all ground disturbance shall immediately cease, and the county coroner shall be notified per Public Resources Code Section 5097.98, and Health & Safety Code Section 7050.5. Human remains and grave/burial goods shall be treated alike per California Public Resources Code section 5097.98(d)(1) and (2). Work may continue on other parts of the Project site while evaluation and, if necessary, mitigation takes place (CEQA Guidelines Section 15064.5[f]). If a non-Native American resource is determined by the qualified archaeologist to constitute a "historical resource" or "unique archaeological resource," time allotment and funding sufficient to allow for implementation of avoidance measures, or appropriate mitigation, must be available. The treatment plan established for the resources shall be in accordance with CEQA Guidelines Section 15064.5(f) for historical resources and PRC Sections 21083.2(b) for unique archaeological resources. Preservation in place (i.e., avoidance) is the preferred manner of treatment. If preservation in place is not feasible, treatment may include implementation of archaeological data recovery excavations to remove the resource along with subsequent laboratory processing and analysis. Any historic archaeological	Less than Significant

Table ES-1. Summary of Environmental Impacts and Mitigation Measures

Environmental Topic	Impact?	Mitigation Measure(s)	Level of Significance After Mitigation
		material that is not Native American in origin shall be curated at a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County or the Fowler Museum, if such an institution agrees to accept the material. If no institution accepts the archaeological material, it shall be offered to a local school or historical society in the area for educational purposes.	

ES.10 References

TJC (TJC and Associates Inc.). 2018. *Arroyo Seco Bridge (B3) Assessment Deterioration Comparison*. Final version. Prepared for Pasadena Water and Power. March 16, 2018.

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1 INTRODUCTION

The purpose of this Section is to introduce the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project), the applicable environmental review procedures, and the organization of the Draft Environmental Impact Report (EIR).

1.1 Purpose and Scope

The purpose of this Draft EIR is to evaluate and disclose the potential environmental consequences of the proposed Arroyo Seco Canyon Project Areas 2 and 3 (Project/proposed Project). The proposed Project constitutes a "project" as defined in the California Environmental Quality Act (CEQA) Guidelines Section 15378. Pursuant to Section 15367 of the State CEQA Guidelines, the City of Pasadena (City) is the Lead Agency for the Project. This Project is being implemented by the City of Pasadena Department of Water and Power (PWP). However, the City of Pasadena is serving as the Lead Agency, as it has the principal responsibility for carrying out the Project and has the authority for approving the Project and its accompanying environmental documentation.

The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco for direct use or to spread for percolation into spreading basins for groundwater pumping credits from the Raymond Basin. Of the total amount of water that is infiltrated into the groundwater through the existing spreading basins, PWP has the right to pump between 60- to 80% of that amount for beneficial use in the City's water supply. The City has historically diverted its 25 cfs surface water right; however, in the two storm seasons following the 2009 Station Fire[1], excessive amounts of sediment washed down from the watershed. The debris flows damaged City structures, greatly reducing the City's capacity to divert water for spreading. As a result, PWP proposes to repair and replace damaged facilities in the Arroyo Seco Canyon as a part of the proposed Project. The improvements would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial uses of this important local water resource. The proposed Project would implement a multi-benefit approach to the repair and replacement of damaged infrastructure in the Arroyo Seco, with the overall Project objective of increasing the beneficial use of the surface water rights held by the City and improving biological functions within the Arroyo Seco. (See Section 3, Project Description for additional details).

EIRs are informational documents "which will inform public agency decision-makers and the public generally of the significant environmental effect of a project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the project." (14 CCR 15121). The purpose of this Draft EIR is to present the evaluation of the anticipated environmental effects of the proposed Project.

[1] In 2009, the Station Fire burned 160,000 acres in the San Gabriel Mountains including the Project site.

1.2 CEQA Requirements

CEQA requires the preparation of an EIR for any project that a lead agency determines may have a significant impact on the environment. According to Section 21002.1(a) of CEQA:

> *"The purpose of an environmental impact report is to identify the significant effects on the environment of a project, to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided."*

CEQA also establishes mechanisms whereby the public and decision makers can be informed about the nature of the project being proposed and the extent and types of impacts that the project and its alternatives would have on the environment if they were to be implemented.

The basic purposes of CEQA are to:

1. Inform governmental decision makers and the public about the potential, significant environmental effects of proposed activities;
2. Identify the ways that impacts to the environment can be avoided or significantly reduced;
3. Prevent significant, avoidable impacts to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible; and
4. Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved (14 CCR 15002).

When applicable, the Draft EIR recommends feasible mitigation measures that can reduce or avoid significant environmental impacts. This Draft EIR was prepared in accordance with Section 15151 of the State CEQA Guidelines, which defines the standards for EIR adequacy as follows:

> *"An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure."*

The EIR process typically consists of three parts: (1) the Initial Study and Notice of Preparation (NOP), (2) the Draft EIR, and (3) the Final EIR, which includes the comment letters and the responses to the public comments on the Draft EIR. The Initial Study/NOP is intended to encourage interagency communication concerning the proposed action and to provide sufficient background information about the proposed action so that agencies, organizations, and members of the public can respond with specific comments and questions on the scope and content of the EIR. The City prepared an Initial Study in order to determine which of those environmental considerations under CEQA the Project would either have no impact or a less than significant impact on and, as such, would not need to

be further analyzed within this EIR. Conversely, those CEQA topics addressed in the Initial Study that could result in significant impacts to the environment as a result of Project implementation are further analyzed within this EIR.

An Initial Study and NOP were distributed on November 4, 2019, to federal, State, regional, and local agencies and interested parties for a 30-day review period to solicit comments and to inform agencies and the public of the proposed Project. Hardcopies of the Initial Study/NOP were made available for review at the PWP office located at 150 South Los Robles Avenue, Suite 200, Pasadena, and online at https://ww5.cityofpasadena.net/planning/category/environmentalnotices/ and/or PWPweb.com/Arroyo. A scoping meeting was held on Thursday, November 21, 2019, at Robinson Park Recreation Center (1081 North Fair Oaks Avenue, Pasadena) from 6:00 PM to 8:00 PM. The purpose of this meeting was to seek input from public agencies and the general public regarding the environmental issues and concerns that may potentially result from the proposed Project. In compliance with Section 15201 of the State CEQA Guidelines, the City conducted outreach efforts for public participation in the environmental process, prior to the scoping meeting. Public outreach efforts included flyer print outs at community centers and senior centers (including, Jackie Robinson & Robinson Park, Victory Park, Villa Parke); notifications in the Pasadena Star-News, Pasadena In Focus, PWP Watts Current Newsletter, PWP Website/Events Page, and PWP Facebook and Twitter pages; on-air notification at KPCC public radio; e-mails to approximately 1,500 addresses on the Public Works, Parks & Natural Resources distribution list; certified mailings to environmental document distribution list from the City Planning Department; and postal service mailings to property owners within a 500-foot radius of the Project boundary.

The 30-day Initial Study/NOP public review period ended December 6, 2019. The City received nine comment letters in response to the Initial Study/NOP. Table 1-1, Notice of Preparation and Scoping Comment Letter Summary provides a brief summary overview of the NOP comments received by the City that address the environmental issues and identifies the appropriate section of the Draft EIR that addresses the topic. These comments were considered during preparation of this Draft EIR. The Initial Study/NOP is included as Appendix A-1, the Appendices to the IS/MND are included as Appendix A-2, NOP comment letters are included as Appendix A-3, and the Final IS/MND is included as Appendix A-4 of this Draft EIR.

Table 1-1. Notice of Preparation and Scoping Comment Letters Summary

Sender of Comments	Date Received	General Summary of Comments	Addressed In Section(s)
State Agency			
California Department of Fish and Wildlife (CDFW)	December 3, 2019	This letter provides the CDFW's comments and suggestions as a Responsible Agency under CEQA. Comments predominantly pertain to necessary considerations that the CDFW require the EIR to consider, including: required permits; impacts to biological resources including sensitive vegetation communities, wetlands, nesting birds, aquatic and riparian habitats; recommendations for biological surveying; fuel modification; water quality; Project alternatives; direct, indirect, and cumulative impacts of the Project; and project mitigation.	Section 4.2

Table 1-1. Notice of Preparation and Scoping Comment Letters Summary

Sender of Comments	Date Received	General Summary of Comments	Addressed In Section(s)
California Department of Transportation (Caltrans)	December 6, 2019	This letter requests an evaluation of impacts to State facilities (roadways), including a queuing analysis for off-ramps. The letter encourages reduction of vehicle miles traveled generated by construction trucks, and identifies the need for an oversized-transport vehicle permit.	Section 4.8
Governor's Office of Planning and Research; State Clearinghouse and Planning Unit	November 1, 2019	This letter provides proof of receipt of the Notice of Preparation and Notice of Completion, and identifies the State agencies that received the NOP and Initial Study for review. The State Clearinghouse (SCH) Number is 2014101022.	N/A
Regional/Local Agency			
South Coast Air Quality Management District (SCAQMD)	December 3, 2019	The SCAQMD identifies what air quality impacts should be addressed and mitigation measures identified. The SCAQMD provides sources of information related to the air quality and greenhouse gas emissions analyses to be used to meet its requirements, and appropriate mitigation measures to be considered.	Section 4.1 and Section 4.4
Organizations/Individuals			
Arroyo Seco Foundation	December 6, 2019	This letter expresses concern with the environmental and recreational benefits of the proposed Project and requests that the EIR evaluate stream flow requirements to support wildlife; impacts to biological resources and habitat, and alternatives that would rely more on the natural stream hydrology.	Section 4.2, Section 4.5, Section 4.7, and Section 6
Friends of Hahamongna	December 4, 2019	This letter requests evaluation of: cumulative impacts due to other nearby projects; the need for habitat preservation in the Hahamongna; potential for impacts to the Central and Lower Arroyo; and review for the chapter topics identified in the Initial Study.	Sections 4.1 through 4.9; Section 6
Gabrieleno Band of Mission Indians – Kizh Nation	November 11, 2019	This letter requests tribal consultation pursuant to Assembly Bill 52.	Section 4.9
Bill Christian	December 6, 2019	This letter requests evaluation of: alternatives to the Project; evaluation of cumulative impacts related to the Devil's Gate sediment removal project; assessment using the best available information related to percolation rates in spreading basins; and requests decreased diversions and reliance more on the natural stream hydrology.	Section 4.2, Section 4.5, and Section 6

Table 1-1. Notice of Preparation and Scoping Comment Letters Summary

Sender of Comments	Date Received	General Summary of Comments	Addressed In Section(s)
Hugh Bowles	December 4, 2019	This letter focuses on the CEQA requirement to explore alternatives that will have less impact on the environment and achieve the project objectives. The comment requests the restoration of natural flows to the Arroyo Seco rather than increasing stream diversion and the need to consider the cumulative impacts of the projects currently underway in the Hahamongna basin including Devil's Gate sediment removal project.	Section 4.2, Section 4.5, and Section 6
Laura Solomon	December 6, 2019	This email requests that the EIR evaluates restoration of habitat and alternatives to the proposed Project.	Section 4.2 and Section 6

This Draft EIR focuses on the environmental impacts identified as potentially significant during the Initial Study and scoping process. The following issues were determined to be potentially significant and are therefore addressed in Section 4, Environmental Analysis of this Draft EIR:

4.1 Air Quality
4.2 Biological Resources
4.3 Cultural Resources
4.4 Greenhouse Gas Emissions
4.5 Hydrology and Water Quality
4.6 Noise
4.7 Recreation
4.8 Transportation
4.9 Tribal Cultural Resources

The Draft EIR will be made available for review to the public and public agencies for a minimum of 45 days to enable them to provide comments on the "sufficiency of the document in identifying and analyzing the possible impacts on the environment and ways in which the significant effects of the project might be avoided or mitigated" (14 CCR 15204). The timeframe of the public review period is identified in the Notice of Availability for this Draft EIR. During this period, a hardcopy of the Draft EIR will be made available for review at the PWP office located at 150 South Los Robles Avenue, Suite 200, Pasadena, and electronic files will be available for viewing online at https://ww5.cityofpasadena.net/planning/category/environmentalnotices/ and/or PWPweb.com/Arroyo.

During this period, comments from the general public, organizations, and agencies regarding environmental issues analyzed in the Draft EIR and the Draft EIR's accuracy and completeness may be submitted to the lead agency at the following address:

ATTN: Elisa Ventura, P.E.
City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
Email: eventura@cityofpasadena.net

As the lead agency for the proposed Project, the City has assumed responsibility for preparing this document. The City's Planning Commission will act in an advisory role, and the City Council has final decision-making authority over the proposed Project and associated discretionary actions. The City will use the information included in this Draft EIR to consider potential impacts to the physical environment associated with the proposed Project when considering approval. As set forth in Section 15021 of the State CEQA Guidelines, the City, as lead agency, has the duty to avoid or minimize environmental damage where feasible. Specifically, 14 CCR 15021(d) states that:

> *"CEQA recognizes that in determining whether and how a project should be approved, a public agency has an obligation to balance a variety of public objectives, including economic, environmental, and social factors and in particular the goal of providing a decent home and satisfying living environment for every Californian. An agency shall prepare a statement of overriding considerations as described in Section 15093 to reflect the ultimate balancing of competing public objectives when the agency decides to approve a project that will cause one or more significant effects on the environment."*

Prior to approval of the proposed Project or an alternative to the proposed Project, the City, as the lead agency and decision-making entity, is required to certify that the Final EIR has been completed in accordance with CEQA, that the proposed Project has been reviewed and the information in the Final EIR has been considered, and that the Final EIR reflects the independent judgment of the City. CEQA also requires the City to adopt "findings" with respect to each significant environmental effect identified in the Final EIR (California Public Resources Code, Section 21081; 14 CCR 15091). For each significant effect, CEQA requires the approving agency to make one or more of the following findings:

- The proposed project has been altered to avoid or substantially lessen significant impacts identified in the Final EIR.
- The responsibility to carry out such changes or alterations is under the jurisdiction of another agency.
- There are specific economic, legal, social, technological, or other considerations, which make infeasible the mitigation measures or alternatives identified in the Final EIR.

If the City concludes that the proposed Project will result in significant effects that cannot be substantially lessened or avoided by feasible mitigation measures and alternatives, the City must adopt a "statement of overriding considerations" prior to approval of the proposed Project (California Resources Code, Section 21081(b)). Such statements are intended under CEQA to provide a written means by which the lead agency balances in writing the benefits of the proposed Project and the significant and unavoidable environmental

impacts. Where the lead agency concludes that the economic, legal, social, technological, or other benefits outweigh the unavoidable environmental impacts, the lead agency may find such impacts "acceptable" and approve the proposed Project.

As discussed in more detail in Section 2, Environmental Setting, the Arroyo Seco Canyon Project was subject to environmental review under an Initial Study/Mitigated Negative Declaration in 2015, and a corresponding Mitigation Monitoring and Reporting Program (MMRP) was approved by the City. Table 2-1, in Section 2 of this Draft EIR includes the mitigation measures included within that MMRP and summarizes whether those measures remain applicable, are altered/revised, or are no longer applicable, when considering the implementation of the proposed Project. Therefore, the City must also adopt a revised MMRP describing the changes that were incorporated into the proposed Project or made a condition of Project approval in order to mitigate or avoid significant effects on the environment (California Public Resources Code, Section 21081.6). The MMRP is adopted at the time of Project approval and is designed to ensure compliance during Project implementation. Upon approval of the proposed Project, the City will be responsible for implementation of the MMRP, which will be attached to the Final EIR.

1.3 EIR Document Organization

This Draft EIR is organized as follows:

Executive Summary - Outlines the conclusions of the environmental analysis and provides a summary of the proposed Project and the Project alternatives analyzed in the EIR. This section also includes a table summarizing all environmental impacts identified in the EIR along with the associated mitigation measures proposed to reduce or avoid each impact.

Section 1: Introduction - Serves as a forward to the EIR, introducing the Project, the applicable environmental review procedures, and the organization of the EIR.

Section 2: Environmental Setting - Describes the environmental setting of the Project and provides an overview of the Project history and planning context.

Section 3: Project Description - Provides a detailed description of the setting, objectives, characteristics, construction and operation of the proposed Project and required discretionary approvals. Additionally, this section describes the approach to the cumulative impacts analysis, and cumulative projects.

Section 4: Environmental Impact Analysis - Describes the potential environmental impacts of the proposed Project, as well as proposed mitigation measures to reduce or avoid any potentially significant impacts. The discussion in Section 4 is organized by the 9 environmental issue areas as outlined above (Sections 4.1 through 4.9)

Section 5: Mandatory CEQA Topics – Provides a discussion of potential environmental impacts as a result of the proposed Project, including those that can be reduced to a less-than-significant level and those significant environmental effects that cannot be avoided if the Project is implemented. These include impacts that can be mitigated, but cannot be reduced to a less than significant level. This Section also includes a discussion on growth-inducing impacts.

Section 6: Alternatives - Discusses alternatives to the proposed Project, including a No Project Alternative. This Section describes the rationale for selecting the range of alternatives discussed in the EIR and identifies the alternatives considered by the City that were rejected from further discussion as infeasible during the scoping process. Lastly, Section 4 includes a discussion of the environmental impacts of the alternatives that were carried forward for analysis and identifies the environmentally superior alternative.

Section 7: List of Preparers - Gives names and contact information of those responsible for writing this EIR.

Appendices include various technical studies prepared for the proposed Project, as listed in the Table of Contents.

1.4 References

14 CCR 15000–15387 and Appendices A–N. Guidelines for Implementation of the California Environmental Quality Act, as amended.

California Public Resources Code, Sections 21000–21177. California Environmental Quality Act (CEQA), as amended.

2 ENVIRONMENTAL SETTING

This section describes the environmental setting of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) and provides an overview of the Project history and planning context. This section provides a general overview of the Arroyo Seco Canyon, with a focus on the environmental setting within Area 2, Area 3, and the Gabrielino Trail/Access Road, as well as temporary staging areas. The environmental impacts of the proposed Project are evaluated in Section 4, Environmental Impact Analysis, through Section 6, Alternatives, of this Draft Environmental Impact Report (EIR).

2.1 Project Location

The Project site is located in the City of Pasadena within and at the base of the Arroyo Seco Canyon at 3420 and 3500 Arroyo Seco Road, City of Pasadena. The Project site is located within Township 1 and 2 North, Range 12 West, of the Pasadena, California 7.5-minute USGS quadrangle. The Project site encompasses portions of two separate parcels, specifically Assessor Parcel Numbers (APNs) 5830-001-906 and 5823-015-902. The proposed Project consists of two primary areas, as shown on Figure 2-1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements. These areas are connected by the North Arroyo Boulevard[1] (i.e. Gabrielino Trail/Access Road), which serves as a recreational trail and the access road for City of Pasadena and U.S. Forest Service (USFS) vehicles heading into the Arroyo Seco Canyon.

Regional access to the Project site is via Interstate (I) 210, exiting Windsor Avenue and traveling northward for approximately 0.8-mile to the intersection of Windsor Avenue and Ventura Street. From this intersection, the Project site can be accessed via either Explorer Road, which is a publicly accessible roadway that leads to the City's open area (i.e., former Jet Propulsion Laboratory [JPL] East Parking Lot), or via a locked/gated entrance to North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road), which is only accessible to the public for non-motorized use, and occasional vehicle use by the City.

- Explorer Road provides vehicular access to the southernmost boundary of Area 3 (approximately 0.3-mile from the intersection of Windsor Avenue and Ventura Street) and continues northward along the eastern boundary of Area 3, terminating at the JPL Bridge, which crosses over the Arroyo Seco and provides access to the JPL campus in the City of La Cañada Flintridge.
- During the Project's construction activities, North Arroyo Boulevard would be made available for construction-related vehicles. North Arroyo Boulevard would provide vehicular access to the Behner Water Treatment Plant (WTP), the northernmost portion of Area 3 near the JPL Bridge, and northward along the Gabrielino Trail/Access Road to Area 2.

The proposed Project involves construction activity and facility improvements in Areas 2 and 3, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The former Travelling Screen and Chlorine Building (Screen Building) adjacent to Area 2 and the Behner WTP adjacent to Area 3 would be used for temporary construction materials and equipment staging only.

[1] Also known as "Arroyo Seco Road".

The Arroyo Seco passes through three distinct recreational areas within the City: (1) Upper Arroyo Seco, containing the Hahamongna Watershed Park (HWP) and Devil's Gate Reservoir and Dam; (2) Central Arroyo Seco, extending south of the Devil's Gate Dam to the Colorado Street Bridge; and (3) Lower Arroyo Seco, from the Colorado Street Bridge to the southern boundary of the City. The Project proposes new facilities and improvements only in the Upper Arroyo Seco, as shown on Figure 2-1. A small portion of the Arroyo Seco streambed is located within the boundaries of Area 2 and also located along the western edge of Area 3. The study area for the Gabrielino Trail/Access Road also includes portions of the Arroyo Seco streambed; however, the Gabrielino Trail/Access Road study area would not include any Project-related construction activity that could result in direct physical impacts to the Arroyo Seco.

2.2 Project Background

2.2.1 Settlement Agreement

On October 9, 2014, the City circulated the ASCP Initial Study/Mitigated Negative Declaration (IS/MND), State Clearinghouse (SCH) Number 2014101022, for a 30-day public review period from October 9, 2014, to November 8, 2014. The City was seeking approval of a Conditional Use Permit (CUP) No. 6222 for the ASCP, which involved improvements to three areas: Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, Jet Propulsion Laboratory (JPL) East Parking Lot. The Final 2015 ASCP IS/MND is available for viewing online at https://ww5.cityofpasadena.net/planning/category/environmental-notices/ and/or PWPweb.com/Arroyo and a hardcopy of the Final 2015 ASCP IS/MND can be viewed during normal business hours at the City of Pasadena Department of Water and Power, 150 South Los Robles Avenue, Suite 200, Pasadena, California 91101.

On January 7, 2015, the City's Hearing Officer held a public hearing regarding the requested CUP and made the findings to approve the ASCP IS/MND for CUP No. 6222. On January 20, 2015, Spirit of the Sage Council, Project Soliton, and Hugh Bowles submitted an appeal of the Hearing Officer's decision to the Board of Zoning Appeals. The Board of Zoning Appeals hearing took place on March 4, 2015, and upheld the Hearing Officer's decision by a unanimous vote. The approval was again appealed to the City Council, and on June 1, 2015, the City Council voted to uphold the Board of Zoning Appeals decision by unanimous vote.

The City of Pasadena filed a Notice of Determination (NOD) for the ASCP IS/MND on January 13, 2015, after the Hearing Officer approval, and filed an additional NOD on March 6, 2015, after the Board of Zoning Appeals approval. On July 2, 2015, a lawsuit (Court Case No. BS156207) was filed against the City by petitioners Spirit of the Sage Council and Project Soliton challenging the approval. On March 20, 2017, the Los Angeles Superior Court issued its decision and on June 26, 2017, entered a Judgment that partially favored the petitioners. The Court found that the elements of the ASCP that related to increased diversions of surface water (i.e., greater taking of stream water from the Arroyo Seco beyond its current withdrawal) required evaluation through the preparation of an EIR. The Court also ruled that the elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP and complied with the California Environmental Quality Act (CEQA). As such, the Court determined that CUP No. 6222 and its related findings and conditions of approval, and the ASCP IS/MND shall remain intact for these components, allowing them to move forward without any additional environmental review pursuant to CEQA (Spirit of the Sage Council v. City of Pasadena 2017). These approved components include:

- Area 1, Arroyo Seco Headworks: All ASCP elements.
- Area 2, Arroyo Seco Intake: Access road improvements and related slope reconstruction and protective riprap elements.

- Area 3, JPL East Parking Lot: All ASCP elements, except the expansion of 4 existing spreading basins and the construction of 2 new spreading basins. Specifically, the components of the ASCP IS/MND allowed to proceed include the parking lot, access road, sedimentation basin, demolition of existing structures and pipelines, new pipelines, new public restroom, new security booth and associated utility services (water, sewer, power, and communication lines), and topics related to the existing groundwater contamination associated with the JPL site listing on hazardous materials sites compiled pursuant to Government Code Section 65962.5.

In addition, after the Courts ruling, the petitioners and the City came to an agreement to resolve remaining issues and obtain certain assurances as to future actions of the parties. Through this Settlement Agreement, it was agreed that the City shall have the right to perform maintenance activities, including tilling and grading of the existing spreading basins to re-establish historical percolation rates and maintenance activities that involve negligible or no expansion of use as described in CEQA Guidelines Section 15301 for a Class 1 Categorical Exemption. The Settlement Agreement further clarified that the City may perform excavation and grading necessary for the temporary bridges as described in the ASCP IS/MND.

As such, this Draft EIR is being prepared by the City in accordance with the terms and provisions of the Judgment and Peremptory Writ of Mandate, the City's Declaration in Support of the Judgment, the Statement of Decision on Petition for Writ of Mandate, and the Settlement Agreement (see Appendix A-2 of this Draft EIR). Because several components of the ASCP were allowed to proceed without any additional environmental review pursuant to CEQA, the proposed Project boundaries of Area 2 and Area 3 have been refined from those shown in the 2015 ASCP IS/MND to reflect the activities subject to review under this Draft EIR, as described below.

2.3 Environmental Setting Overview

2.3.1 Arroyo Seco Canyon

The Arroyo Seco is a major tributary of the Los Angeles River, flowing from the San Gabriel Mountains in the Angeles National Forest (ANF). The Canyon has a north-south alignment with steep east- and west-facing slopes. The Arroyo Seco originates in the San Gabriel Mountains, with waters flowing south through the cities of Pasadena, South Pasadena and Los Angeles, before joining the Los Angeles River just east of Elysian Park and west of the Interstate (I) 5/I-110 Interchange. Within the City of Pasadena, the Arroyo Seco passes through three distinct recreational areas: (1) Upper Arroyo Seco, containing HWP and Devil's Gate Dam; (2) Central Arroyo Seco, containing the Brookside Golf Course and Rose Bowl; and (3) Lower Arroyo Seco, containing an archery range, casting pond, and Memorial Grove. The Project proposes improvements in the Upper Arroyo Seco in the City of Pasadena on land owned by the City.

The Hahamongna Watershed Park (HWP) Master Plan describes the rocky streambed as containing an ephemeral stream, which is the source of its given Spanish name "arroyo seco" meaning "dry wash" (City of Pasadena 2003). However, the Arroyo Seco north (upstream) of the JPL Bridge has been classified by the U.S. Fish and Wildlife Service as having a seasonally flooded water regime, which means surface water is typically present for extended periods, especially in the winter and early spring, but is absent by the end of the spring or early summer in most years (USFWS 2019).

The HWP is bound on the south by the Devil's Gate Dam and Oak Grove Drive. Oak Grove Drive and the JPL of the California Institute of Technology bound the HWP to the west in the City of La Cañada-Flintridge. To the east, HWP

is bound by the residential neighborhoods of Pasadena and Altadena. The HWP extends northward into the San Gabriel Mountains and includes approximately 1,300 acres of open spaces and recreational amenities, including the Gabrielino Trail that is heavily used for hiking/bicycling and equestrian activities.

Upstream of the JPL Bridge, vegetation communities in the Project study area include California sagebrush-California buckwheat-laurel sumac scrub, coast live oak woodland, and white alder-California sycamore woodland. Downstream of the JPL Bridge, the Arroyo Seco fans out into the alluvial system of the Devil's Gate Reservoir. Vegetation communities in this portion of the Project study area include California sagebrush-California buckwheat-laurel sumac scrub, coast live oak woodland, and a small area of arroyo willow-mulefat scrub; however, the majority of the study area below the JPL Bridge is disturbed/graded land and ornamental vegetation associated with the spreading basins and the City's open space area (see Section 4.2, Biological Resources for more information).

In November 2018, the Los Angeles County Flood Control District (LACFCD) began the removal of 1.7 million cubic yards of accumulated sediment located within 42 acres of the Devil's Gate Reservoir. Sediment removal activities would occur adjacent to existing Spreading Basin No. 14. Approximately 70 acres of habitat restoration would occur in the remaining portions of the Reservoir, including along the sloped areas between the Arroyo Seco and the spreading basins as well as within the southernmost Spreading Basin No. 17. Sediment removal activities are anticipated to continue through 2022 with habitat restoration activities occurring through 2023 (Los Angeles County Public Works 2018).

2.3.2 Area 2 Existing Conditions

The proposed Project's Area 2 study area includes approximately 1.4 acres. Figure 2-2A, Area 2 Existing Conditions, identifies the locations of the primary features and structures in Area 2, including the concrete diversion weir and intake structure, the Gabrielino Trail/Access Road, and the Arroyo Seco. Figure 2-2A also identifies the locations of the primary features and structures within the Gabrielino Trail/Access Road study area in the proximity of Area 2, including the Bridge No. 3 and the former Travelling Screen and Chlorine Building (Screen Building). Figure 2-2B, Area 2 Existing Conditions Photographs, includes four photographs taken in and around Area 2.

- **Photo 1** depicts views northward and upstream of the Arroyo Seco from the top of the intake structure, which is fenced and not publicly accessible. This photograph was taken in April 2019 and depicts the streamflows approaching the existing diversion/intake structure during springtime water conditions, as well as the rocky streambed and heavily vegetated adjacent streambed.
- **Photo 2** depicts a view from the edge of the intake structure near the chainlink fence, looking down towards the trash rack at the intake to the conveyance system, the concrete diversion and weir structure, and the diversion pool (a pool created behind the weir to allow for an appropriate water elevation to flow into the diversion intake).
- **Photo 3** depicts the view from the Gabrielino Trail/Access Road looking northward, near the diversion/ intake structure. The existing chain-link fencing and K-rails can be seen, as well as the mature trees and vegetation that line the trail.
- **Photo 4** depicts the view from the Gabrielino Trail/Access Road looking southward, near the diversion/intake structure. The existing chain-link fencing that blocks public access to the concrete top of the intake structure can be seen, as well as the mature trees and vegetation that line the trail.

As shown in Photos 3 and 4, public access to the diversion/intake structure is prohibited, and views of the facility from the Gabrielino Trail/Access Road are limited because the structure is located to the east of the trail, below the grade of the trail behind chain-link fencing, and is obscured by existing mature vegetation.

The diversion weir directs water into the intake structure by obstructing the stream flow and creating a small pool of water behind the weir that flows into the intake. When water enters the intake, it is conveyed downstream through the conveyance pipeline system to the PWP's spreading basins in Area 3. The existing intake/diversion system consists of an approximate 9-foot-high reinforced concrete training wall and intake structure with a trash rack on the east bank of the stream, and a reinforced concrete weir with stop logs in slots. Under current conditions, the weir crest is approximately 2 feet above the streambed on the downstream side.

Under current conditions, the diversion/intake structure cannot handle debris and sediment loads carried in stream flows during storm events and is shut down during these times. The former headworks facility and sedimentation basins located upstream of Area 2 were designed to remove sediment from the stream flows prior to reaching the diversion structure, but those facilities were destroyed by the debris flows that occurred during the storm events following the 2009 Station Fire (Carollo Engineers 2013), and the system's ability to settle out sediment and debris prior to entering the intake and conveyance system to the spreading basins was eliminated. Also, sediment has collected behind the weir, limiting the capacity of the diversion pool. As such, the existing diversion/intake structure is not functioning as designed for moderate to high flows due to its inability to accommodate the amount of sediment that accompanies this range of flows; therefore, PWP is not currently able to divert its 25 cfs water rights during all the times these flows are available in the stream.

2.3.3 Area 3 Existing Conditions

As shown in Figure 2-3A, Area 3 Existing Conditions, Area 3 is located approximately 0.3-mile downstream from Area 2 and includes two existing spreading basins that are known as Pasadena Ponds 1 and 2 (formerly used as sludge ponds for the Behner WTP) and Spreading Basins No. 1 through 4, the former JPL Parking Lot and adjacent Explorer Road, and the North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road), which would provide construction vehicle access to Area 2 of the Project site. After NASA's completion of a new parking structure on the JPL campus in 2016, they vacated the former parking lot (which was previously leased by the City to JPL), and removed the paving for the specific purpose of accommodating PWP's planned expansion of the spreading basins. The former JPL Parking Lot is currently unpaved, with the exception of the temporary alignment of Explorer Road.

Figure 2-3A identifies the primary structures and facilities in Area 3, as well as two easements. The LACFCD easement overlies a stormdrain that conveys flows in a subterranean pipe from the residential neighborhood to the east to the Arroyo Seco. The Southern California Edison (SCE) easement is for the transmission lines that cross east to west across the Project site and includes a tower near Pond 2 that supports the electrical lines. Figure 2-3B, Area 3 Existing Conditions Photographs, includes four photographs taken within and adjacent to Area 3.

- **Photo 1** depicts views eastward near Pond 1 and shows the graded and unpaved surfaces and vegetation surrounding the pond. Also shown is a woodshed, pipes and valves, chainlink fencing, and corrugated metal pipe, as well as the SCE electrical transmission lines associated with the easement.
- **Photo 2** depicts surface flows into the Spreading Basin No.1 and associated adjacent vegetation.

- **Photo 3** depicts Spreading Basin No. 2 and the graded slopes and engineered spreading floor area, as well as adjacent vegetation. The infrastructure that connects the basins together is shown at the northeastern corner of the basin, as are the San Gabriel Mountains in the distance.
- **Photo 4** depicts views southward in the vicinity of Pond 2, outside of the Area 3 study area and within the streambed of the Arroyo Seco. As shown, this portion of the stream includes rocky and sandy soils, steep slopes, and is often dry in this area. Also shown are the SCE electrical transmission lines.

The proposed Project's Area 3 study area includes approximately 23.3 acres. The surface area of the spreading basins within Area 3 include approximately 13 acres. According to PWP, the current spreading basins reach an equilibrium during recharge events of 18 cubic feet per second (cfs), meaning that diversions equaling 18 cfs would fill the basins to capacity, with water percolating at generally the same rate as entering the basins; however, higher flows beyond 18 cfs would not be able to be infiltrated due to capacity constraints. It is estimated that the existing spreading basins are capable of recharging a maximum of about 35 acre-ft per day (Carollo Engineers 2013). The existing spreading basin capacity limits PWP's ability to divert a sustained 25 cfs.

2.3.4 Gabrielino Trail, Bridges, and Staging Areas

Gabrielino Trail/Access Road and Bridges

The proposed Project's Gabrielino Trail/Access Road study area includes approximately 11.8 acres. The Gabrielino Trail (i.e., North Arroyo Boulevard) runs generally parallel to the Arroyo Seco and along the eastern side of the former JPL East Parking Lot and serves as a recreation trail for hikers, bikers, and equestrian uses. It also serves as a maintenance access road that leads to the Behner WTP and into the Arroyo Seco Canyon area to provide access for PWP and the USFS. During construction activities, the Gabrielino Trail/Access Road would provide for vehicular access to and from Area 2, and sometimes Area 3 (Explorer Road will be its primary access road).

As shown on Figure 2-4A, Gabrielino Trail and Bridge Crossings, along the Gabrielino Trail/Access Road, three bridges cross portions of the Arroyo Seco. Bridge Nos. 1, 2, and 3 are located between Areas 2 and 3, respectively.

Figure 2-4B, Gabrielino Trail Existing Conditions Photographs, includes four photographs taken along the Gabrielino Trail/Access Road study area. For more detailed information, see Section 4.3, Cultural Resources.

- **Photo 1** depicts a view of the temporary crossing over Bridge No. 1 near Millard Creek, looking southward towards the JPL Bridge. Bridge No. 1 is a two-span box culvert bridge with the bridge deck supported by a metal plate(s) set upon cobblestone walls, constructed either during a Civilian Conservation Corps (CCC) repair campaign in 1939 or as part of the 1941 Arroyo Seco Program. A temporary bridge deck (i.e. structural overlay bridge) with concrete access ramps and yellow railings is located on top of Bridge No. 1.

  Bridge No. 1 is approximately 0.13-mile north of the JPL Bridge. A July 2015 Bridge Condition Assessment found that the bridge abutments were being undermined due to scouring and that the Gabrielino Trail/Access Road had sloughed off in sections (TJC 2015). The structural overlay bridge spanning the length of this bridge was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage.

- **Photo 2** depicts a view of Bridge No. 2, looking upward from the Arroyo Seco streambed. Bridge No. 2 was constructed circa 1920 and it exhibits classical design elements in the rows of single balusters resembling the form of a flower bud from a pomegranate tree, as well as the four-point shape of the arch. The bridge

also displays the pattern of board-formed concrete, a method of construction popular for civil works during the early 19th Century.

Bridge No. 2 is located approximately 130 feet north of Bridge No. 1 and was likely constructed to provide a formal entrance to the Upper Arroyo Seco and the ANF. Bridge No. 2 meets the required criteria to be listed as a historical resource in the California Register of Historic Resources (CRHR) and in the City of Pasadena as a landmark.

- Photo 3 depicts a view of Bridge No. 3 looking upward from the Arroyo Seco streambed. Bridge No. 3 is a wooden kingpost truss bridge with heavy timber supports braced by a vertical metal rod and angled wood beam braced on a cantilevered timber girder, constructed in 1939 by the CCC. Timber railings line both side of the bridge deck, and board-formed concrete retaining walls support either end of the bridge.
- Photo 4 depicts a view of Bridge No. 3 from the Gabrielino Trail/Access Road, looking northward. The structural overlay bridge spanning the entire length of Bridge 3 was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage. As shown, a temporary bridge deck is positioned directly above the original wood bridge, isolating traffic weight and movement from affecting the older wood bridge. The temporary bridge deck is built with anti-skid steel decking supported by steel I-beam girders. Sloped, poured-in-place concrete ramps provide access to the structural overlay bridge at either end. Yellow tubular metal railings line each side of the temporary bridge deck and concrete access ramps. A structural evaluation of Bridge 3 subsequent to the structural overlay; however, shows that the condition of Bridge 3 continues to deteriorate (TJC 2018).

  Bridge No. 3 is located approximately 0.34-mile north of the JPL Bridge and is associated with events that made a significant contribution to the history of the United States and California. Bridge No. 3 meets the required criteria to be listed as a historical resource in the National Register of Historic Place (NRHP) and in the CRHR. The bridge was heavily damaged by the 2010 storms.

As shown on Figure 2-4A, stone masonry walls line the east side of the Arroyo Seco near Bridge No. 2 and continue upstream to Bridge No. 3, largely outside of the Gabrielino Trail/Access Road study area. Additionally, short segments of the pipeline conveyance system that connects the intake structure in Area 2 to the spreading basins in Area 3 is visible on Figure 2-4A, although the majority of the conveyance system is underground.

Staging Areas

The Screen Building and the Behner WTP are depicted in Figure 2-4C, Staging Areas Existing Conditions Photographs. The Screen Building includes approximately 0.1-acre and the Behner WTP includes approximately 0.8-acre. The Screen Building is a fully fenced area that is accessed via a short gravel driveway from the Gabrielino Trail/Access Road. This facility was likely constructed by the CCC during their Arroyo Seco improvements campaign in the 1930s. The Screen Building allows access to the subterranean conveyance system and previously provided a means of chlorinating the Arroyo Seco stream flows when it was used as a surface water source of drinking water supplies, although it is now vacant and no longer used by PWP except for periodic maintenance of the conveyance system.

The John L. Behner WTP is a one-story Brutalist-style civic building, rectangular in shape with a flat roof, built in 1970. Exterior walls are exposed concrete with strong vertical accents, and the entire facility is surrounded

by a chainlink fence. The external water treatment facilities comprise a series of open concrete tanks that were originally used to treat surface water from the Arroyo Seco for potable water supplies. The Behner WTP is no longer in operation.

2.3.5 Planning Context

Water Integrated Resources Plan, Urban Water Management Plan, and Water System Resources Plan

In 2011, PWP completed the Water Integrated Resources Plan (WIRP) which provided a long-term water resources strategy through the year 2035. It recommended a portfolio of supply and conservation options that was determined to be the best strategy for meeting current and future water needs. Among the benefits listed for the recommended strategy were 1) improved groundwater levels, 2) improved local environment and surface water quality, and 3) consistency with MWD's regional water strategy of increasing conservation and local water supplies.

The WIRP served as the primary source document for preparing the 2010 and 2015 state-mandated Urban Water Management Plans (UWMP). Among other topics, the UWMP contains information describing the supply service area, water supplies and demands, and water supply reliability over a twenty-year planning horizon. The 2015 UWMP identified the Arroyo Seco Canyon Project as a planned source of water that would increase the diversion of stream water for groundwater augmentation. A resolution approving the 2015 UWMP was adopted by the City in June 2016.

Even though many of the WIRP's objectives, strategies and recommended projects remain relevant, changing conditions since 2011 warranted a reevaluation of the plan. As a result, in 2018 PWP embarked on an update to the WIRP called the Water System and Resources Plan (WSRP). A draft WSRP has been prepared after a year-long process with stakeholder involvement, and adoption of the final document by City Council is scheduled for summer 2020. The WSRP serves as a roadmap for PWP's long-term capital and water resource planning by addressing its aging infrastructure, future water demands, existing water resources, and opportunities for new water supplies. The Arroyo Seco Canyon Project is included in the WSRP's preferred portfolio of projects which emphasizes the Raymond Basin as an asset for recharge and potable water production, and as a source of non-potable supply. The portfolio maximizes the use of local surface water as a non-potable source which includes not only the Arroyo Seco, but tunnel water and high nitrate groundwater for irrigation and recharge.

Hahamongna Watershed Park Master Plan

The HWP is almost entirely designated and zoned as Open Space in the City of Pasadena's General Plan Land Use Element and Zoning Map, including Areas 2 and 3 (City of Pasadena 2019). The Open Space designation and zone applies to City-owned land with active and passive public recreational facilities and natural open space. A Modification to the Conditional Use Permit (CUP) No. 6222 is required for any parkland and recreational improvements within the OS Zoning District.

The Arroyo Seco Master Plan is a park/facility planning document that consists of four elements: (1) Hahamongna Watershed Park Master Plan, (2) Central Arroyo Seco Master Plan, (3) Lower Arroyo Seco Master Plan, and (4) Design Guidelines for the Arroyo Seco. The Hahamongna Watershed Park Master Plan (HWP Master Plan) and the Arroyo Seco Design Guidelines are applicable documents that address select components of the proposed Project.

The HWP Master Plan sets forth objectives for the future use and development of HWP, which includes approximately 1,300 acres of open space that extends up the Arroyo Seco Canyon from the Devil's Gate Dam. The lower watershed, the 330 acres roughly defined as the floodplain and basin behind the Dam, is the focus of the

HWP Master Plan. The HWP Master Plan establishes a framework for flood management, water conservation, habitat restoration, recreation, and cultural resources protection in this area. The HWP Master Plan was adopted in 2003 and an amendment approved in 2010 (City of Pasadena 2010).

The projects specified in the HWP Master Plan that are within the Project's boundaries include the expansion of the existing spreading grounds through the creation of new spreading basins on the central and southern portions of the former JPL East Parking Lot. The HWP Master Plan also calls for habitat restoration around the spreading basins. Other improvements are planned in the HWP Master Plan that were covered and approved under the ASCP IS/MND, including parking lot improvements and a new restroom (see Section 3, Project Description and Table 3-1).

Raymond Basin Judgement

PWP's water supplies consist of local groundwater from the Raymond Basin (approximately 40%) and purchases of imported water (approximately 60%). Of the local supplies, PWP receives its water supply from two sources: direct pumping from the Raymond Basin (groundwater) and diverted surface water, which is spread into spreading basins, allowing for groundwater pumping credits. Allocations for the extraction of groundwater supplies are detailed in the Raymond Basin Judgement. The City's Urban Water Management Plan provides a summary of the Raymond Basin Judgement (Pasadena Water and Power 2016). The City's Urban Water Management Plan (UWMP; Pasadena Water and Power 2016) provides a summary of the Raymond Basin Judgement.

In order to alleviate overdraft conditions in the Raymond Basin, the Raymond Basin Judgment (Judgment) was signed on December 23, 1944. The Judgment assigns each pumper a "present unadjusted right" corresponding to the average amount of water that they pumped in the five years prior to 1937. Pasadena's present unadjusted right is 12,946 AFY. Each pumper's present unadjusted right was scaled down to create the "decreed right" such that the sum of all pumpers' decreed rights is equal to the estimated operating yield of the basin. In the original Judgment, the operating yield was determined to be 21,900 AFY for the entire Raymond Basin. However, according to the first modification of the Judgment in 1955, the operating yield was increased to 5,290 AFY in the Eastern Unit and 25,480 AFY in the Western Unit. This resulted in a total operating yield of 30,770 AFY in the Raymond Basin. Therefore, the sum of all water that is pumped—excluding water pumped from individual storage accounts or as a result of spreading or injection credits—is regulated so as not to exceed the total operating yield of the basin. Based on the new operating yield, PWP's decreed right was calculated to be 12,807 AFY from the Western Unit (Monk Hill and Pasadena subareas); PWP has no water right in the Eastern Unit (Santa Anita subarea). In 2009, the Raymond Basin Management Board (RBMB) implemented a resolution to the 1955 decreed rights to slow declining water levels in the Western Unit of Raymond Basin.

This resolution called for a cooperative pumping reduction for parties with water rights in the Pasadena subarea effective July 1, 2009, where RBMB seeks to reduce water production incrementally over five years until a 30% reduction is achieved. Hence, PWP's water right was decreased by 2,503 AF over 5 years to a final right of 10,304 AFY beginning in 2014.

A 1974 modification to the Raymond Basin Judgment allows each pumper with surface runoff diversion rights to recharge the Raymond Basin with surface water, and to then pump a portion of the recharged volume in addition to their decreed right water right. 60% to 80% of the recharged volume may be pumped depending on the spreading basin in the Arroyo Seco used for recharge of the Monk Hills subbasin. The ability to spread surface runoff provides benefits associated with natural water treatment because the alluvium can function as a filter to remove certain

constituents from the water. In addition, the ability to spread surface runoff provides storage benefits, because surface water that is diverted and spread during the wet season can be stored in the basin for use in periods of higher demand (Pasadena Water and Power 2016).

The Judgement states that PWP, which diverts surface water for beneficial use from a source contributing to the supply of groundwater in the Raymond Basin area (i.e. the Arroyo Seco), has the right to continue to divert a maximum amount of 25 cfs of water (City of Pasadena v. City of Alhambra, 1984). As stated in the Judgement, the water "shall be spread for percolation into the underground in the existing water conservation facilities of the Los Angeles County Flood Control District, or in such additional spreading grounds as the parties may acquire or construct, or in any natural stream channels leading to such existing or future spreading grounds, provided that all such spreading locations shall be within the Monk Hill Basin or Pasadena Subarea hydrologic subdivision of the Western Unit of the Raymond Basin Area" (City of Pasadena v. City of Alhambra, 1984).

2.4 Effects Found Not to be Significant

Per Section 15143, the CEQA Guidelines require that an EIR focus on the significant effects on the environment, discussing the effects with emphasis in proportion to their severity and probability of occurrence. Effects dismissed in an Initial Study (Environmental Checklist) as clearly insignificant and unlikely to occur do not need to be discussed further in the EIR unless information inconsistent with the finding in the Initial Study is subsequently received.

Section 21100 (c) of the Public Resources Code (PRC) states that an EIR shall contain a statement briefly indicating the reasons that various possible significant effects of a project were determined not to be significant and were, therefore, not discussed in detail in the EIR (PRC, Section 21000 et seq.). Section 15128 of the CEQA Guidelines adds, "Such a statement may be contained in an attached copy of an Initial Study" (14 CCR 15000 et seq.).

An Initial Study was prepared and circulated with the Notice of Preparation (NOP) for the proposed Project for public review on November 4, 2019. The NOP and Initial Study are included in Appendix A-1 and the Appendices to the Initial Study are included in Appendix A-2 of this Draft EIR. Comment letters received by the City during the NOP public review period are included in Appendix A-3 of this Draft EIR. The Initial Study for the Arroyo Seco Canyon Project Areas 2 and 3 concluded that the proposed Project would result in no impacts, result in less than significant impacts, or result in no new/different impacts than what was analyzed in the 2015 IS/MND, to the following areas:

- Aesthetics
  a) Have a substantial adverse effect on a scenic vista;
  b) Substantially damage scenic resources including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
  c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality;
  d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.
- Agricultural and Forestry Resources

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use;

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract;

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g));

d) Result in the loss of forest land or conversion of forest land to non-forest use;

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use.

- Energy
  a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation;
  b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.
- Geology and Soils
  a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:
     i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.
     ii. Strong seismic ground shaking
     iii. Seismic-related ground failure, including liquefaction
     iv. Landslides
  b) Result in substantial soil erosion or the loss of topsoil;
  c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;
  d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property;
  e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water;
- Hazards and Hazardous Materials
  a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
  b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
  c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;

d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment;

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area;

f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan;

g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.

- Land Use and Planning
  a) Physically divide an established community;
  b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.
- Mineral Resources
  a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state;
  b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.
- Population/Housing
  a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure);
  b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.
- Public Services
  a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:
     i. Fire Protection
     ii. Police Protection
     iii. Schools
     iv. Parks
     v. Other Public Facilities
- Utilities and Service Systems
  a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects;

b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years;

c) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments;

d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals;

e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste.

- Wildfire
  a) Substantially impair an adopted emergency response plan or emergency evacuation plan;
  b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;
  c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment;
  d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

2.5 2015 ASCP Mitigated Negative Declaration Summary

The City, as the designated lead agency for the proposed Project, is responsible for enforcing and verifying that each mitigation measure is implemented as required. The 2015 Arroyo Seco Canyon Project Initial Study/MND and corresponding Mitigation Monitoring and Reporting Program (MMRP) were adopted on June 1, 2015. Table 2-1 includes the mitigation measures within the 2015 MMRP and summarizes whether those measures remain applicable, are altered/revised, or are no longer applicable, when considering the implementation of the proposed Project. Therefore, the City must also adopt a revised MMRP describing the changes that were incorporated into the proposed Project or made a condition of Project approval in order to mitigate or avoid significant effects on the environment (Pub. Resources Code Section 21081.6). The 2015 IS/MND is included in Appendix A-4, 2015 Final ASCP Initial Study/Mitigated Negative Declaration of this Draft EIR.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
Aesthetics	None	Topic scoped-out through the Initial Study.
Agricultural and Forestry Resources	None	Topic scoped-out through the Initial Study.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
Air Quality	None	Topic scoped-out through the Initial Study.
Biological Resources	**MM BIO-1** A Biological Monitor shall be on site during vegetation clearing activities in Project work areas (i.e., areas of disturbance). Prior to the start of activities, the Biological Monitor shall confirm that the limits of Project work areas are clearly marked. In addition, the Biological Monitor shall conduct a pre-clearing sweep of the Project work area and shall flush and/or move common and unlisted special status wildlife to nearby suitable habitat outside the Project work area to the extent practicable. The Biological Monitor shall also be familiar with least Bell's vireo and shall conduct pre-clearing non-protocol surveys for this species while onsite. If a least Bell's vireo or other State of federally listed species is detected, work activity within 200 feet of the occupied habitat detected will be temporarily halted and the City will consult with the USFWS and CDFW. With authorization from these agencies, which may include a 'take' permit, the project will proceed in accordance with conditions developed in the consultation. Conditions will include avoidance and minimization measures to prevent or minimize impacts on the listed species(s) occurring on or adjacent to the site.	**Replaced with MM-BIO-1** See Executive Summary and Section 4.2, Biological Resources for revised mitigation.
Biological Resources	**MM BIO-2** Project construction shall be conducted in compliance with the conditions set forth in the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code with methods approved by the ~~U.S. Fish and Wildlife Service (USFWS)~~ and California Department of Fish and Wildlife (CDFW) to protect active bird/raptor nests. To the maximum extent feasible, vegetation removal shall occur during the non-breeding season for nesting birds (generally late September to early March) and nesting raptors (generally early July to late January) to avoid impacts to nesting birds and raptors. If the Project requires that work be initiated during the breeding season for nesting birds (March 1–September 30) and nesting raptors (February 1–June 30), in order to avoid direct impacts on active nests, a pre-construction survey shall be conducted by a qualified Biologist for nesting birds and/or raptors within 3 days prior to clearing of any vegetation and/or any work near existing structures (i.e., within 300 feet for nesting birds and within 500 feet for nesting raptors). If the Biologist does not find any active nests within or immediately adjacent to the impact areas, the vegetation clearing/construction work shall be allowed to proceed.	With minor modification, **MM BIO-2** remains applicable. (Text in **bold** is added; Text in ~~strikeout~~ is deleted).

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	If the Biologist finds an active nest within or immediately adjacent to the construction area and determines that the nest may be impacted or breeding activities substantially disrupted, the Biologist shall delineate an appropriate buffer zone around the nest depending on the sensitivity of the species and the nature of the construction activity. Any nest found during survey efforts shall be mapped on the construction plans. The active nest shall be protected until nesting activity has ended. To protect any nest site, the following restrictions to construction activities shall be required until nests are no longer active, as determined by a qualified Biologist: (1) clearing limits shall be established within a buffer around any occupied nest (the buffer shall be 100–300 feet for nesting birds and 300–500 feet for nesting raptors), unless otherwise determined by a qualified Biologist and (2) access and surveying shall be restricted within the buffer of any occupied nest, unless otherwise determined by a qualified Biologist. Encroachment into the buffer area around a known nest shall only be allowed if the Biologist determines that the proposed activity would not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest or the nest has failed.	
Biological Resources	**MM BIO-3** A Biological Monitor shall conduct a pre-construction bat habitat assessment of buildings and trees marked for potential removal. Potential for roosting shall be categorized by 1) potential for solitary roost sites, 2) potential for colonial roost sites (10 bats or more). If the potential for colonial roosting is determined, those trees shall not be removed during the bat maternity roost season (March 1 – July 31). Trees potentially supporting colonial roosts outside of maternity roost season, and trees potentially supporting solitary roosts may be removed via a two-step removal process, whereby some level of disturbance (such as trimming of lower branches) (at the direction of Biological Monitor) is applied to the tree on day one to allow bats to escape during the darker hours, and the roost tree shall be removed two days later (i.e., there shall be no less or more than two nights between initial disturbance and the grading or tree removal). When feasible, trees will be dropped slowly and a Biological Monitor will monitor the activity. If buildings are determined to be occupied, one-way exclusionary devices will be placed over bat access points and left in place for two nights prior to building removal.	No Change. **MM-BIO-3** remains applicable, as set forth in the MMRP.
Biological Resources	**MM BIO-4** Prior to habitat disturbing activities of any Project component, a detailed restoration program shall be developed and	**Replaced with MM-BIO-4 and MM-BIO-6**

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	implemented for any special status vegetation type identified within the Project disturbance limits that is removed. These special status vegetation types shall be restored within the project disturbance limits at a ratio of not less than 1:1, or as agreed to by the City of Pasadena in consultation with the CDFW. If the 1:1 ratio cannot be achieved within the project disturbance limits, then the balance shall be achieved by identifying additional areas for restoration or conservation within the Arroyo Seco or adjacent watersheds. Restoration shall consist of seeding and container plantings of appropriate species. A Restoration Program shall be submitted to the City of Pasadena for review by a qualified Biologist and approval by the resource agencies (USACE, RWQCB, CDFW) prior to issuance of grading permits. The Restoration Program shall include, at a minimum, the following elements: a. Responsibilities and qualifications of the personnel to implement and supervise the plan. The responsibilities of the landowner, specialists, and maintenance personnel that will supervise and implement the plan shall be specified. b. Site selection. The site(s) for mitigation shall be determined in coordination with the City of Pasadena and the resource agencies. Restoration required outside the Project disturbance limits shall be located in dedicated open space areas (i.e. preserved in perpetuity as open space) and shall be contiguous with other natural open space areas. c. Site preparation and planting implementation. The site preparation shall include (1) protection of existing native species; (2) trash and invasive non-natives removal; (3) native species salvage and reuse (i.e., duff); (4) soil treatments (i.e., imprinting, decompacting); (5) erosion-control measures (i.e., rice or willow wattles); and (6) native seed mix application and plantings. d. Schedule. Establishment of restoration/revegetation sites shall be conducted between October 1 and January 30. Seeding and planting of container plants shall take place immediately after preparation of the restoration sites. e. Maintenance plan/guidelines. The maintenance plan shall include (1) invasive non-natives control, (2) herbivory control, (3) trash removal, (4) irrigation system maintenance, (5) maintenance training, and (6) replacement seeding and/or planting.	See Executive Summary and Section 4.2, Biological Resources for revised mitigation.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	f. Monitoring Plan. The monitoring plan shall include (1) site preparation and implementation activities; (2) performance criteria as approved by the City of Pasadena and resource agencies; (3) long-term monitoring requirements and methods to determine compliance with performance criteria; (4) goals and methods of site maintenance (e.g., weed removal, erosion control); (5) preparation of regular progress reports to document site progress; and (6) preparation of annual reports which shall be submitted to the City of Pasadena and resource agencies for three to five years. The monitoring shall be conducted for three to five years, depending upon the performance standard requirements for the vegetation type at the mitigation site. g. Long-term preservation. Long-term preservation of the restoration site shall be outlined in the conceptual mitigation plan to ensure the mitigation site is not impacted by future development. h. Performance standards will be identified and will apply for each special status vegetation type. Revegetation shall be considered successful at three years if the percent cover and species diversity of the restored and/or created habitat areas are similar to percent cover and species diversity of adjacent existing habitats, as determined by quantitative testing of existing, restored, and created habitat areas. In addition, earth-moving equipment shall avoid maneuvering in areas outside the construction limits in order to avoid disturbing adjacent habitats. Prior to grading, the construction limits shall be identified on the grading plan and established at the Project site with appropriate staking and flagging materials. The Contractor shall submit a letter to the City of Pasadena verifying that the construction limits have been staked and flagged at the Project site.	
Biological Resources	**MM BIO-5** Mitigation for the loss of jurisdictional resources shall be negotiated with the resource agencies during the regulatory permitting process (see RR BIO-1) and shall ensure that mitigation to compensate for permanent impacts on jurisdictional resources is equivalent or superior to biological functions and values impacted by the Project. Potential mitigation options may include: (1) removal of exotic species from the Arroyo Seco Canyon or Hahamongna Watershed Park or elsewhere within the Arroyo Seco or adjacent watersheds; (2) payment to a mitigation bank or regional riparian enhancement program (e.g., invasive plant or wildlife species	**Replaced with MM-BIO-6** See Executive Summary and Section 4.2, Biological Resources for revised mitigation.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	removal); and/or (3) restoration of riparian habitat, including qualifying vegetation and trees, either on site or off site at a ratio of no less than 1:1, determined through consultation with the USACE, the RWQCB, and the CDFW. The restoration plan shall detail the methodology and performance standards, which shall be prepared in accordance with requirements specified in permits/agreements issued by the USACE, the RWQCB, and the CDFW.	

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
Biological Resources	**MM BIO-6** A team of qualified specialists in hydrology and plant and wildlife biology will monitor the Arroyo Seco stream and associated riparian habitat from the intake structure (i.e. diversion point) downstream to Devil's Gate Dam. The extent of the riparian habitat, including aquatic habitat, will be defined based on field observations during the initial site visit. Monitoring will begin with an initial baseline assessment to be conducted within six months prior to start of increased diversions. Thereafter, monitoring shall continue quarterly for a duration of five years. Data will be gathered at fixed points along the stream, and general descriptive notes and photos will be taken of the entire stretch. Data will include surface flow measurements; subsurface hydrology; surface water extent mapping; vegetation mapping; a vegetation health assessment; active channel location mapping; and a plant and wildlife habitat suitability assessment (including protocol surveys if warranted and necessary to determine presence or absence of species). Data from four quarterly visits will be compiled in an annual report. The initial report will include a summary of available biological and hydrological historic data for the site. Annual reports will also include U.S. Geological Survey (USGS) stream gauge data from the Arroyo Seco (upstream of the Project site) and City of Pasadena data on diversion amounts within the year. These reports will consider all potential contributing factors, including precipitation and hydrologic conditions, flows from other managed tributaries, as well as potential maintenance and sediment removal activities behind the Devil's Gate Dam, and focus the reports on that which is attributable to the project to the maximum extent feasible. Annual reports will conclude with an assessment on the effects of increased diversion and will provide recommendations for corrective actions, if deemed necessary to avoid or reduce downstream impacts attributable to the Project. Reports will be submitted to the City of Pasadena for review and approval of recommended corrective measures, if any. Alternatively, if the City chooses not to take corrective measures, the City may mitigate for any loss of vegetation at a minimum 1:1 replacement ratio. The City shall only be required to mitigate for those impacts attributable to the City's increased diversions. Replacement vegetation shall be in kind; shall be equal to or greater than biological value prior to diversion; and shall be located within the Arroyo Seco watershed. Vegetation replacement shall mitigate for plant and wildlife impacts of the impacted community. Re-vegetated riparian communities within Area 1 established as part of the Project may	This mitigation is no longer necessary and is eliminated from the MMRP, as substantiated in Section 4.2, Biological Resources.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	potentially qualify towards credit for reduced flow impacts, if credit is available.	
Biological Resources	**MM BIO-7** Prior to commencement of construction activities, trees not expected to be impacted by construction shall be enclosed by barriers such as chain-link fencing or orange snow fencing. At a minimum, the barriers will be placed at the outer canopy of each tree to be protected in place, and no grade changes will be made within the barriers without prior approval by the City. During Project construction, a biological monitor will be periodically present to record the number of trees actually impacted. If project construction can avoid impacting oak trees, the number of replacement trees will be reduced accordingly.	**Replaced with MM-BIO-8** See Executive Summary and Section 4.2, Biological Resources for revised mitigation.
Cultural Resources	**MM CUL-1** Prior to the start of construction activities in Areas 1 and 2, the cast concrete baluster railing of Bridge No. 2 shall be protected from construction activities that include the movement of heavy and large motor vehicles and machinery over it to gain access to Areas 1 and 2. Each baluster railing, from the bridge deck to the top of the railing, shall be clad with solid plywood panels, with a minimum thickness of ¾ inches (or equally effective measures shall be installed) to protect against unintentional impacts from passing over the bridge. The plywood barriers shall be secured without damaging the balusters or railing. The design and construction (and eventual removal) of the protective barriers at Bridge No. 2 shall be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The plans for the temporary barriers shall be reviewed by an architectural historian, historic architect, and structural or civil engineer who has experience with the physical components of historic bridges. A qualified architectural historian (who meets the Secretary of Interior's Professional Qualification Standards) shall be retained to monitor the proposed installation and removal of the protective barriers on Bridge No. 2, prior to construction. An installation/construction/repair methodology to protect the historic resources shall be developed prior to construction activities to ensure that the protective measures adequately safeguard Bridge No. 2. A pre-construction and a post-construction survey shall be prepared to ensure that adverse effects or significant impacts have not occurred to the bridge. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning – Historic Preservation.	**Replaced with MM-CUL-1** See Executive Summary and Section 4.3, Cultural Resources for the revised mitigation.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
Cultural Resources	**MM CUL-2** Prior to commencement of construction activities within Areas 1 and 2, the design and construction (and eventual removal) of the temporary bridge over Bridge No. 3 shall be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The plans for temporary bridge shall be reviewed by an architectural historian, historic architect, and structural or civil engineer who has experience with the physical components of historic bridges and stone walls. A qualified architectural historian (who meets the Secretary of Interior's Professional Qualification Standards) shall be retained to monitor the proposed installation/construction and removal plan documents for the temporary bridge on Bridge No. 3, prior to the start of construction activities. A pre-construction and a post-construction survey shall be prepared to ensure that adverse effects or significant impacts have not occurred to the bridge. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning and Community Development, Design and Historic Preservation	**Replaced with MM-CUL-2** See Executive Summary and Section 4.3, Cultural Resources for the revised mitigation.
Cultural Resources	**MM CUL-3** Prior to commencement of earthmoving activities, the City shall retain a qualified Archaeologist to observe grading activities. The Archaeologist shall be present at the pre-grade conference; shall establish procedures for archaeological resource surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts, as appropriate. Should archaeological resources be found during ground-disturbing activities for the Project, the Archaeologist shall first determine whether it is a "unique archaeological resource" pursuant to the California Environmental Quality Act (CEQA, i.e., Section 21083.2[g] of the California Public Resources Code) or a "historical resource" pursuant to Section 15064.5(a) of the State CEQA Guidelines. If the archaeological resource is determined to be a "unique archaeological resource" or a "historical resource", the Archaeologist shall formulate a mitigation plan in consultation with the City of Pasadena that satisfies the requirements of the above-referenced sections. The Archaeologist shall prepare a report of the results of any study prepared as part of a testing or mitigation plan, following guidelines of the California Office of Historic Preservation, and s/he shall record the site and submit the recordation form to the City of Pasadena and the California Historic Resources Information System (CHRIS) at the	**Replaced with MM-CUL-4** See Executive Summary and Section 4.3, Cultural Resources for the revised mitigation.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	South Central Coastal Information Center (SCCIC) at California State University, Fullerton. Work may proceed in other areas of the site, subject to the direction of the Archaeologist.	
Cultural Resources	**MM CUL-4** Prior to commencement of earthmoving activities, a qualified Paleontologist shall be retained to observe grading activities in native soils that are 5 feet below the ground surface or deeper, in paleontologically sensitive sediments, and to conduct salvage excavation of paleontological resources, as necessary. The Paleontologist shall be present at the pre-grading conference; shall establish procedures for paleontological resources surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of any fossils discovered, as appropriate. If paleontological resources are discovered, the Paleontologist shall report such findings to the City of Pasadena. If paleontological resources are found to be significant, the Paleontologist shall determine appropriate actions, in cooperation with the City, for exploration and/or salvage. These actions, as well as final mitigation and disposition of the resources, shall be subject to the approval of the City. All recovered fossils shall be deposited in an accredited institution or museum, such as the Natural History Museum of Los Angeles County.	**Replaced with MM-PALEO-1** See Executive Summary and Section 4.3, Cultural Resources for the revised mitigation.
Energy	None	Topic scoped-out through the Initial Study.
Geology and Soils	None	Topic scoped-out through the Initial Study.
Greenhouse Gas Emissions	None	Topic scoped-out through the Initial Study.
Hydrology and Water Quality	None	Topic scoped-out through the Initial Study.
Hazards and Hazardous Materials	**MM HAZ-1** The City shall require Construction Contractors to implement the following measures: • Trucks and equipment entering the site shall be inspected to be free from oil, gasoline, or other vehicle fluid leaks. • Equipment fueling areas shall be located outside jurisdictional waters as identified by the USACE and CDFW. • Hazardous materials shall not be stored within the 50-year floodplain for the Arroyo Seco. Instead, hazardous materials shall be stored within staging areas located away from the	No Change. **MM HAZ-1** remains applicable, as set forth in the MMRP.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	Arroyo Seco and shall be removed prior to the start of the storm season. • All hazardous material spills and contaminated soils shall be excavated immediately upon discovery to minimize soil and water contamination and the potential of wildlife being poisoned or otherwise harmed. • The Contractor shall maintain hazardous materials spill control, containment, and cleanup kits of adequate size and materials for potential accidental instream spills and releases.	
Hazards and Hazardous Materials	**MM HAZ-2** Should discolored or odorous soils be encountered during grading and excavation activities in Area 3, the Contractor shall have a sample of the soils analyzed for the presence of contamination. If the results of the testing show that chemical levels are present below regulatory levels, grading and excavation activities may proceed accordingly. Otherwise, remediation and/or removal of the contaminated soils shall be completed prior to continued ground disturbance if chemical levels are above regulatory standards. Remediation and/or disposal shall be conducted with the oversight of applicable regulatory agencies such as the Los Angeles County Fire Department, the South Coast Air Quality Management District (SCAQMD), the California Department of Toxic Substances Control (DTSC), and/or the U.S. Environmental Protection Agency in compliance with established maximum contaminant levels (MCLs).	No Change. **MM HAZ-2** remains applicable, as set forth in the MMRP.
Hazards and Hazardous Materials	**MM HAZ-3** The Contractor shall schedule ~~the temporary bridge construction and~~ the access road reconstruction in Area 2 so as to shorten the necessary closures of the ~~bridges and~~ access road to the extent feasible. The Contractor shall also inform the Pasadena Department of Water and Power (PWP), the Pasadena Fire Department, the Pasadena Police Department, the Los Angeles County Fire Department, and the United States Forest Service (USFS) at least one week in advance of the start of construction of the times when work on ~~Bridge No. 1/temporary bridge; Bridge No. 3/temporary bridge; and~~ the Gabrielino Trail/access road are planned. Any major changes to the schedule shall be forwarded to these agencies at least one week prior to ~~the bridge or~~ trail closures.	The temporary bridges are currently in place and operational. With minor modification, **MM HAZ-3** remains applicable.
Hazards and Hazardous Materials	**MM HAZ-4** The Contractor shall not use, operate, or cause to be operated any internal combustion engine that uses hydrocarbon fuel, unless the engine is equipped with a spark arrestor and is maintained in effective working order, or the engine is constructed, equipped and maintained for the prevention of fire.	No change. **MM HAZ-3** remains applicable, as set forth in the MMRP.

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
Land Use and Planning	None	Topic scoped-out through the Initial Study.
Mineral Resources	None	Topic scoped-out through the Initial Study.
Noise	**MM NOI-1** The **City and/or their Construction** Contractor shall implement the following noise-reduction measures during all construction activities: • Equip all construction equipment (fixed or mobile) with properly, operating and maintained mufflers, consistent with or exceeding manufacturers' standards. • Ensure that construction equipment engine enclosures and covers, as provided by manufacturers, shall be in place during operation. • Place all stationary construction equipment so that the equipment is as far as feasible from noise-sensitive receptors and so that the emitted noise is directed away from the noise-sensitive receptors. • Locate equipment and materials staging in areas that will create the greatest distance between staging area noise sources and noise-sensitive receptors during Project construction. • Ensure that construction equipment is shut down when not in use. • Limit haul truck deliveries to the same hours specified for the operation of construction equipment.	With minor modification, **MM NOI-3** remains applicable. (Text in **bold** is added; Text in ~~strikeout~~ is deleted).
Population and Housing	None	Topic scoped-out through the Initial Study.
Public Services	None	Topic scoped-out through the Initial Study.
Recreation	**MM REC-1** Prior to the closure of recreational trails for public use, the Construction Contractor shall post signs at the parking lots and trail entrances providing at least one week of advanced notice of the dates and times of planned trail closures. The trails shall be closed no more than 5 consecutive days in non-emergency circumstances. In addition to the closure notice, the Contractor shall provide directions to the nearest trails in the surrounding areas that would be open for public use at the times when the trails are closed.	**Replaced with MM-REC-1.** See Executive Summary and Section 4.7, Recreation for the revised mitigation.
Transportation	**MM TRA-1** During construction activities in Areas 1, 2 and 3, all Contractors shall schedule the arrival and departure of the construction equipment, and construction trucks outside the AM peak hours of 7:30	**Replaced with MM-TRA-1.**

Table 2-1. 2015 IS/MND Mitigation Monitoring and Reporting Program

Initial Study Topic	2015 MMRP: Mitigation Measure	Applicability to the ASCP Areas 2 and 3 EIR
	AM to 8:30 AM and the PM peak hours of 4:30 PM to 5:30 PM. In addition, trucks transporting sediment and debris from the site shall travel to and from the site outside the AM and PM peak hours.	See Executive Summary and Section 4.8, Transportation for the revised mitigation.
Transportation	**MM TRA-2** During construction activities in Areas 1 and 2, use of Bridge No. 1, Bridge No. 3, and the Gabrielino Trail/access road by hikers, bicyclists and equestrians shall be limited or prohibited when work on the temporary bridges and Gabrielino Trail/access road is ongoing. Flagpersons and/or other safety procedures shall be used as necessary to ensure the safety of recreational users.	**Replaced with MM-TRA-2.** See Executive Summary and Section 4.8, Transportation for the revised mitigation.
Transportation	**MM TRA-3** Prior to the start of construction, the **City and/or their** Construction Contractor shall provide written notice to the USFS and residences at the Ranger Station of the anticipated construction schedule, stating that access may be temporarily obstructed on an intermittent basis and providing a schedule of anticipated closures. In order to ensure that emergency vehicles would not be obstructed at any time, any temporary obstructions to the Gabrielino Trail/Access Road that could hinder emergency vehicular access shall be mobile and able to be removed from the roadway immediately upon notice from emergency responders.	With minor modification, **MM TRA-3** remains applicable. (Text in **bold** is added; Text in ~~strikeout~~ is deleted).
Transportation	**MM CUM-1** The Contractor for the Arroyo Seco Canyon Project shall coordinate with the Los Angeles County Department of Public Works and their contractor for the sediment removal activities at Devil's Gate Reservoir on the schedule of trucks coming to and from Scholl Canyon Landfill, such that the Project's truck traffic avoids the AM and PM peak hours to reduce conflict with local traffic so that truck arrival times are staggered between the two projects to avoid queuing on Figueroa Street and on the State Route 134 on-and off-ramps.	**Replaced with MM-CUML-1.** See Executive Summary and Section 4.8, Transportation for the revised mitigation.
Tribal Cultural Resources	None	**New MM-TCR-1 and TCR-2.** See Executive Summary and Section 4.9, Tribal Cultural Resources
Utilities and Service Systems	None	Topic scoped-out through the Initial Study.
Wildfire	None	Topic scoped-out through the Initial Study.

2.6 References

14 CCR 15000–15387 and Appendices A–N. Guidelines for Implementation of the California Environmental Quality Act, as amended.

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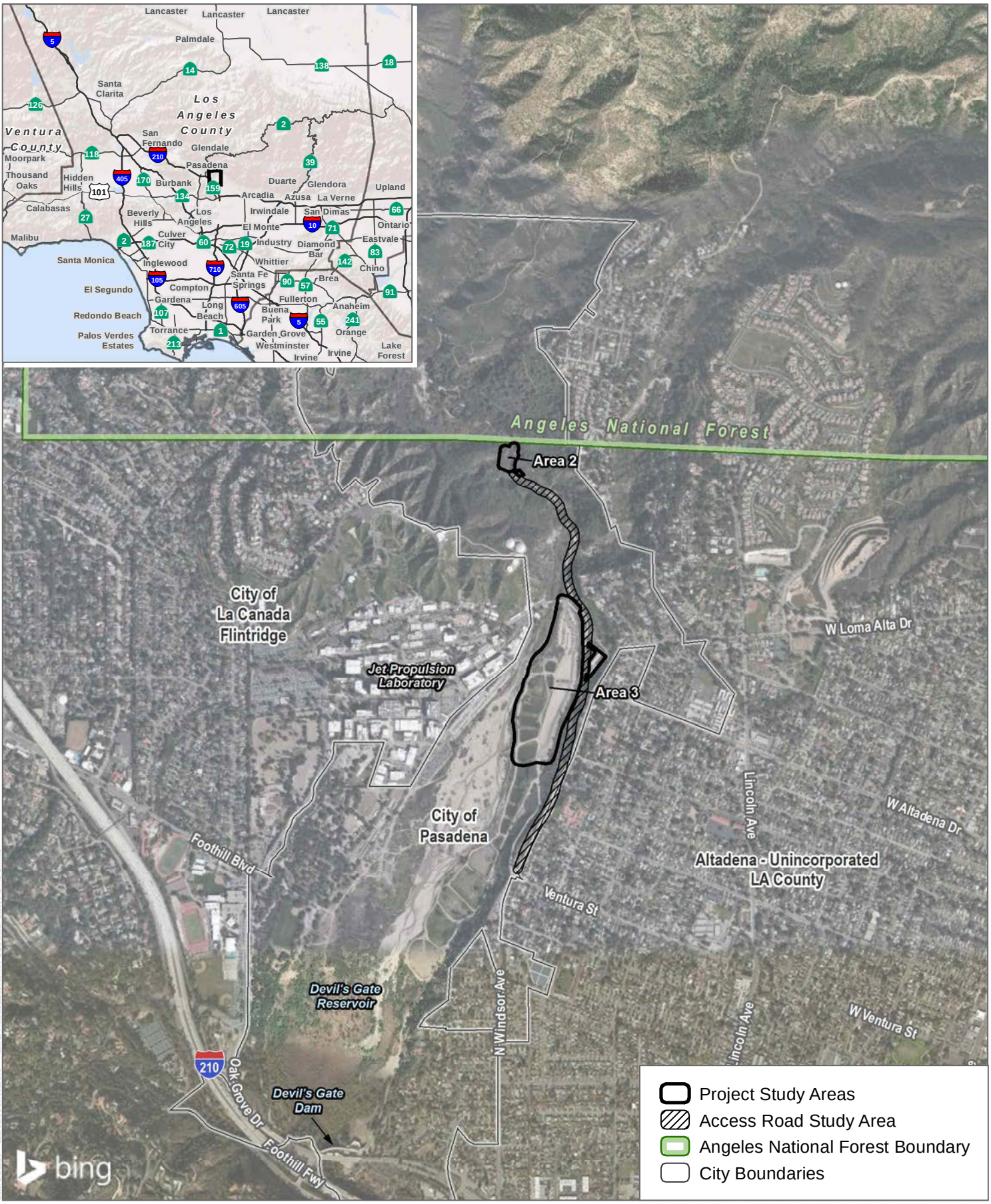
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TJC (TJC and Associates, Inc.) 2015. *Bridge Condition Assessment and Temporary Structure Design at Arroyo Seco Canyon*. TJCAA Project NO. 114096. Prepared for Pasadena Water and Power. July 2015.

TJC (TJC and Associates, Inc.) 2018. *Arroyo Seco Bridge (B3) Assessment Deterioration Comparison*. TJCAA Project NO. 114096. Prepared for Pasadena Water and Power. March 16, 2018.

USFWS (U.S. Fish and Wildlife Service). 2019. National Wetlands Inventory Mapper [online application]. Accessed December 4, 2019. https://www.fws.gov/wetlands/data/Mapper.html.



SOURCE: Bing 2019, Open Street Map 2019

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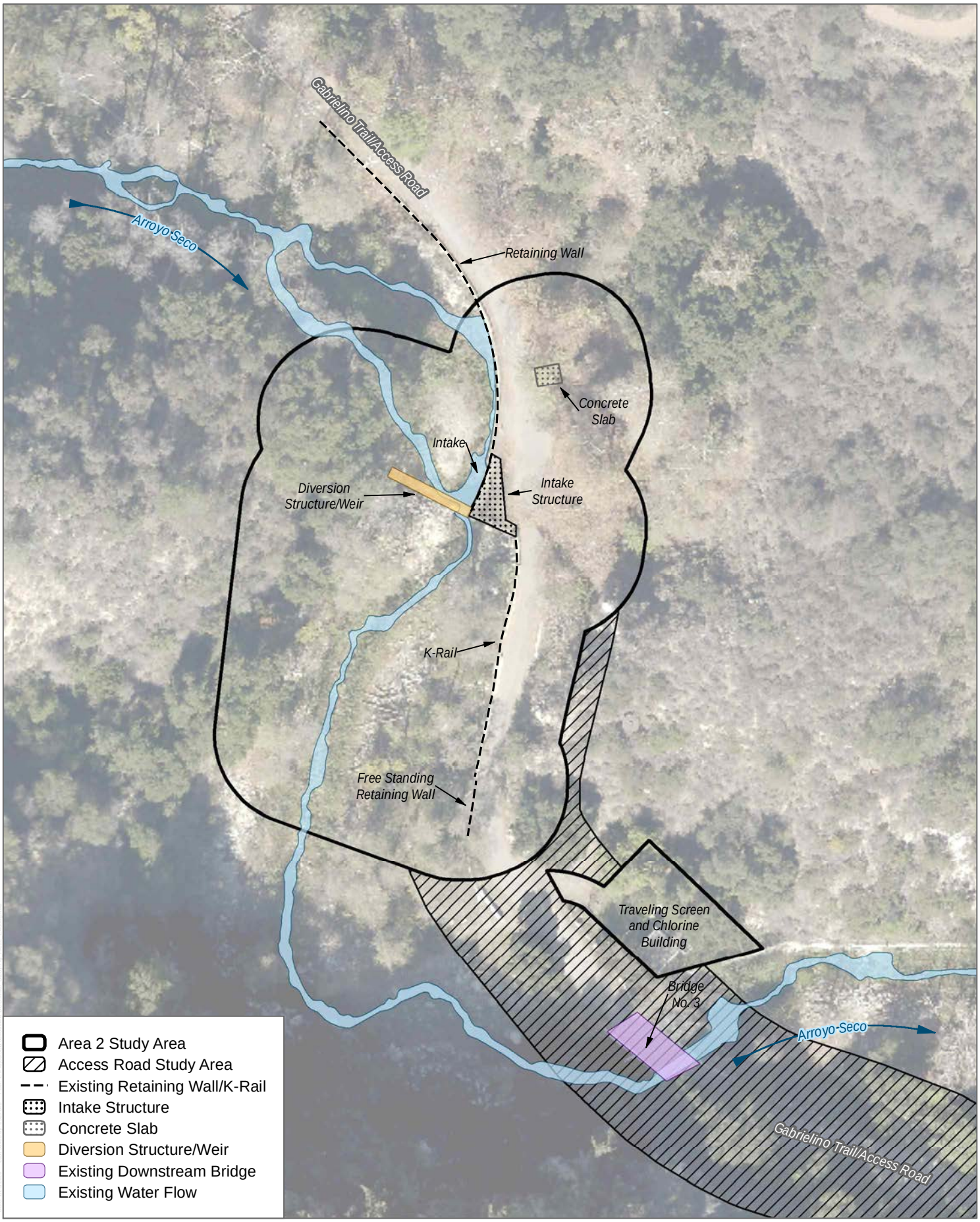
0 700 1,400 Feet

FIGURE 2-1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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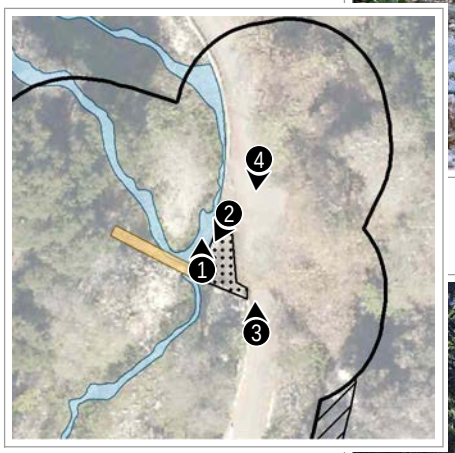
0 35 70 Feet

FIGURE 2-2A

Area 2 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

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0 50 100 Feet



Photo 1



Photo 2



Photo 3



Photo 4

Photo Location and Direction
Diversion Structure/Weir
Intake Structure
Area 2 Study Area
Access Road Study Area

Note: Photos 1 and 2 taken April, 2019.
Photos 3 and 4 taken July, 2019.

SOURCE: LARIAC 2014

FIGURE 2-2B

Area 2 Existing Conditions Photographs

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Esri, Digital Globe 2019

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0 112.5 225 Feet

FIGURE 2-3A

Area 3 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

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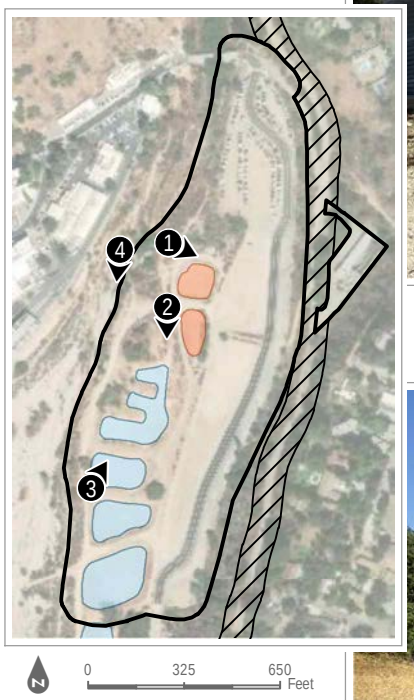




Photo 1



Photo 2



Photo 3



Photo 4

Note: Photos taken October, 2019
Photo 4 taken September, 2019

Esri, Digital Globe 2019

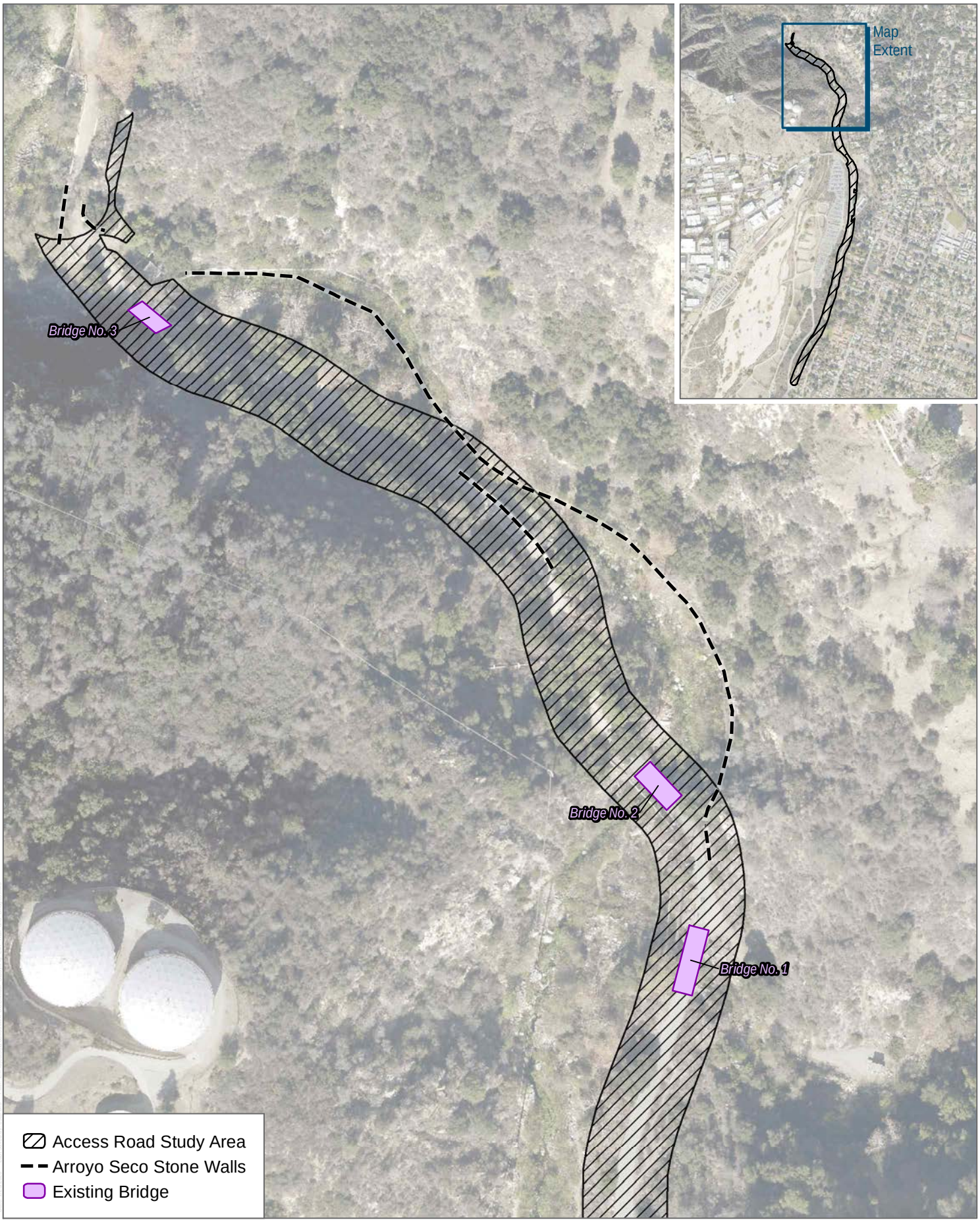
FIGURE 2-3B

Area 3 Existing Conditions Photographs

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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0 75 150 Feet

FIGURE 2-4A

Gabrielino Trail and Bridge Crossings Map

Arroyo Seco Canyon Project Areas 2 and 3

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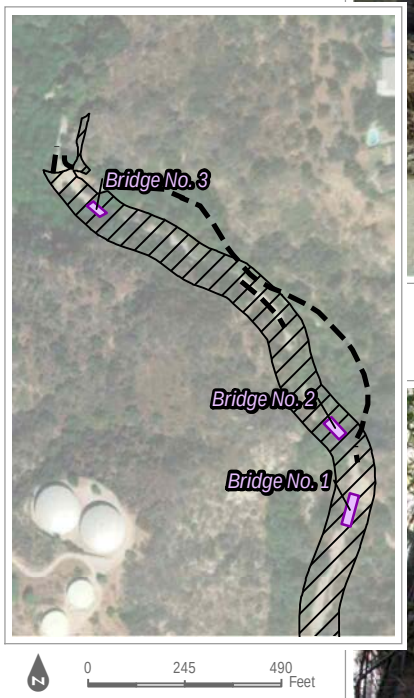




Photo 1 - Bridge No. 1

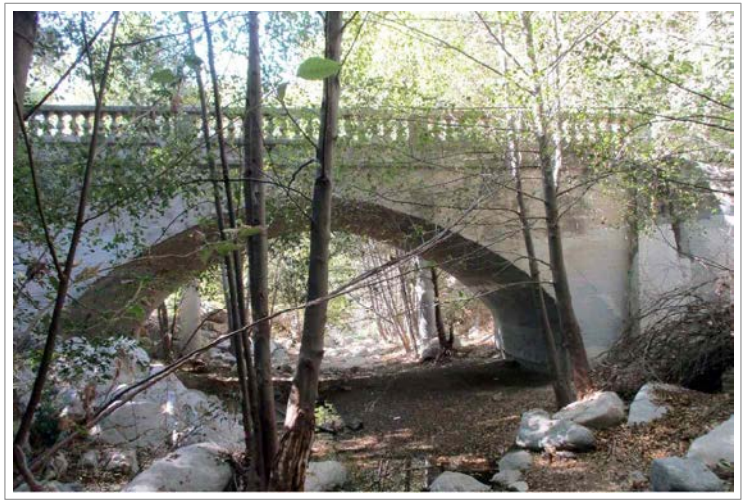


Photo 2 - Bridge No. 2

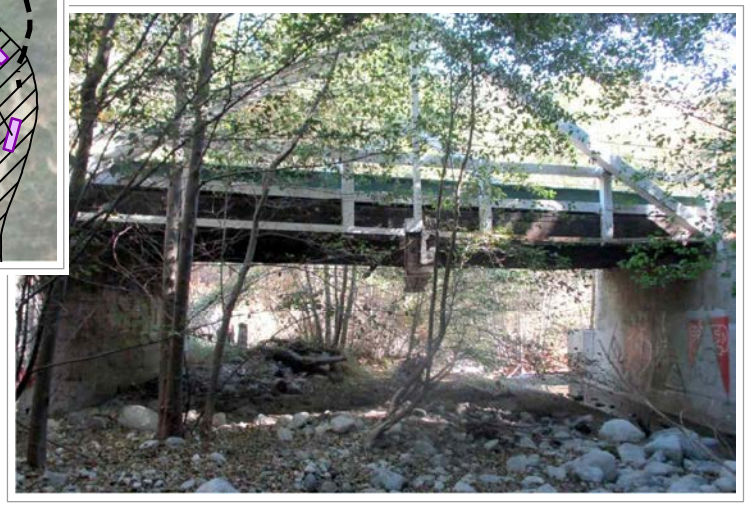


Photo 3 - Bridge No. 3



Photo 4 - Bridge No. 3

Access Road Study Area
Existing Bridge

Esri, Digital Globe 2019

FIGURE 2-4B

Gabrielino Trail/Access Road Existing Conditions Photographs

Arroyo Seco Canyon Project Areas 2 and 3

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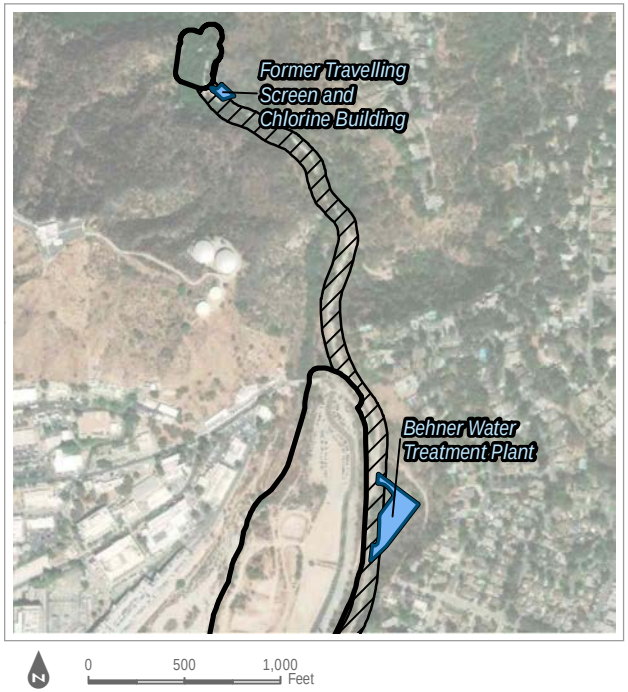




Photo 1 - Former Travelling Screen and Chlorine Building

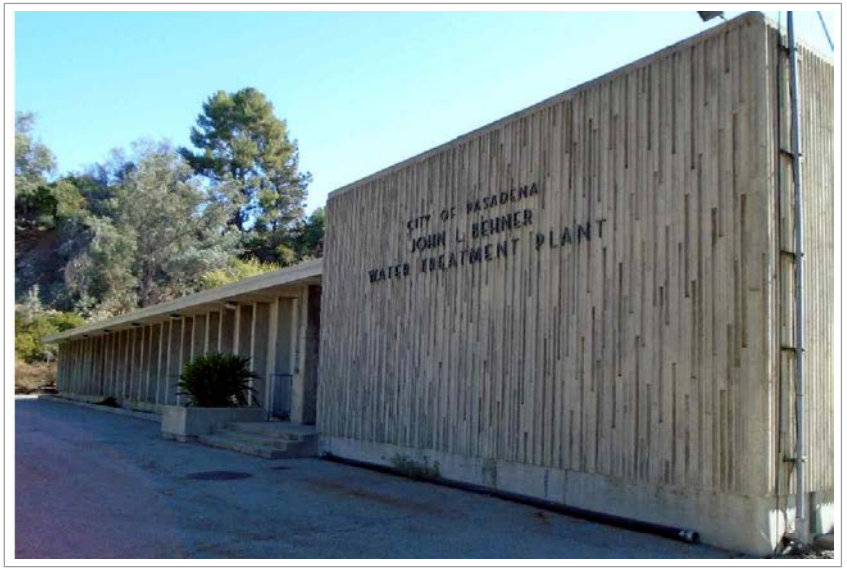


Photo 2 - Behner Water Treatment Plant

Areas 2 and 3 Study Areas
Access Road Study Area
Staging Area Location

Esri, Digital Globe 2019

FIGURE 2-4C

Staging Areas Existing Conditions Photographs

Arroyo Seco Canyon Project Areas 2 and 3

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3 PROJECT DESCRIPTION

This section describes the objectives of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) and provides a detailed description of Project characteristics. This section includes: (1) the precise location and boundaries of the proposed Project; (2) the Project Objectives, including the underlying purpose of the Project; (3) a general description of the Project's technical, economic, and environmental characteristics, including an overview of the engineering plans and supporting public infrastructure/facilities; and (4) a statement of the intended uses of the EIR, including responsible agencies and entitlements required. The environmental impacts of the proposed Project are evaluated in Section 4, Environmental Impact Analysis, through Section 6, Alternatives, of this Draft Environmental Impact Report (EIR).

3.1 Project Components

As described in Section 2, Environmental Setting, the Project site consists of two primary areas, as shown on Figure 2-1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements, which are connected by the North Arroyo Boulevard[1] (i.e. Gabrielino Trail/Access Road). The proposed Project involves construction activity and facility improvements in Areas 2 and 3, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The former Travelling Screen and Chlorine Building (Screen Building) adjacent to Area 2 and the Behner Water Treatment Plant (WTP) adjacent to Area 3 would be used for temporary construction materials and equipment staging only.

3.1.1 Area 2: Diversion and Intake Replacement

Short-Term Construction Activities

Replacement of the existing diversion and intake structure would require site preparation, including demolition and grading. Prior to commencement of grading within Area 2, a temporary coffer dam would be installed in the Arroyo Seco upstream and downstream of the intake replacement area within Area 2, which would provide a dry area for construction activities within the streambed. The coffer dam would capture the stream flows and allow them to be contained, pumped into a flexible pipeline that would bypass the construction area, and then outlet downstream of the construction area. The Project would involve the removal of sediment and debris that has accumulated upstream and downstream of the existing weir, and demolition would commence.

Improvements in Area 2 include the demolition and removal of the following structures: (1) existing concrete diversion weir, associated masonry abutments, and rock wall built over concrete dam that extends under the trail; (2) intake structure, metal ladder and platform, and trash racks; (3) 10-foot by 15-foot concrete slab adjacent to the Gabrielino Trail/Access Road, and (4) excavations of soil/sediment, rocks, debris, and vegetation within the upstream diversion pool, downstream streambed, and on the adjacent slopes on the downstream side of the diversion weir.

The Project involves the construction of a new diversion weir and intake in the same location within the Arroyo Seco as the current facility. The existing elevation at the top of the weir is approximately 1,183 feet amsl and the bottom

[1] Also known as "Arroyo Seco Road".

of the weir is approximately 1,179 feet amsl. Excavations in the Arroyo Seco would extend to approximately 1,171 feet amsl (approximately 8 feet deep) and extend approximately 60 feet upstream and approximately 150 feet downstream of the diversion weir, across the full width of the Arroyo Seco streambed, as shown in Figure 3-1, Area 2 Conceptual Design Overview. The engineering design plans are included as Figure 3-2, Area 2 Preliminary Engineering Designs. Additional preliminary engineering plans for Area 2 are included in Appendix B-1 of this Draft EIR, which includes the Arroyo Seco Canyon Project- Intake/Diversion Design (Area 2) Draft Basis of Design Report prepared by Northwest Hydraulic Consultants, Inc., dated March 2, 2020.

The proposed reinforced concrete diversion control structure would span the entire width of the existing channel (approximately 55 feet) in the same general location as the existing structure. A 30-foot long operable weir crest gate would be located in a notched section of the structure and would be mechanically operated. The structure section would be approximately 7.5 feet wide in the stream longitudinal direction with a top elevation that would match the existing top of weir. The crest of the notch would be flush with the streambed. Operation of the crest gate would be controlled by water depth measurements from a transducer located immediately upstream of the diversion. The new diversion intake would be constructed of reinforced concrete in the same location as the existing structure on the left bank of the stream immediately upstream of the diversion weir. The intake would be equipped with a trash rack mounted parallel to the stream flow and a bulkhead allowing the intake structure to be fully isolated during flood flows with the manual installation of flashboards.

The proposed Project's design for the new diversion weir/intake structure would be protective of future fish while taking into account the Project's existing setting, including conditions that are currently unfavorable to fish and their survivability. Specifically, if fish were present in the Arroyo Seco, downstream fish passage during current diversion operations would result in fish being transported to the downstream reach and Devil's Gate Reservoir area in low flows. Under current conditions, fish may perish in this reach due to isolation or stranding in low or zero flow periods. As such, the proposed Project features include (1) a fish screen to prevent future fish from entering the intake, and (2) an engineered roughened channel downstream of the new diversion structure and operable weir to allow return passage upstream should fish pass during periods of high flows.

The intake approach channel would be angled and taper to an off-channel screen bay, allowing for: 1) sediment to be flushed through the bay, 2) protection of the screens, and 3) potential adaptability in future conditions for downstream fish passage. The tapered bay would end at a 12-inch diameter slide gate and flushing pipe for removing sediment and small debris build-up in front of the screens. Design of a drum screen or a vertical screen with automatic brush cleaning system would follow CDFW published design criteria to prevent future fish populations from entering into the conveyance system and becoming stranded in the spreading basins. A second slide-gated cleanout pipe would be located at the back of the fish screens to further remove sediment build-up. The final component of the intake structure would be an 8-foot long outlet weir, located behind the screens and fitted with an adjustable weir plate. The purpose of the outlet weir is to create the necessary hydraulic conditions for proper operation of the drum screens, Flow would spill over the weir to a small vault and a 30-inch diameter outlet pipe that conveys the diverted flow to the existing conveyance system and spreading basins downstream.

Additionally, the roughened channel would be constructed to allow passage when the weir crest gate is lowered. Roughened channels are an accepted method of providing passage for steelhead trout in CDFW's Salmonid Stream Restoration Manual (CDFG 2010), requiring site specific design and review. The roughened channel configuration proposed is a channel approximately the width of the active channel in adjacent stream segments (upstream and downstream), with an asymmetric v-shaped cross section to concentrate lower flows and provide adequate depth. Compared to other potential types of upstream passage features, the roughened channel type has the advantage of

providing a range of velocities and depths at a given flow rate. Thus smaller or weaker swimming native fish and other aquatic organisms could pass along the margins of the channel or near the bottom, using spaces in the bed material for hydraulic cover. Construction of the streambed shoulder and bank, including the roughened channel, downstream of the new diversion structure and operable weir would be with permeable engineered streambed material (ESM). The ESM selected for the Project would consist of a well-graded mixture of rock, gravel and sand similar to natural streambed material, and would not add any new impervious surfaces within the Arroyo Seco streambed.

The proposed roughened channel profile slope downstream of the diversion weir would be 4%, or approximately twice the average bed slope; therefore, the profile slope would be reasonably similar to a natural steep section or chute in the adjacent reaches of channel. The roughened channel would be designed to allow operational changes that could accommodate low- and high-flow fish passage and would include a small cushion pool at the crest to prevent injury and an asymmetric cross-section to provide appropriate depths and velocities across the range of design flows.

An existing concrete slab that previously supported an equipment building located adjacent to the Gabrielino Trail/Access Road would be demolished. A new 106-square-foot (11 feet 4 inches by 9 feet 4 inches) intake Service Building would be constructed to house the electrical and controls for the diversion structure. Electric power for the operation of the diversion structure and control equipment enclosure would be supplied by an existing power line at the screen building (southeast of the intake structure).

Upon completion of construction activities, all temporary fencing, flagging, signage, soil stockpiles, and/or mobile and stationary construction equipment would be removed from the Area 2.

Long-Term Operational Activities

The proposed new diversion/intake structure would capture flows up to PWP's 25 cfs surface water rights into the existing conveyance system, while additional flows beyond 25 cfs would continue downstream. The system would be operated to divert all flows during small storm events and dry weather flows in the Arroyo Seco, and a portion of flows during large storm events. During larger storms when the water is too turbid with suspended sediments (e.g., flows generally above 100 cfs), the weir would be lowered to allow the stream flows with its associated sediment load to bypass the diversion/intake structure and continue downstream towards Devil's Gate Reservoir.

Under the current conditions, no diversions from the existing intake can occur when stream flows are greater than 25 cfs; therefore, the City can divert an average of 2,045 acre-ft/yr. Under the proposed Project conditions (i.e. diverting up to 25 cfs for storm flows <100 cfs), the City could divert approximately 3,080 acre-ft/yr; therefore, the Project would add approximately 1,035 acre-ft/yr of diverted flows into the spreading basins. This number is based on historic data, which is the best available information related to the future flows within the Arroyo Seco, and future flows would continue to be subject to various factors such as number, intensity, and duration of rainfall events, as well as drought conditions. Prior to the use of the City's spreading basins, when water was diverted for direct use from the Arroyo Seco directly into the water treatment facility for potable use, the conditions for diversion were not limited to the same considerations related to managing sediment for spreading, and records show diversions exceeding 5,000 acre-ft/yr. Therefore, the Project's goal of increasing the beneficial use of the City's water rights, can also be seen as restoring a portion of its historic use.

As further discussed in Section 4.2, Biological Resources, this EIR includes an assessment of fish conditions within the Arroyo Seco and determined that there are currently no fish inhabiting the Arroyo Seco above Devil's Gate Dam,

including the Project area. However, in coordination with the California Department of Fish and Wildlife (CDFW), PWP's proposed diversion weir/intake design would incorporate features that minimize potential adverse effects of diversion should there be a reoccurrence of one of the likely species for the area, the steelhead/rainbow trout (*Oncorhynchus mykiss)*.

Under existing conditions, the diversion weir structure is a barrier to the movement of small aquatic animals due to an approximate 4-foot elevation drop downstream of the structure. The new diversion/intake structure would improve biological functions in the Arroyo Seco by allowing for fish passage in the event that fish populations are established in the Upper Arroyo Seco in the future.

Under current conditions, if fish were to be present, they may perish downstream of the diversion structure due to isolation or stranding in low or zero flow periods. The proposed Project design in Area 2 focuses on excluding fish from the diversion and downstream reach while considering potential for future downstream passage during diversions if connectivity is re-established for passage through Devil's Gate Dam and downstream channels to the ocean. The diversion weir would be lowered during periods of higher flows, and some passage of fish downstream may occur during these periods. Operation of the weir in combination with the roughened channel would allow upstream passage for future fish populations during periods when the diversion is not operating (the weir is lowered) and flows are adequate to allow for passage.

No new employees would be required for the long-term operation or maintenance of the Project components in Area 2. No operational changes would occur, and may be reduced with the automated function of the crest gate to control diversions. Similarly, PWP's future schedule of maintenance activities would not substantively differ from the current maintenance routine and procedures. City personnel would continue to provide maintenance of the diversion and intake structures as occurs under the existing conditions. It is possible that maintenance would be reduced in Area 2 because less sediment would accumulate within the pool behind the diversion weir with the improved intake structure.

3.1.2 Area 3: Spreading Basin Improvements

Short-Term Construction Activities

As shown in Figure 3-3, Area 3 Conceptual Design Overview, improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of stream flows for infiltration into the Raymond Basin. Figure 3-3 depicts the proposed configuration of the spreading basin improvements, while Figure 3-4A, Area 3 Basin Grading Plan (Basins A, E, and F), Figure 3-4B, Area 3 Basin Grading Plan (Basins F, G, H, and I), and Figure 3-4C, Area 3 Basin Grading Plan (Basins I and J) identify the grading contours of the proposed basins and provide the engineering design plans. Additional detailed engineering plans for Area 3 are included in Appendix B-2 of this Draft EIR, which includes the Arroyo Seco Canyon Project 100% Submittal (Area 3 and Area 2 Service Building), prepared by Carollo Engineers in 2017.

In Area 3, the proposed Project includes the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of stream flows for infiltration into the Raymond Basin. Existing Ponds 1 and 2, and Basins 1 and 2, would be replaced with Basin A and six new/expanded spreading basins. Stream flows from the existing conveyance system would outlet to the new sedimentation basin (Basin A) or to new spreading Basin E located over the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's open area (i.e., former JPL East Parking Lot). Each new basin would have

an access ramp for maintenance. Rock boulders would be placed along the western edge of Explorer Road to separate the roadway from the adjacent basins. With the area's sloping terrain, depths of the basins would range from 3 feet to 7 feet. When spreading water, the water depth in the basins would be approximately 1 foot. All basins would include inlets/outlets with 24-inch interconnection pipelines. Spillways, pipelines, culverts, and valves would be provided to connect the basins to each other. Basin J would be the last newly constructed basin located entirely within the former JPL East Parking Lot, which would include interconnection pipelines into the existing Basin 3. Other basins downstream of Basin 3 are not a part of the proposed Project, although Basin 4 may be temporarily impacted during construction.

Area 3 construction would begin with the removal of existing pipelines and structures in proximity to Pond 1, including the inlet/outlet structures, concrete dry vaults, woodsheds, flow meter, gauging station, aluminum pipe tank and pad, connecting pipes and valves, PWP light poles, and chainlink fencing. Removal of these structures and facilities was fully evaluated and approved through the 2015 IS/MND. The SCE electrical transmission tower would not be impacted by construction activities, although construction activities would occur within the SCE easement.

The existing 30-inch-diameter conveyance system pipeline would be connected to a new 24-inch-diameter pipeline to Basin A (sedimentation basin). A 12-inch pipeline would also be constructed from a tee on the 24-inch line to bypass Basin A when maintenance of the basin is needed. Downstream of Basin A, the 24-inch pipeline would daylight to an open channel with a Parshall Flume that would be used to meter flows entering the spreading basins starting at Basin E. Each basin would include a 48-inch inlet structure connected via 24-inch outlet pipeline, which would connect Basins E to F to G to H to I to J, and then connect to existing Basin 6. Riprap made of quarry stones (not cobbles) would be constructed at the location where the 24-inch pipeline outlets into each spreading basin (see Appendix B-2).

As the pipeline construction is completed, excavations for the new spreading basins would begin, especially in the areas abutting the new Explorer Road alignment. The amount of excavated soils (from the spreading basin construction) to be hauled off-site would be minimized by raising the elevation of the access road and the new parking lot. After the pipeline work, the new Explorer Road alignment, which was fully evaluated and approved through the 2015 IS/MND, would be built along the eastern edge of Area 3. When this road is completed, the existing temporary access road would be removed and construction of the spreading basins would continue. During these improvements, JPL employees and their visitors would have access through Area 3 to enter JPL using the existing temporary access road or the new Explorer Road alignment in Area 3.

Upon completion of construction activities, all temporary fencing, flagging, signage, soil stockpiles, and/or mobile and stationary construction equipment would be removed from Area 3.

Long-Term Operational Activities

No new employees are required for the long-term operation or maintenance of the Project components in Area 3. Upon completion of construction activities, the long-term maintenance of the spreading basins would be dependent upon the amount of diversion from Area 2 and the need to restore percolation rates due to the amount of sediment that accompanies these flows. PWP typically scrapes and tills the existing spreading basins about once per year, which is anticipated to generally reflect the proposed ongoing maintenance schedule. When necessary, cleaning of the spreading basins in Area 3 would continue to be accomplished by mechanically scraping the top layer of soil using front-end loaders, graders, or scrapers. Following removal, the surface would be disked or harrowed to loosen any soil compaction caused by cleaning. An estimated 100 truckloads of soil from the existing and proposed

spreading basins would have to be disposed of off-site approximately every 5 years (approximately 20 trucks per year), which is reflective of current maintenance activities.

As described in Section 2, Environmental Setting, through the Settlement Agreement, it was agreed that the City shall have the right to perform maintenance activities, including tilling and grading of the existing spreading basins to re-establish historical percolation rates and maintenance activities that involve negligible or no expansion of use. As discussed, the construction and operation of the sedimentation basin (Basin A) was also approved through the 2015 IS/MND. Currently, PWP operates and maintains approximately 13 acres of spreading basins in Area 3. With the proposed Project, the approximate area of spreading basins would be increased to 15.7 acres, or an additional 2.7 acres of spreading basins to be maintained. The periodic scraping and tilling of these additional acres beyond the current condition is expected to be offset by the reduced need to scrape and till the basins overall, as sediment deposition within the basins would be reduced with the proposed Project due to the new design and Basin A, which would capture and settle out the majority of the sediment from the diverted Arroyo Seco flows prior to entering the spreading basins.

As discussed above, the City can divert an average of 2,045 acre-ft/yr under current conditions. Under the proposed Project conditions (i.e. diverting up to 25 cfs for storm flows <100 cfs), the City could divert approximately 3,080 acre-ft/yr; therefore, the Project would add approximately 1,035 acre-ft/yr of diverted flows into the spreading basins for the beneficial use of the City's water rights.

All proposed spreading basins within Area 3 would be operated by gravity and would not require any new pumps or facilities that require the use of electricity or natural gas. As such, no substantive changes to ongoing operations and/or maintenance activities are anticipated.

3.1.3 Gabrielino Trail and Bridge Crossings

Short-Term Construction Activities

The Gabrielino Trail (i.e., North Arroyo Boulevard) runs generally parallel to the Arroyo Seco and along the eastern side of the former JPL East Parking Lot and serves as a recreation trail for hikers and equestrian uses. It also serves as a maintenance access road that leads to the Behner WTP and into the Arroyo Seco Canyon area to provide access for PWP and the USFS. During construction activities, the Gabrielino Trail/Access Road would provide for vehicular access to and from Area 2, and sometimes Area 3, although Explorer Road would be the primary access road for Area 3. As shown in Section 2, Environmental Setting, on Figure 2-4A, three bridges along the Gabrielino Trail/Access Road cross portions of the Arroyo Seco. Bridge Nos. 1, 2, and 3 are located between Areas 2 and 3, respectively.

Bridge No. 1 is a culvert-style bridge with concrete slab deck over Millard Creek, approximately 0.13-mile north of the JPL Bridge. As previously discussed, the 2015 Bridge Condition Assessment found that the bridge abutments were being undermined due to scouring and that the Gabrielino Trail/Access Road had sloughed off in sections and that a temporary bridge was required (TJC 2015). Therefore, a temporary structural overlay bridge spanning the length of Bridge No. 1 was constructed in 2017 to accommodate the loading from heavy equipment needed during construction of the Arroyo Seco Canyon Project that would be beyond the capacity of the original bridge. This temporary structural overlay bridge would remain in place throughout construction activities in Area 2. Upon completion of the ASCP construction activities, the temporary structural overlay bridge would be removed from Bridge No. 1.

Bridge No. 2 is located approximately 130 feet north of Bridge No. 1 and is a reinforced concrete arch bridge with decorative cast-concrete railing. The July 2015 Bridge Condition Assessment found that Bridge No. 2 was in good condition and that no significant cracks that would be detrimental to the structural integrity of the bridge were identified. This bridge was determined to be able to support a 52,000-pound load (e.g. 8-cubic yard concrete truck) and no temporary bridge would be required (TJC 2015).

Bridge No. 3 is located approximately 0.34-mile north of the JPL Bridge just south of the boundary of Area 2. The 2015 Bridge Condition Assessment found that several members of Bridge No. 3 are damaged including the bridge timbers stringers, lateral bracing steel rods, and handrail posts. For Bridge No. 3, the Assessment determined that the existing 4 x 18-inch bridge stringers would not be able to carry construction equipment without permanent shoring of the bridge, and that a temporary bridge was required (TJC 2015). Therefore, a temporary structural overlay bridge spanning the length of Bridge No. 3 was constructed in 2017 to accommodate the loading from heavy equipment needed during construction of the Arroyo Seco Canyon Project. This temporary structural overlay bridge would remain in place throughout construction activities in Area 2.

Additionally, stone masonry walls line the east side of the Arroyo Seco at Bridge No. 2 and continue upstream to Bridge No. 3. The stone masonry walls would not be altered by Project activities. As previously discussed, the Screen Building adjacent to Area 2 and the Behner WTP adjacent to Area 3 would be used for temporary construction materials and equipment staging only. No impacts or construction activities would occur at these facilities.

During construction of the proposed Project, there may be times when portions of the Altadena Crest Trail, Gabrielino Trail/Access Road, Arroyo Seco Trail, and the unnamed trails/maintenance roads would be partially or fully closed to the public due to construction activities.

- North Arroyo Boulevard, which is a gated maintenance road that leads from the intersection of Ventura Street and Windsor Road northward to the JPL Bridge, would be a primary corridor for construction truck traveling to and from Area 2, and may also be used for activities within Area 3. Portions of this roadway may be closed during construction to minimize the proximity of construction trucks and equipment movement with recreational users.
- The Gabrielino Trail/Access Road, which is the northward the extension of North Arroyo Boulevard, would be a primary corridor for construction equipment and haul trucks to access Area 2. Portions of this access road may be closed during construction to minimize the proximity of construction trucks and equipment movement with recreational users, as well as during construction on the roadway associated with Arroyo Seco Canyon Project (ASCP) improvements, as described further in Section 4.7.6 below.
- The Arroyo Seco Trail and unnamed trails located adjacent to the existing spreading basins would be temporarily closed during construction of the new basin configuration and would also permanently realigned around the perimeter of the new basins and along the realignment of Explorer Road, as discussed further below. The portions of the unnamed trails within the construction footprint in Area 3 would be fully closed during short-term construction activities, and would not reopen until the completion of construction in Area 3, as described further below under “Long-Term Operational Impacts”.

While the trails would be kept open during construction to the extent possible, there would be days when construction equipment and haul trucks would be on and/or near the trails. Upon completion of construction activities, all temporary fencing, flagging, signage, soil stockpiles, and/or mobile and stationary construction equipment would be removed from the staging areas.

Long-Term Operational Activities

A structural evaluation of Bridge No. 3 was conducted in 2018, subsequent to the placement of the temporary structural bridge overlay, which determined that the condition of Bridge No. 3 continues to deteriorate and is no longer safe for use (TJC 2018). Upon completion of the proposed Project, the City intends to keep the Bridge No. 3 overlay structures as-is, with the understanding that the reconstruction/replacement of Bridge No. 3 may eventually be required if the City wishes to maintain the bridge. The temporary structural bridge overlay was constructed to allow transport of heavy equipment and materials during the ASCP construction; however, its continued presence provides for the safe passage of vehicles and pedestrians along the Gabrielino Trail/Access Road and to the USFS facilities. Additionally, the temporary structure allows access to large vehicles, including fire trucks, that were previously restricted due to the loading limitations of the original bridge even before it was damaged. The temporary structure spans the existing bridge abutments; therefore, its structural integrity is not impacted by the deteriorating structural integrity of Bridge No. 3. Since the temporary structure is constructed of steel elements and concrete, and will experience relatively light traffic, its expected service life is estimated to exceed 50 years. There may be safety risks associated with the continued deterioration of Bridge No. 3 if structural members fail and fall, and therefore the City may need to remove dangerous elements to protect public safety.

Because there are no plans for the future reconstruction/replacement of the Bridge No. 3 at the time of the preparation of this Draft EIR, it is anticipated that the existing bridge may continue to deteriorate, and although not anticipated at this point, may even be removed to protect public safety. Therefore, this Draft EIR anticipates the impacts of the continued use of the temporary bridge structure over Bridge No. 3, and the continued deterioration of the existing Bridge No. 3, into the foreseeable future, and perhaps even its eventual removal or potential removal of dangerous elements. Whether and when reconstruction/replacement of Bridge No. 3 would take place is unknown, and it is unknown whether the new bridge would be constructed in such a manner that would allow for its preservation as a historical resource. The retention of the bridge overlay deck into the foreseeable future would not require any additional construction activities, as the structure is currently fully functional and secured.

Given the history of wildfires in the region, and specifically within the San Gabriel Mountains and Arroyo Seco subwatershed that leads to the Project site, PWP will keep in place the current overlay bridge and will not repair or rehabilitate the historic Bridge No. 3, because the current overlay bridge can accommodate firefighting equipment and large fire trucks into the Arroyo Seco Canyon and the ANF. It is anticipated that the historic Bridge will continue to deteriorate, and as a result PWP will need to remove dangerous elements of the historic Bridge (rotting timbers failed joists, for example) and even partially or fully demolished to protect public safety as it continues to deteriorate.

Upon completion of the proposed Project, the temporarily disrupted trail network would be restored. The proposed Project would restore connections with the alignments of the Altadena Crest Trail and the Arroyo Seco Trail. These trail connections are discussed in Section 4.7, Recreation.

No new employees would be required and no long-term operational changes would occur related to the maintenance of the Gabrielino Trail/Access Road or the existing bridges.

3.2 Project Purpose and Objectives

As described above, the City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco for direct use or for spreading into its existing spreading basins for groundwater pumping credits from the Raymond Basin. Of the total amount of water that is infiltrated into the groundwater through the existing spreading basins, PWP has the right to pump between 60- to 80% of that amount for beneficial use in the City's water supply. According to PWP, the current spreading basins reach an equilibrium during recharge events of 18 cfs, meaning that sustained diversions equaling 18 cfs would fill the basins to capacity, with water percolating at generally the same rate as entering the basins; however, higher flows beyond 18 cfs would not be able to be infiltrated due to capacity constraints (Carollo Engineers 2013). Dividing this 18 cfs recharge capacity by the surface area of the existing spreading basins (approximately 13 acres), the basins exhibit an average percolation rate of 2.72 feet per day (ft/d), or 1.4 cfs/acre.

Improvements in the intake structure, however, would allow for diversion of PWP's right to 25 cfs during high flows, which would be an improvement upon the current structure that requires high flows to bypass the diversion/intake structure because of the previous damage to the facility and the inability to remove sediment and debris prior to entering the spreading basins. The proposed Project's Area 3 configuration includes a maintainable sedimentation basin (Basin A) located prior to the entry of flows into the spreading basins. This improvement upon the current design would substantively reduce sediments in the spreading basins that settle on the ground surface of the basin and decrease infiltration rates.

Based on the data gathered from the USGS gaging station from 1990 through 2019, the average in-stream flows are 6,890 acre-ft/yr. Using these years of data to represent the current condition of diverting when stream flows are 25 cfs or less, the City diverts an average of 2,045 acre-ft/yr. As previously discussed, the City would be able to divert approximately 3,080 acre-ft/yr, resulting in approximately 1,035 acre-ft/yr of additional diverted flows into the spreading basins. These proposed increased diversions would result in a measurable increase in diversion only during larger wet-weather flows. There would be little to no difference in diversions between the current condition and the proposed Project during the drier periods of the year. In summary, the proposed Project elements would increase Arroyo Seco diversion almost exclusively during wet winter months with high stream flows because the threshold for diverting is increased.

3.2.1 Increase Reliability of Local Water Supplies

In the two storm seasons following the 2009 Station Fire[2], excessive amounts of sediment washed down from the watershed. The debris flows damaged City structures, greatly reducing the City's capacity to divert water for spreading. As a result, PWP proposes to repair and replace damaged facilities in the Upper Arroyo Seco Canyon as a part of the proposed Project. The proposed Project's improvements would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial uses of this important local water resource. The proposed Project would implement a multi-benefit approach to the repair and replacement of damaged infrastructure in the Arroyo Seco, with the overall Project objective of increasing the beneficial use of the surface water rights held by the City and improving biological functions within the Arroyo Seco. For any future fish populations that may establish

[2] In 2009, the Station Fire burned 160,000 acres in the San Gabriel Mountains including the Project site.

in the Arroyo Seco, the new intake would include a fish screening feature to prevent fish populations from passing into the intake and conveyance system, and a roughened channel would be constructed directly downstream of the new weir to allow for future fish passage upstream during moderate flow periods.

The City's General Plan Open Space and Conservation Element sets forth objectives related to the use of water resources in the City (City of Pasadena 2012). The proposed Project supports these objectives, as follows:

- Increase the efficiency of water use among Pasadena residents, and commercial and industrial organizations.

The proposed Project would facilitate the efficient use of water in the Arroyo Seco by allowing for the full utilization of the City's surface water rights and reducing reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD). PWP has a longstanding right to divert up to 25 cfs from this source. MWD imports water from the Sacramento-San Joaquin Delta via the State Water Project, and from the Colorado River. In recent years, MWD has imposed allocation limits on its water supply deliveries to its member agencies, and the future reliability of imported water will continue to face uncertainties from climate change, environmental regulations, and droughts. Another important issue associated with imported water is cost, which has increased substantially in the past few years (City of Pasadena 2012). Achieving water supply reliability will depend on a number of key water policy and management decisions on a regional and local level, including implementation of projects such as the proposed Arroyo Seco Canyon Project Areas 2 and 3.

- Protect local water supply sources and plant trees and vegetation that are consistent with habitat and water conservation policies.

The proposed Project would facilitate the protection of local water supply sources by improving the ability of the diversion weir and intake structure to capture water during high-flow storm events. It has been PWP's practice in the past (more so after floods following the Station Fire damaged the upstream settling basins) to bypass water from high-flow storm events when the water is sediment-laden and turbid in order to protect the existing infrastructure from damage. The proposed Project would include improvements to the diversion weir and intake structure to better accommodate turbid waters in high-flow events, as well as improvements to the capacity of the spreading basins, both of which would facilitate increased availability and use of local water supply sources.

- Improve surface permeability and recharge aquifers/enhance storm water quality to prevent pollution/trash from entering Los Angeles and San Gabriel Rivers and ocean.

The proposed Project would improve the functionality and efficiency of the facilities responsible for the diversion and infiltration of water into the Raymond Basin. PWP has in the past forfeited available water due to the lack of spreading capacity within the spreading basins (Carollo Engineers 2013). The increased capacity and efficiency of the spreading basin improvements in Area 3 (which includes a new sedimentation basin for sediment to settle out before water is directed to the spreading basins) would maximize capacity and infiltration rates, thereby improving the recharge of groundwater supplies.

3.2.2 Implementation of Components of Hahamongna Watershed Park Master Plan

The proposed Project would either implement or not hinder the implementation of improvements set forth in the Hahamongna Watershed Park (HWP) Master Plan within the Project area. The study area for the HWP Master Plan includes the area below the JPL Bridge, which includes Area 3 of the proposed Project (City of Pasadena 2003, 2010).

Table 3-1, Hahamongna Watershed Park Area 5A Water Resource and Associated Improvements, identifies the proposed Project's consistency with the HWP Master Plan Improvements identified for the proposed Project Area 3.

Table 3-1. Hahamongna Watershed Park Area 5A: Water Resource and Associated Improvements

HWP Master Plan Improvements for Area 5A	Arroyo Seco Canyon Project Areas 2 and 3 (Proposed Project)
Remove the southern ¾ of the east JPL parking lot.	Not Applicable. The parking lot was removed in 2016.
Relocate and improve water conservation distribution system (diverted and pumped-back storm water).	Not Applicable. However, implementation of the proposed Project would not conflict with, or hinder implementation, of this improvement.
Construct the Eastside Spreading Basins Project including expanded spreading basins 1 through 4, two new basins, and relocated sludge ponds 1 and 2.	Applicable. The proposed Project would implement this proposed improvement.
Complete the pump-back system from the dam area to the spreading basins.	Not Applicable. However, implementation of the proposed Project would not conflict with, or hinder implementation, of this improvement.
Construct the overall storm drain modification improvements, including the Altacrest Drain improvements and drainage improvements in the Interpretive Area.	Not Applicable. However, implementation of the proposed Project would not conflict with, or hinder implementation, of this improvement.
Implement the Habitat Establishment Project at the eastside spreading basins from the remaining northern parking lot south to Johnson Field.	Not Applicable. However, implementation of the proposed Project would not conflict with, or hinder implementation, of this improvement.
Convert the northern ¼ of the east JPL parking lot to public parking and restore and establish habitat in this area.	Not Applicable. However, this improvement has already been approved under the previous ASCP 2015 IS/MND.
Construct a sewer lift station and force main across the JPL bridge to JPL's sewer system and underground the power to the site for the new public restroom.	Not Applicable. However, this improvement has already been approved under the previous ASCP 2015 IS/MND.
Construct a new public restroom at the north end of the east lot; install eastside picnic amenities on the west side of the Stream Corridor Alignment Habitat Project and at the new public restroom. These improvements will be made when specific need and locations are identified.	Not Applicable. However, the restroom improvement has already been approved under the previous ASCP 2015 IS/MND. Although the remaining improvements are not applicable to the proposed Project, implementation of the proposed Project would not conflict with, or hinder implementation, of this improvement.

Source: City of Pasadena 2003

3.2.3 Project Objectives

Section 15124 of the State CEQA Guidelines requires the Project Description of an EIR to include a statement of the objectives sought by the proposed Project, which is intended to help the Lead Agency to develop a reasonable range of alternatives to evaluate in the EIR and the preparation of Findings of Fact and a Statement of Overriding Considerations, if necessary. The statement of objectives may include the Project benefits. The objectives that have been established for the proposed project are listed below.

1. Fully divert and utilize the City's 25 cubic feet per second surface water rights while operating in a manner objectively consistent with the Raymond Basin Agreement and the 1984 Judgment.
2. Increase the capacity and functionality of the spreading basins to increase PWP's ability to recharge the groundwater basin, as envisioned by the 2011 Water Integrated Resources Plan with its recommendation to maximize the value of the groundwater basin and non-potable supplies.
3. Provide opportunities for increased aquatic biological functions within the Arroyo Seco by: (1) protecting fish and eliminating the unimpeded passage of stream flows that could carry aquatic animals into the conveyance system, and (2) reducing existing impediments to fish passage at the diversion weir structure.
4. Increase PWP's ability to rely upon local water for its potable water supply to reduce reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD).

3.3 Project Construction

Construction of the Project improvements would be phased, with construction in Area 2 requiring approximately 3 months (August 2021 through October 2021), and construction in Area 3 requiring approximately 9 months (March 2022 through November 2022). In the interest of minimizing the export of excavated materials from the Project site, the City may implement a mechanical shaker to sort and sift through excavated soils to separate finer soils from larger rocks, thereby allowing for the beneficial reuse of some excavated materials as engineered fill during the construction of the spreading basins. Rock materials may be used on-site for decorative/landscaping purposes throughout the Project study area, added to an existing stockpile that has been created by the City in an area along the west bank of the Arroyo Seco for future uses, or may be exported off-site. For the purposes of assessing a conservative construction scenario, this Draft EIR assumes that all excavated materials would be exported off-site and also accounts for the possible noise generated by use of a mechanical shaker (see Section 5.6, Noise).

Construction trucks hauling soils and debris generated by construction activities are anticipated to drive to and from Vulcan Materials Company landfill located at 13000 East Los Angeles Street in the City of Irwindale, which is approximately 18 miles from the Project site. Haul trucks and equipment deliveries are expected to come to the Project site from I-210 at the Windsor Avenue westbound off-ramp and head north on Windsor Avenue to the intersection with Ventura Street. At this intersection is a fork in the road, one leading to Explorer Road into Area 3 and the other leading to the gated North Arroyo Boulevard, which passes adjacent to residential properties and the Behner WTP. North of the JPL Bridge, North Arroyo Boulevard (the Gabrielino Trail/Access Road) would be used for construction vehicles and equipment transport to and from Area 2. Explorer Road and potentially North Arroyo Boulevard would be used to access Area 3.

For the disposal of excavated soils, it is expected that haul trucks from the Project site would head eastbound on I-210 via eastbound ramps at Windsor Avenue; exit at the I-605 southbound off ramp at Lower Azusa Road/Los

Angeles Street; head east towards the Vulcan Materials Company landfill. Trucks would come back from the landfill entering the northbound on-ramp on the I-605 at Los Angeles Street and head north; trucks would then go west on I-210 to Windsor Avenue to Explorer Road and then to the Project site. As shown in Table 3-2, Estimated Construction Schedule, construction of the proposed Project would be phased.

Table 3-2. Estimated Construction Schedule

	2021				2022			
	Quarters per Year							
Year/Quarter	*1*	*2*	*3*	*4*	*1*	*2*	*3*	*4*
Area 2								
Site Prep and Demolition			♦					
Grading and Excavations			♦	♦				
Building Construction			♦	♦				
Paving/Architectural Coating				♦				
Area 3								
Site Prep and Demolition					♦	♦		
Grading and Excavations						♦	♦	
Building Construction							♦	
Paving/Architectural Coating							♦	♦

As previously described in Section 2, Environmental Setting, all activities within Area 1, Headworks, were entirely evaluated within the 2015 IS/MND and allowed to proceed without additional environmental review pursuant to the Settlement Agreement. As such, the construction of planned improvements within Area 1 is not a part of this proposed Project, as evaluated in this Draft EIR. Improvements in Area 1 are considered to be a cumulative project, as discussed in Section 3-5 below.

3.4 Discretionary Actions

Table 3-3 lists all the agencies that are known or expected to have permit or approval authority over the proposed Project. This Initial Study covers all federal, state, local government, and quasi-government approvals that may be needed to construct, implement, or operate the Project, whether or not they are specifically identified in Table 3-3 or elsewhere in this Draft EIR.

Table 3-3. Agency Approvals and Requirements

Agency	Approval/Permit Required	Purpose	Notes
Lead Agency			
City of Pasadena	Project Approval	Approve the proposed Project and allocate City funds.	--
	Conditional Use Permit No. 6222 Modification	Allow for utility improvements in the Open Space zone	In compliance with the City's Zoning Code
	Tree Removal Authorization	Allow removal of trees in areas to be disturbed	In compliance with City's Trees and Tree Protection Ordinance
Responsible Agencies			
U.S. Army Corps of Engineers (USACE)	Section 404 Nationwide Permit	Allow the discharge of dredge and fill material into "waters of the United States."	Nationwide Permit (NWP) required for temporary and permanent disturbance of Arroyo Seco in Area 2
Los Angeles Regional Water Quality Control Board (RWQCB)	Section 401 Water Quality Certification	Protect water quality within "waters of the United States."	Water Quality Certification required for temporary and permanent disturbance of Arroyo Seco in Area 2 and for temporary impacts due to spreading basin expansion in Area 3
California Department of Fish and Wildlife (CDFW)	Section 1600 Streambed Alteration Agreement	Authorize changes to the natural flow or the bed, channel, or bank of any river, stream, or lake and associated impacts to biological resources.	Streambed Alteration Agreement required for temporary and permanent disturbance of Arroyo Seco in Area 2 and for temporary impacts due to spreading basin expansion in Area 3
Los Angeles County Flood Control District	Encroachment Permit	Authorize construction activities within the Altadena Storm Drain Easement	--

3.5 Cumulative Impacts

3.5.1 Cumulative Approach

The CEQA Guidelines require that an EIR discuss cumulative impacts of a project, taken together with other past, present, and probable future projects producing related impacts. The goal of this analysis is twofold: first, to determine whether the impacts of all such projects would be cumulatively significant; and, second, to determine whether the project would itself cause a "cumulatively considerable" (and thus significant) incremental contribution to any such cumulatively significant impacts. The definition of cumulatively considerable is provided in Section 15065(a)(3) of the CEQA Guidelines: "'Cumulatively considerable' means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects."

CEQA Guidelines Section 15130(b) provides the following parameters relative to cumulative impact analysis:

> The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified related projects contribute, rather than the attributes of other projects which do not contribute to the cumulative impact.

CEQA Guidelines Section 15130 allows for the use of two alternative methods to determine the scope of projects to analyze cumulative impacts.

- List Method: A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or
- Projection Method: A summary of projects contained in an adopted general plan or related planning document, or in a prior environmental document, that have been adopted or certified, which describe or evaluate regional or area-wide conditions contributing to the cumulative impact.

This Project proposes to use both the list method and the projection method, as applicable for each environmental topic as presented in this Draft EIR.

The geographic area that could be affected by implementation of a proposed project in combination with other projects varies depending on the type of environmental resource being considered. For instance, cumulative noise impacts are more localized; whereas, cumulative air quality and greenhouse gas emissions impacts occur on a broader regional or global scale. Table 3-4 describes the geographic scope of cumulative impact analysis for each environmental resource category, as well as the method of evaluation for each category.

Table 3-4. Geographic Scope and Method of Evaluation for Cumulative Impacts

Environmental Resource		Geographic Area	Method of Evaluation
Air Quality	Toxic Air Contaminants; Odors	Immediate vicinity	List and Projections
	Construction/Mobile Sources	South Coast Air Basin	
Biological Resources		Regional	List and Projections

Table 3-4. Geographic Scope and Method of Evaluation for Cumulative Impacts

Environmental Resource		Geographic Area	Method of Evaluation
Cultural Resources		Regional	List
Greenhouse Gas Emissions		South Coast Air Basin	Projections
Hydrology and Water Quality		Arroyo Seco Sub-Watershed	List and Projections
		Raymond Groundwater Basin	
Noise	On-Site Construction Noise	Immediate vicinity	List and Projections
	Off-Site Truck Noise	Immediate vicinity	
Recreation		Immediate vicinity	List
Transportation		Regional	List and Projections
Tribal Cultural Resources		Regional	List and Projections

For the purposes of this Draft EIR, the proposed Project would have a significant cumulative effect if:

1. The cumulative effects of related projects (past, current, and probable future projects) are already significant and implementation of the proposed Project makes a considerable contribution to the effect; or
2. The cumulative effects of related projects (past, current, and probable future projects) are not significant but the incremental impact of implementing the proposed Project is substantial enough, when added to the cumulative effects of related projects, that a new a new cumulatively significant impact occurs.

The analysis in Sections 4.1 through 4.9 of this Draft EIR addresses whether, after adoption of Project-specific mitigation, the residual impacts of the proposed Project would (1) contribute considerably to an existing/anticipated (without the project) cumulatively significant effect or (2) cause a new cumulatively significant impact. A cumulative impact is not considered significant if the impact can be mitigated to below the level of significance through mitigation. The EIR must examine "reasonable options for mitigating or avoiding any significant cumulative effects of a proposed project" (14 CCR 15130(a)(3) and 15130(b)(5)).

3.5.2 List of Cumulative Projects

The cumulative projects outlined below were chosen based on direction from the City. The cumulative project list was developed for the purposes of this EIR analysis through consultation with planning and engineering staff from the City of Pasadena to include key projects in their respective jurisdictions. Figure 3-5, Cumulative Projects, shows geographically where the cumulative projects are located in comparison to the proposed Project. The cumulative projects listed below serve as the foundation on which the cumulative analysis approach has been based in Sections 4.1 through 4.9 of this Draft EIR. The five (5) cumulative projects are summarized below:

Previously Approved Components of Arroyo Seco Canyon Project (ASCP). The Final IS/MND for the ASCP (January 2015) analyzed environmental impacts as a result of the proposed three areas of improvements along the upper Arroyo Seco, which involve restoration of a portion of the Arroyo Seco, reconstruction of surface water diversion facilities, expansion of spreading basins, and construction of recreational and educational amenities (Areas 1 through 3). PDFs were proposed to minimize or avoid environmental impacts to aesthetics, air quality, geology and

soils, greenhouse gas emissions, hydrology and water quality, land use and planning, mineral resources, noise, public services, and utilities and service systems. In the Final IS/MND, mitigation measures were proposed for potentially significant project impacts to biological resources, cultural resources, hazards and hazardous materials, recreation, and transportation/traffic. The Final IS/MND determined that implementation of proposed mitigation would reduce all potentially significant impact to less than significant levels.

This project was challenged in July 2015, and in June 2017 the Los Angeles Superior Court found that elements of the ASCP that related to increased diversions of surface water (proposed Areas 2 and 3) required evaluation through the preparation of an EIR. The Court ruled that the elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP, complied with CEQA, and did not require further environmental review. These approved components include:

- Area 1, Arroyo Seco Headworks: All ASCP elements.
- Area 2, Arroyo Seco Intake: Access road improvements and related slope reconstruction and protective riprap elements.
- Area 3, JPL East Parking Lot: All ASCP elements, except the expansion of 4 existing spreading basins and the construction of 2 new spreading basins. Specifically, the components of the ASCP IS/MND allowed to proceed include the parking lot, access road, sedimentation basin, demolition of existing structures and pipelines, new pipelines, new public restroom, new security booth and associated utility services (water, sewer, power, and communication lines), and topics related to the existing groundwater contamination associated with the JPL site listing on hazardous materials sites compiled pursuant to Government Code Section 65962.5.

Additional details related to these non-Project components are included in Appendix A-4, 2015 Final ASCP Initial Study/Mitigated Negative Declaration.

Devil's Gate Reservoir Sediment Removal and Management Project. The goal of this project is to restore and maintain flood capacity at Devil's Gate Reservoir to meet its intended level of flood protection for the communities downstream. This project involves a sediment removal plan to restore flood capacity and establish a reservoir management system to maintain the flood control capacity of the reservoir. The project is located within Hahamongna Watershed Park in the City of Pasadena. The Final EIR for the project was adopted by the County of Los Angeles Board of Supervisors on November 12, 2014. The Los Angeles County Flood Control District (LACFCD) began sediment removal activities in the Devil's Gate Reservoir in 2019, and sediment removal and placement is expected to continue through Fall 2022. Habitat restoration is scheduled to occur over a 5-year period between Fall 2018 and Fall 2023, with ongoing reservoir and habitat maintenance after 2023 (Los Angeles County Department of Public Works 2020).

In the analysis undertaken for the Initial Study for this project, several issue areas pursuant to CEQA were determined not significant, including agricultural and forest resources, population and housing, and public services. The analysis undertaken for the Draft EIR for this project determined that impacts to geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology and water quality, public services, recreation, and utilities and service systems were less than significant. The analysis undertaken for the Final EIR for this project determined that impacts to air quality, biological resources, cultural resources, land use and planning, and noise could be mitigated to a level of less than significant. Unmitigable significant impacts as a result of the project include significant unavoidable impacts to aesthetics, and temporary significant impacts to traffic/transportation. For aesthetics, there is no feasible mitigation to reduce impacts

to scenic vistas and impacts to visual characteristics as a result of sediment removal activities during the sediment removal phase. For impacts to transportation and traffic, implementation of proposed mitigation would reduce impacts to haul route intersections, intersection level of service, public transportation using the existing roadway network, and cumulative transportation impacts; but not to a level of less than significant (Los Angeles County Department of Public Works 2014).

Oak Grove Area Improvements (OGAI) Project. The OGAI project geographically includes the western portion of Hahamongna Watershed Park from the Flint Wash Bridge, north, to the southern edge of the Hahamongna Annex area. There are five projects in the current Capital Improvement Program (CIP) with funding and that are located within the OGAI project area, including (1) Oak Grove Area Improvements, (2) Trail Development, (3) Berkshire Creek Area Improvements, (4) Habitat Restoration, and (5) Oak Grove Disc Golf Course Improvements (City of Pasadena Department of Public Works 2020). The Oak Grove Area Improvements was adopted as part of the Hahamongna Watershed Park Master Plan approval and is currently funded for the planning and design phase. The project will improve the area of the existing Oak Grove field, and may include a new restroom, improvements to vehicular and pedestrian circulation, rehabilitation of a drain, assessment of the disc golf course layout and improvements to the outdoor amphitheater. The City has not budgeted for the project beyond FY 2020, but should funding become available construction could occur as early as 2021, concurrent with the proposed Project.

In May 2019, an IS/MND was prepared for the Berkshire Creek Area Improvements project (project No. 3 of the CIP projects listed above under the OGAI project). Currently, there are no CEQA environmental documents prepared for the other OGAI projects. The Berkshire Creek Area Improvements project includes approximately 4.7 acres within the Oak Grove area, located at 4550 Oak Grove Drive. The primary goal of this project is to improve the ecological, hydrological, and recreational conditions throughout the lower third of the Oak Grove area. The IS/MND found that impacts to aesthetics, agriculture and forestry resources, air quality, energy, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, traffic and transportation, utilities and service systems, and wildfire, would be less than significant with no mitigation required. The IS/MND found that impacts to biological resources, cultural resources, recreation, tribal cultural resources, would be less than significant with implementation of proposed mitigation. No impacts would be significant and unavoidable as a result of the Berkshire Creek Area Improvements project. This cumulative project was approved, construction began in September 2019, and was substantially completed in March 2020 (Arroyo Seco Foundation 2020).

LACFCD Pump back/Intake at Devil's Gate to Eaton Canyon. The LACFCD is planning a water conservation project at Devil's Gate Dam that involves the installation of a pump and intake structure at the upstream face of the Dam. The main objective of this project is to conserve stormwater by holding a reservoir pool behind Devil's Gate Dam and pumping the water to fill Arroyo Seco Spreading Grounds first prior to filling Eaton Wash Dam and Eaton Wash Spreading Grounds for post-storm groundwater recharge into the Raymond Basin. The portion of the project that included a five-mile pipeline from the pump easterly to Eaton Wash in order to divert water from the Dam for recharge at Eaton Wash was put on indefinite hold in 2017; however, the feasibility of maximizing stormwater capture and groundwater replenishment through a pipeline to the Arroyo Seco spreading grounds is being assessed. The concept for conveying water from Devil's Gate Dam upstream to the Arroyo Seco Spreading Grounds for recharge was included in the Devil's Gate Dam to Eaton Water Conservation Pipeline Study, Feasibility Report (March 2017), but a timeline for its implementation has not been identified. It is assumed that if the LACFCD moves forward with the project, it would be after the Devil's Gate Sediment Removal Project has been completed at the end of 2022 and, consequently, after completion of the ASCP Areas 2 and 3 (proposed Project). No environmental

documents under CEQA have been prepared for this cumulative project. However, it is stated in the Feasibility Study that no significant environmental impacts are anticipated for construction of the proposed pipeline alignments, as all construction would be within paved right-of-way. Each pipeline alignment alternative proposed would have temporary impacts related to noise, air quality, greenhouse gas emissions, traffic and public services during construction, and a more detailed environmental impact analysis would be required to develop mitigation measures to ensure these impacts are not significant, and in compliance with regulatory codes (County of Los Angeles 2017).

Explorer Groundwater Well. City of Pasadena Department of Water and Power continues to plan for the construction of a new groundwater well that would augment the existing municipal production wells in the area owned by the City of Pasadena (i.e. Arroyo Well, Well 52, Windsor Well, and Ventura Well) and utilize the Monk Hill Treatment System (MHTS) to remove target chemicals (e.g. perchlorate and volatile organic compounds [VOCs]) from the aquifer. Project activities are likely to include drilling and completion of a new groundwater well located just east of the spreading basins in Area 3 near the SCE Easement, new pipelines connections for transmitting well water to the MHTS, and the potential renovation of the Behner WTP to augment the water treatment capacity. This project could potentially be concurrent with ASCP Area 3 (proposed Project) construction in 2022. Currently, there is no CEQA environmental document prepared for this project.

3.6 References

14 CCR 15000–15387 and Appendices A–N. Guidelines for Implementation of the California Environmental Quality Act, as amended.

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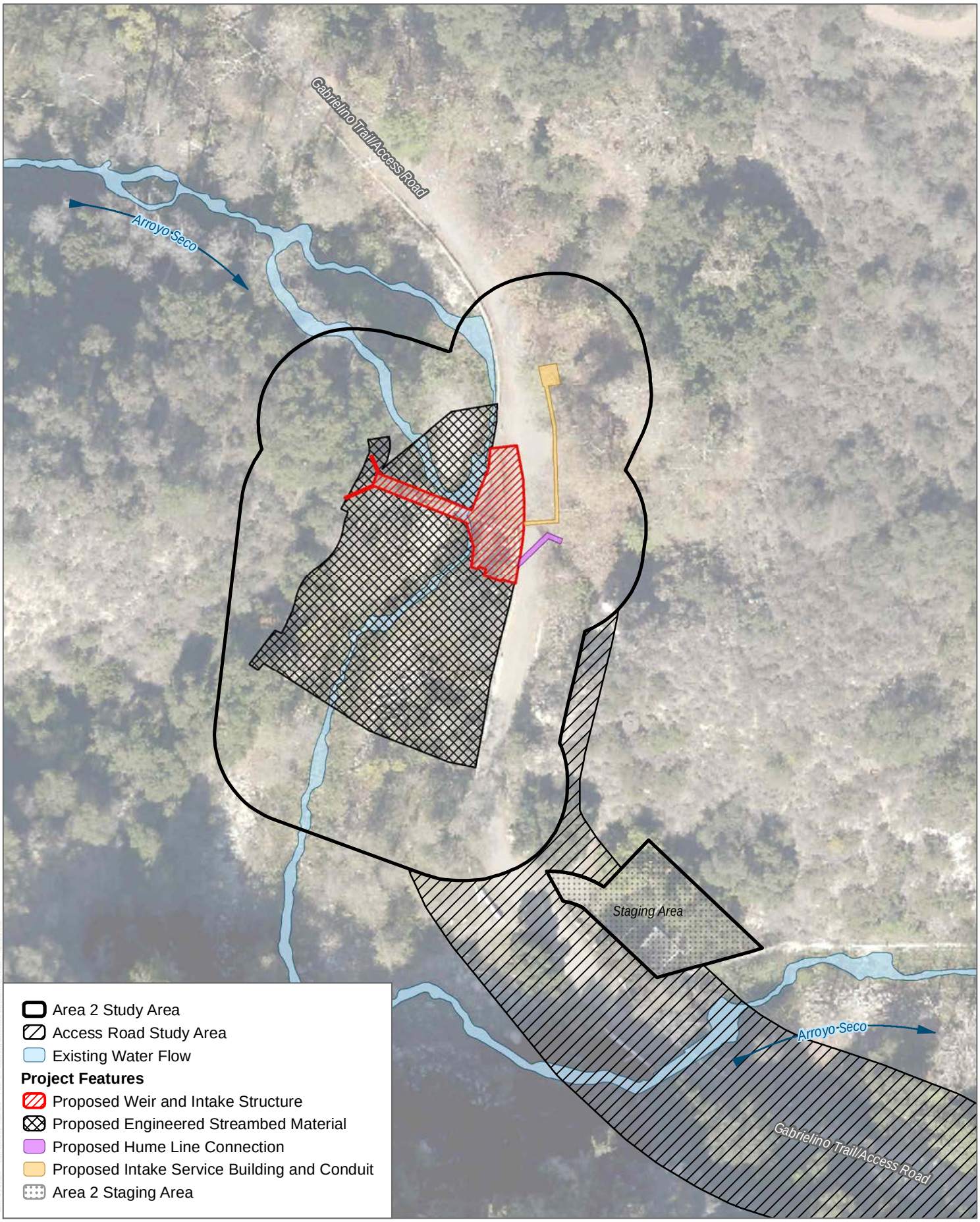
Los Angeles County Department of Public Works. 2014. "Executive Summary." In *Devil's Gate Reservoir Sediment Removal and Management Project Final Environmental Impact Report (FEIR)*. October 2014. https://pw.lacounty.gov/wrd/Projects/DevilGate/FEIR/Devils_Gate_FEIR_2014_10_20_Vol_1_Executive_Summary.pdf.

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SOURCE: LARIAC Aerials 2014

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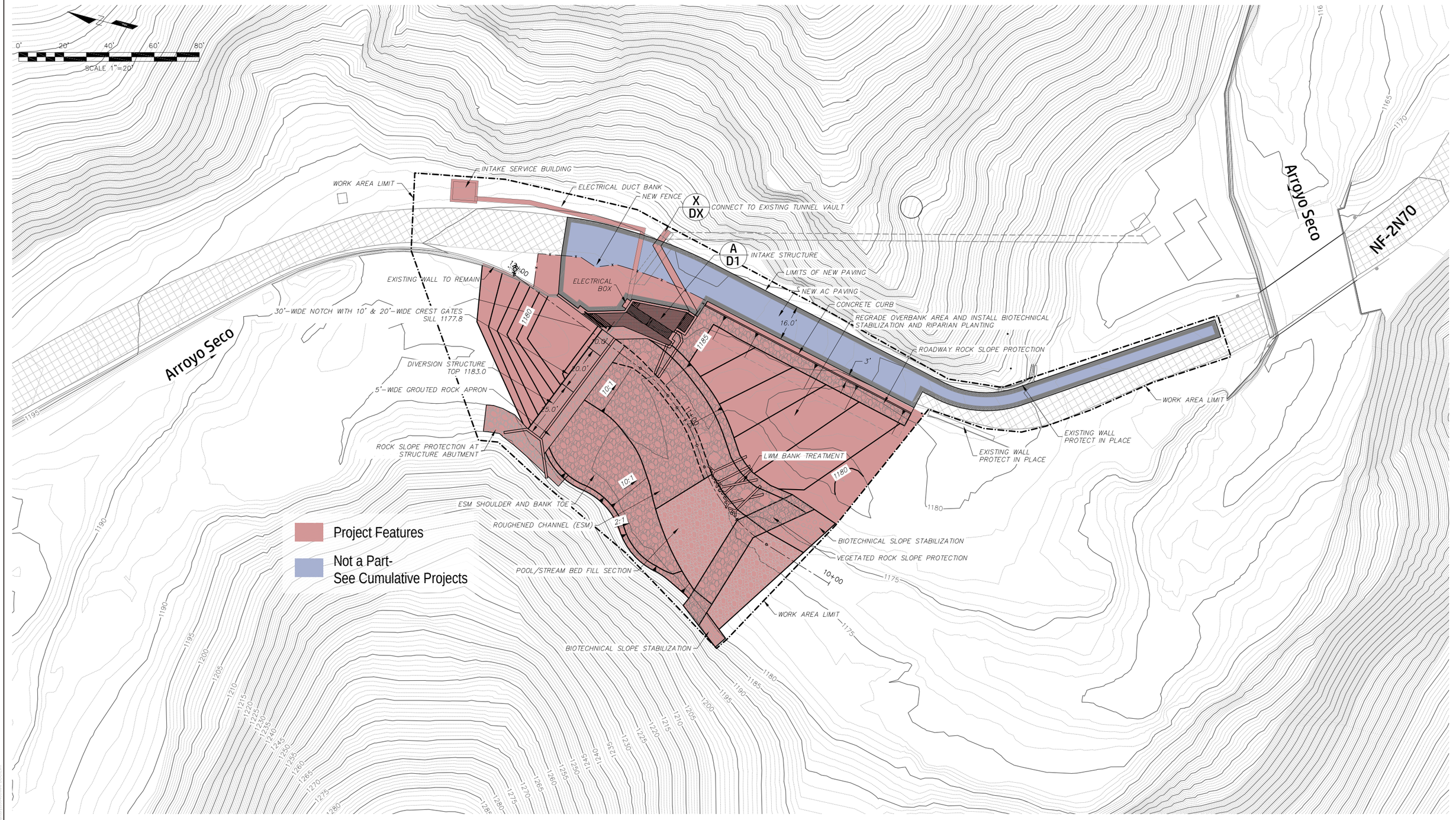
0 35 70 Feet

FIGURE 3-1

Area 2 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: NHC 2020

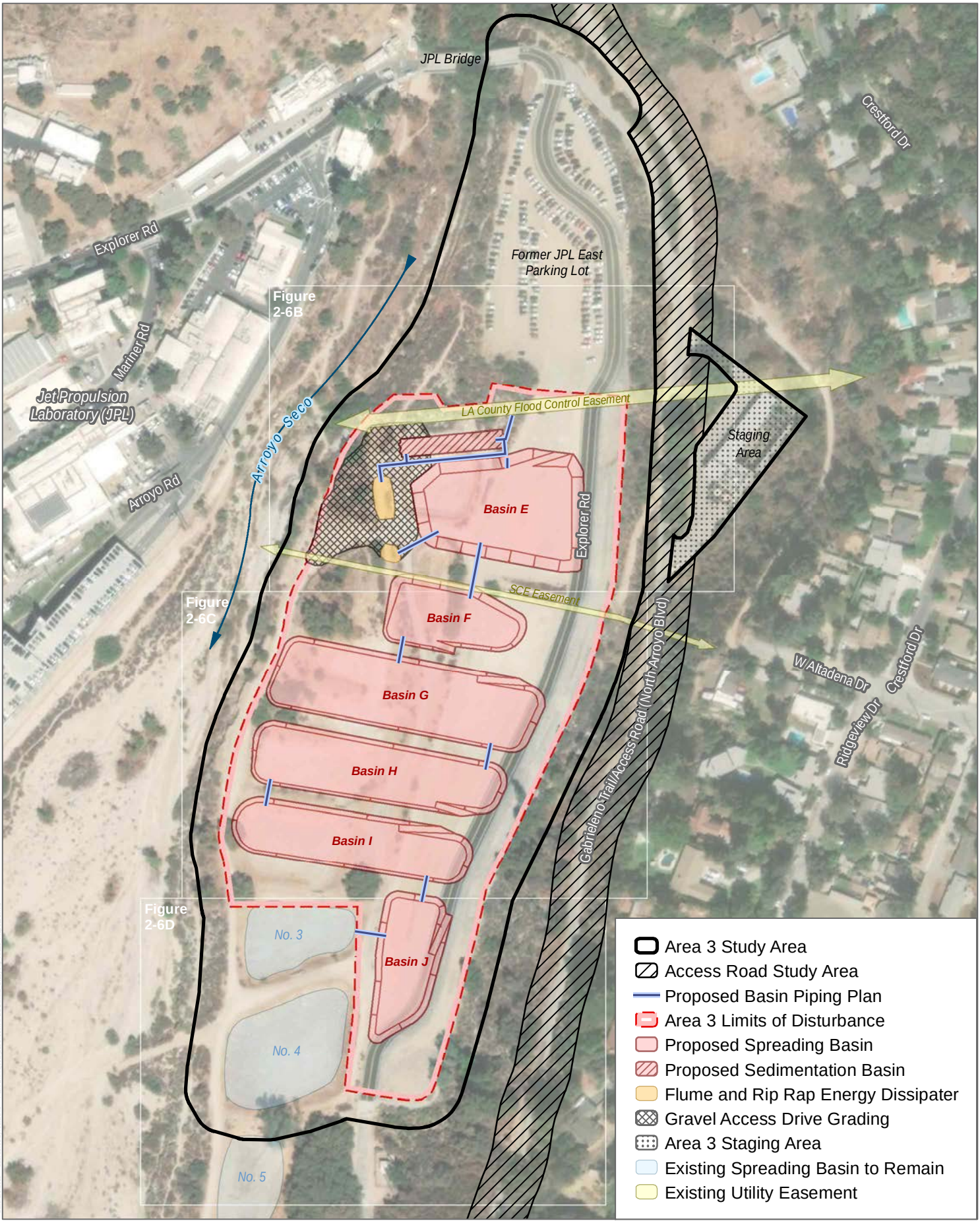
FIGURE 3-2

Area 2 Preliminary Engineering Design

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Esri, Digital Globe 2019

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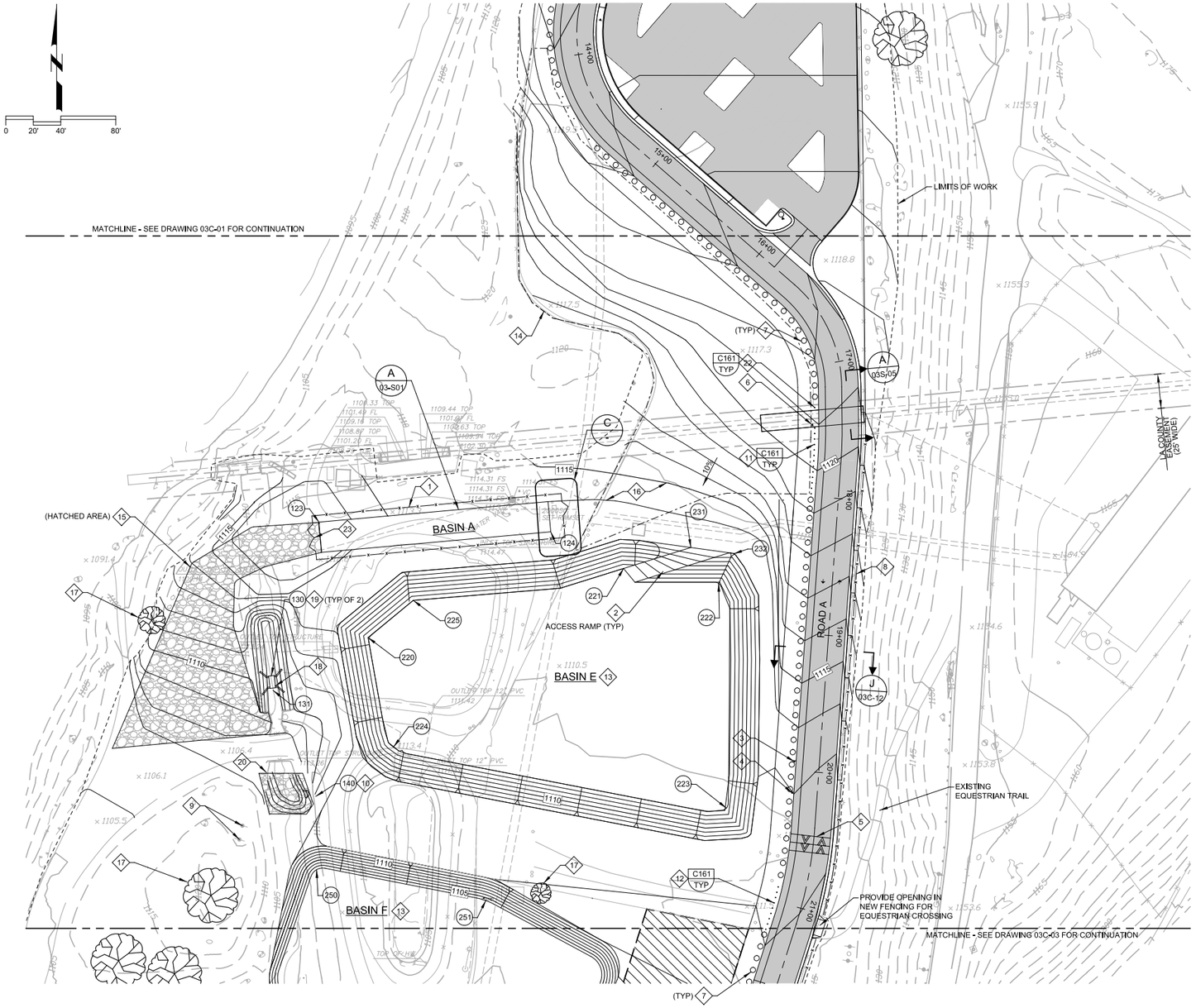
0 112.5 225 Feet

FIGURE 3-3

Area 3 Conceptual Design Overview

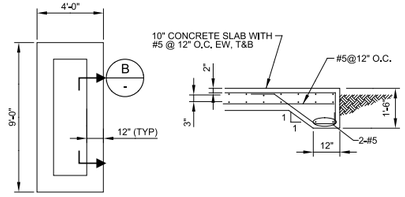
Arroyo Seco Canyon Project Areas 2 and 3

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B AREA 3B - BASIN SITE AND GRADING PLAN
SCALE: 1" = 40'
FILE: FILE

COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
123	1895612.64	6511204.05	1118.00	TOW NW CORNER OF BASIN A
124	1895605.59	6511372.85	1118.00	TOW SE CORNER OF BASIN A
130	1895500.72	6511169.47	1107.00	BOTTOM CENTERLINE OF HEADWALL
131	1895491.77	6511170.45	1107.00	BOTTOM CENTERLINE OF HEADWALL
140	1895412.64	6511201.14	1106.50	BOTTOM CENTERLINE OF HEADWALL
220	1895528.33	6511240.68	1106.00	CORNER, BOTTOM, BASIN E
221	1895578.88	6511425.87	1106.00	BOTTOM OF RAMP
222	1895568.03	6511495.11	1106.00	CORNER, BOTTOM, BASIN E
223	1895404.44	6511500.74	1106.00	CORNER, BOTTOM, BASIN E
224	1895449.09	6511258.48	1106.00	CORNER, BOTTOM, BASIN E
225	1895555.67	6511272.74	1106.00	CORNER, BOTTOM, BASIN E
231	1895594.16	6511474.85	1113.00	TOP OF RAMP
232	1895589.59	6511506.13	1113.00	CORNER, TOP, BASIN E
250	1895359.53	6511202.31	1104.00	CORNER, BOTTOM, BASIN F
251	1895337.08	6511325.20	1104.00	CORNER, BOTTOM, BASIN F



PLAN **B - SECTION**

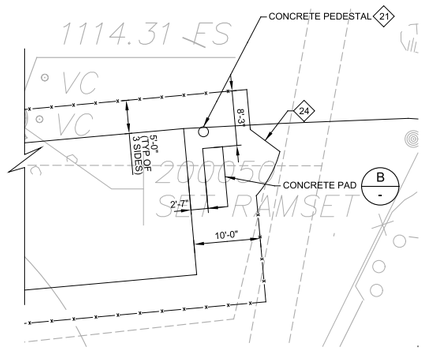
B CONCRETE SLAB
SCALE: NTS
FILE: 9137A1003C02

GENERAL NOTES:

1. REFER TO ROAD PLAN AND PROFILE DRAWINGS FOR ADDITIONAL FINISHED GRADE ELEVATIONS.
2. REFER TO LANDSCAPE PLANS FOR ALL PLANTING SCHEDULES AND IRRIGATION DESIGN.

KEY NOTES:

1. FURNISH AND INSTALL CHAIN LINK FENCE (H=8') AROUND PERIMETER OF BASIN A PER APWA STANDARD PLAN 600 AND ONE WALK GATE (WIDTH=10'). PROVIDE ONE DOUBLE LEAF DRIVE GATES (WIDTH = 20'). FIELD VERIFY FINAL DIMENSIONS.
2. PROVIDE 8% (APPROX) LONGITUDINAL SLOPE AND 2% CROSS SLOPE.
3. SPEED BUMP SIGN. REFER TO MUTCD W8-1. (QUANTITY 6)
4. EQUESTRIAN CROSSING AHEAD SIGN, REFER TO MUTCD W11-7. (QUANTITY 2)
5. SPEED BUMP PER PWS STANDARD.
6. "NO PARKING" SIGN. REFER TO MUTCD R7-1. (QUANTITY 3)
7. INSTALL ROCK BOULDER ALONG EDGE OF ROADWAY. EACH BOULDER SHALL BE APPROX 1/2 TON W / 6-FOOT SPACING ON CENTER.
8. NEW CHAIN LINK FENCING PER APWA 600 (H = 6').
9. RETAIN AND PROTECT EXISTING POWER POLE, GUY WIRES, AND OVER HEAD POWER LINES. REFER TO ALL SCE SAFETY REQUIREMENTS WHEN OPERATING AROUND SCE EQUIPMENT.
10. CONCRETE WING HEADWALL (SAN DIEGO RSD NO. D-35A, USE DIM FOR 42-INCH PIPE).
11. INSTALL REMOVABLE GUARD POST. INSTALL 13 @ 4'-0" O.C. FOR 72-FEET.
12. INSTALL REMOVABLE GUARD POST. INSTALL 9 @ 4'-0" O.C. FOR 36-FEET.
13. REFER TO PIPING PLANS (DWG 03C-06) FOR DETAIL ON INLET/OUTLET FOR EACH BASIN
14. CONTRACTOR LAY DOWN AND CONSTRUCTION TRAILER AREA. NO EQUIPMENT OR MATERIALS SHALL BE STORED ON TOP OF COUNTY STORM DRAIN BOX.
15. CONSTRUCT ACCESS DRIVE OF GRAVEL (THICKNESS = 2") AND ABC (THICKNESS = 8").
16. ALL BASIN RAMPS AND AREAS OUTSIDE OF BASINS SHALL BE COMPACTED NATIVE MATERIAL, UNLESS OTHERWISE NOTED OR SPECIFIED.
17. PROTECT AND RETAIN EXISTING TREES. FENCE OFF AREA UNDER TREE CANOPIES.
18. FLUME. REFER TO DWG 03C-06.
19. CONCRETE WING HEADWALL SIM TO SDRSD NO. D-35A. USE DIM FOR 42-INCH PIPE. PROVIDE REINFORCED CONCRETE SLAB (4' X 9') BETWEEN HEADWALLS. MATCH SLAB THICKNESS AND REINFORCING FOR HEADWALL SLAB.
20. RIP RAP ENERGY DISSIPATER, 800 SF AS DETAILED IN SAN DIEGO RSD D-40(1/4-TON).
21. FUTURE LOCATION FOR RADIO ANTENNA. REFER TO ELECTRICAL DWGS FOR ADDITIONAL DETAIL.
22. INSTALL REMOVABLE GUARD POST ON EITHER SIDE OF CONCRETE SLAB. HANG CHAIN BETWEEN POST WITH SWIVEL EYE BOLT SNAPS ON EITHER END. HANG "NO PARKING" SIGN IN MIDDLE OF CHAIN
23. DOUBLE-LEAF GATE
24. WALK GATE



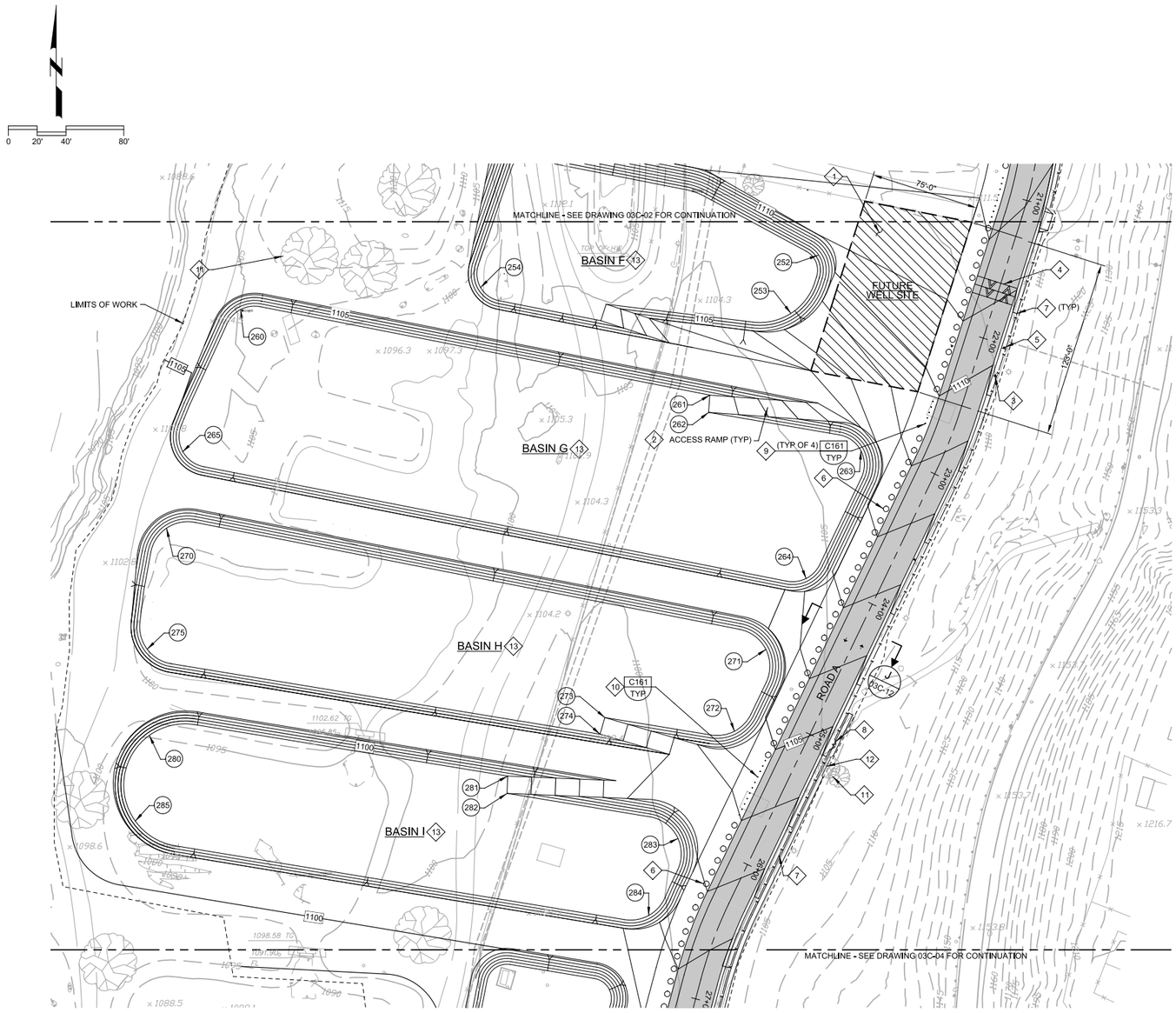
C DETAIL
SCALE: 1" = 10'
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SOURCE: Carollo 2017

FIGURE 3-4A
Area 3 Basin Grading Plan (Basins A, E, and F)
Arroyo Seco Canyon Project Areas 2 and 3

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COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
252	1895288.74	6511408.94	1104.00	CORNER, BOTTOM, BASIN F
253	1895253.24	6511391.59	1104.00	CORNER, BOTTOM, BASIN F
254	1895271.19	6511176.50	1104.00	CORNER, BOTTOM, BASIN F
266	1895255.94	6511010.29	1102.00	CORNER, BOTTOM, BASIN G
261	1895196.66	6511335.34	1102.00	RAMP, BOTTOM, BASIN G
262	1895184.69	6511334.50	1102.00	RAMP, BOTTOM, BASIN G
263	1895158.08	6511440.09	1102.00	CORNER, BOTTOM, BASIN G
264	1895069.62	6511402.05	1102.00	CORNER, BOTTOM, BASIN G
265	1895157.70	6510970.12	1102.00	CORNER, BOTTOM, BASIN G
270	1895104.48	6510958.93	1100.00	CORNER, BOTTOM, BASIN H
271	1895020.57	6511374.21	1100.00	CORNER, BOTTOM, BASIN H
272	1894963.84	6511352.43	1100.00	CORNER, BOTTOM, BASIN H
273	1894973.32	6511262.63	1100.00	RAMP, BOTTOM, BASIN H
274	1894961.81	6511259.26	1100.00	RAMP, BOTTOM, BASIN H
275	1895020.68	6510945.49	1100.00	CORNER, BOTTOM, BASIN H
280	1894960.98	6510946.99	1098.00	CORNER, BOTTOM, BASIN I
281	1894932.81	6511195.31	1098.00	RAMP, BOTTOM, BASIN I
282	1894920.82	6511194.84	1098.00	RAMP, BOTTOM, BASIN I
283	1894889.57	6511313.34	1098.00	CORNER, BOTTOM, BASIN I
284	1894836.26	6511292.99	1098.00	CORNER, BOTTOM, BASIN I
285	1894901.67	6510937.25	1098.00	CORNER, BOTTOM, BASIN I

GENERAL NOTES:

1. REFER TO ROAD PLAN AND PROFILE DRAWINGS FOR ADDITIONAL FINISHED GRADE ELEVATIONS.
2. REFER TO LANDSCAPE PLANS FOR ALL PLANTING SCHEDULES AND IRRIGATION DESIGN.

KEY NOTES:

1. AREA RESERVED FOR FUTURE GROUND WATER WELL.
2. PROVIDE 8% (APPROX) LONGITUDINAL SLOPE AND 2% CROSS SLOPE. COMPACTED NATIVE MATERIAL SHALL BE USED.
3. SPEED BUMP SIGN. REFER TO MUTCD W8-1. (QUANTITY 6)
4. SPEED BUMP PER CITY STANDARD (S-707).
5. EQUESTRIAN CROSSING AHEAD SIGN. REFER TO MUTCD W11-7. (QUANTITY 2)
6. INSTALL ROCK BOULDER ALONG EDGE OF ROADWAY. EACH BOULDER SHALL BE APPROX 1/2 TON W / 6-FOOT SPACING ON CENTER.
7. NEW CHAIN LINK FENCING PER APWA 600 (H = 6' L = 4' PER LEAF).
8. MAINTENANCE ACCESS GATE (APWA 600, DOUBLE LEAF, H=6')
9. INSTALL 15-FOOT WIDE ACCESS INTO BASIN AREA. INSTALL 5 REMOVABLE GUARD POSTS. SPACE EVENLY ACROSS OPENING.
10. INSTALL REMOVABLE GUARD POST. SPACE EVENLY ACROSS OPENING.
11. RETAIN AND PROTECT EXISTING TREES. FENCE OFF AREA UNDER TREE CANOPIES.
12. ROUTE DITCH BETWEEN FENCE AND TREE. HAND DIG ALL ESCAVATION WITHIN DRIPLINE OF TREES. REDUCE DITCH TO 2 FT WIDTH IF NEEDED TO AVOID TREE TRUNK.
13. REFER TO PIPING PLAN (DWG 03C-07) FOR ADDITIONAL DETAIL ON INLET/OUTLET FOR EACH BASIN.

Call before you Dig
Avoid cutting underground

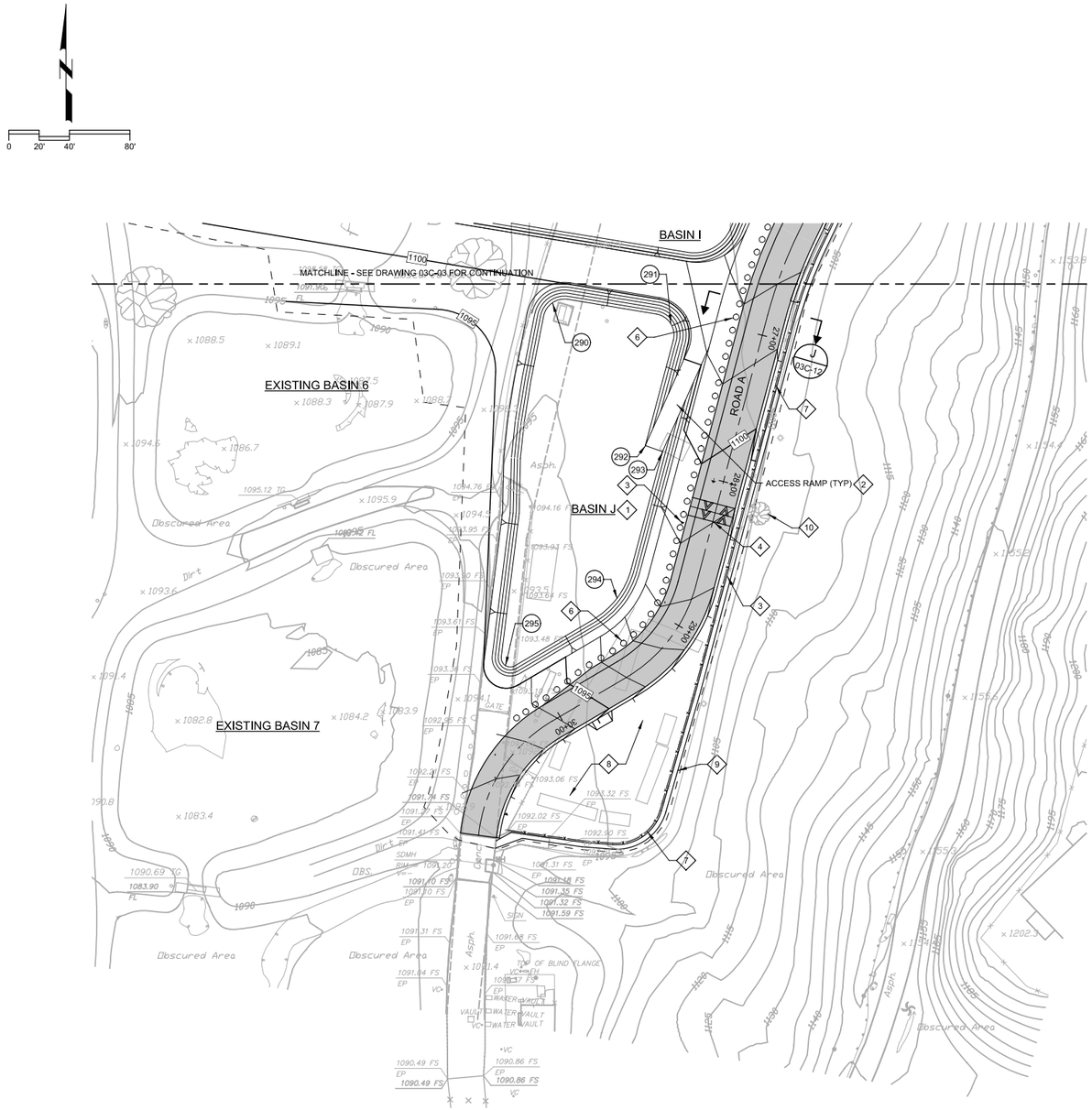
C **AREA 3C - BASIN SITE AND GRADING PLAN**
SCALE: 1" = 40'
FILE: FILE

SOURCE: Carollo 2017

FIGURE 3-4B
Area 3 Basin Grading Plan (Basins F, G, H, and I)
Arroyo Seco Canyon Project Areas 2 and 3

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D **AREA 3D - BASIN SITE AND GRADING PLAN**
SCALE: 1" = 40'
FILE: FILE

COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
290	1894799.99	6511186.78	1095.00	CORNER, BOTTOM, BASIN J
291	1894786.37	6511264.94	1095.00	CORNER, BOTTOM, BASIN J
292	1894705.63	6511248.21	1095.00	RAMP, BOTTOM, BASIN J
293	1894701.61	6511259.56	1095.00	RAMP, BOTTOM, BASIN J
294	1894604.69	6511229.44	1095.00	CORNER, BOTTOM, BASIN J
295	1894560.29	6511155.72	1095.00	CORNER, BOTTOM, BASIN J

GENERAL NOTES:

1. REFER TO ROAD PLAN AND PROFILE DRAWINGS FOR ADDITIONAL FINISHED GRADE ELEVATIONS.
2. REFER TO LANDSCAPE PLANS FOR ALL PLANTING SCHEDULES AND IRRIGATION DESIGN.

KEY NOTES:

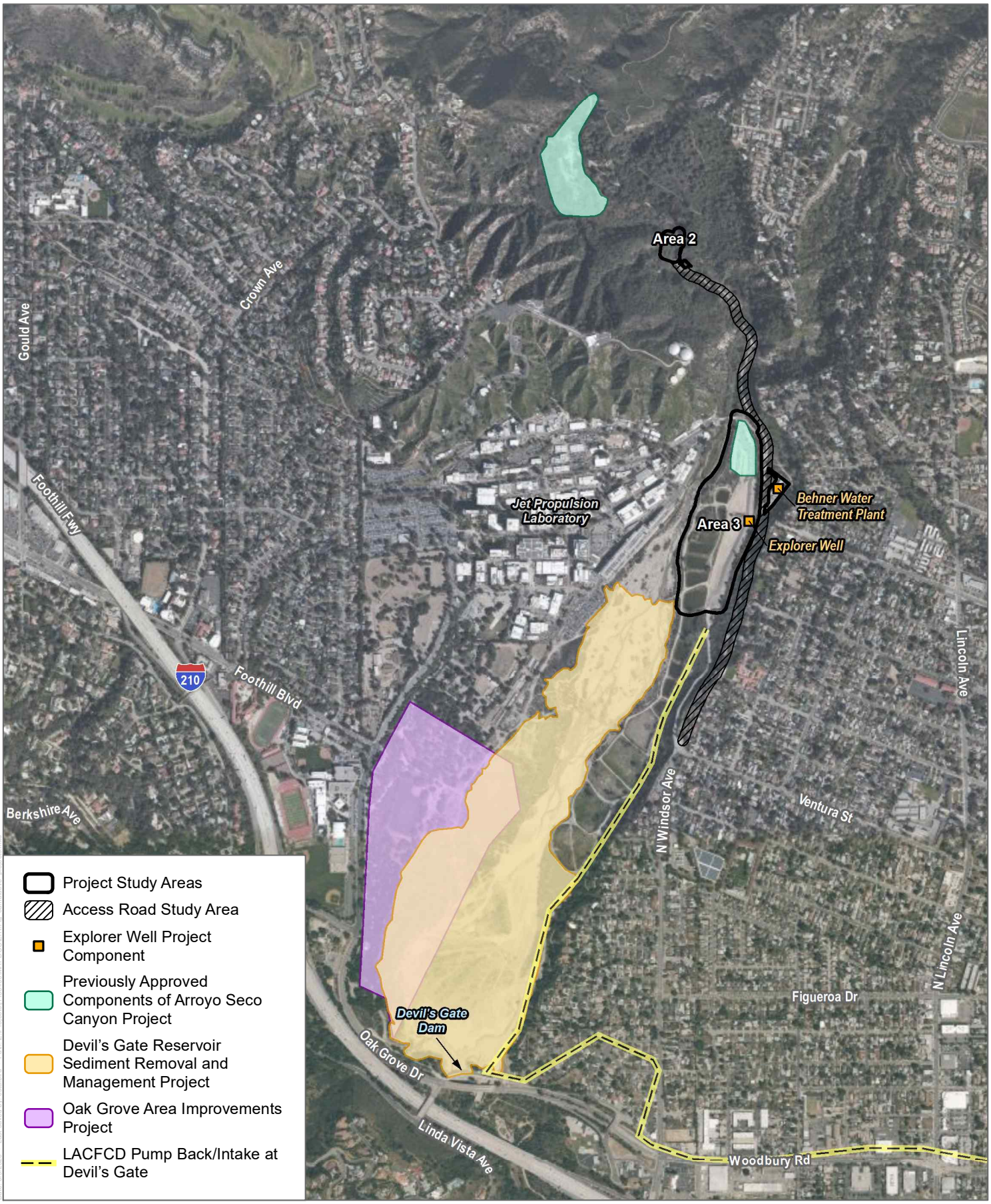
1. REFER TO PIPING PLAN (DWG 03C-08) FOR ADDITIONAL DETAIL ON INLET/OUTLET FORE EACH BASIN
2. PROVIDE 8% (APPROX) LONGITUDINAL SLOPE AND 2% CROSS SLOPE. COMPACTED NATIVE MATERIAL SHALL BE USED.
3. SPEED BUMP SIGN. REFER TO MUTCD W8-1. (QUANTITY 6)
4. SPEED BUMP PER CITY STANDARD (S-707).
6. INSTALL ROCK BOULDER ALONG EDGE OF ROADWAY. EACH BOULDER SHALL BE APPROX 1/2 TON W / 6-FOOT SPACING ON CENTER.
7. NEW CHAIN LINK FENCING PER APWA 600 (H = 6').
8. INSTALL 6" DECOMPOSED GRANITE OVER COMPACTED BASE. APPROX. 8,700 S.F.
9. REMOVE AND RECONSTRUCT CONCRETE DRAINAGE GUTTER PER DETAIL J, SHEET 03C-12.
10. RETAIN AND PROTECT EXISTING TREES.

SOURCE: Carollo 2017

FIGURE 3-4C
Area 3 Basin Grading Plan (Basins I and J)
Arroyo Seco Canyon Project Areas 2 and 3

DUDEK

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SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 625 1,250 Feet

FIGURE 3-5

Cumulative Projects

Arroyo Seco Canyon Project Areas 2 and 3

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4 ENVIRONMENTAL IMPACT ANALYSIS

This Section provides an overview of the subsections format found in Section 4 of this Draft Environmental Impact Report (EIR) (Sections 4.1 through 4.9). For the purpose of this Environmental Impact Report (EIR), the Appendix G Guidelines of the California Environmental Quality Act have been used as the basis for the environmental issue area analyses.

Impact Analysis Format

The purpose of this Draft EIR is to evaluate the potential environmental effects of the proposed Project. Environmental topic areas outlined in Sections 4.1 through 4.9 of the Draft EIR were determined to be the applicable and appropriate topics to analyze in the Draft EIR, as identified through the Initial Study, which was prepared and circulated with the Notice of Preparation (NOP) and included in Appendix A-1 of this Draft EIR. Section 2.4 in Section 2 of this Draft EIR, discusses the environmental effects found not to be significant as a result of the Project. The Initial Study for the Arroyo Seco Canyon Project Areas 2 and 3 concluded that the proposed Project would result in no environmental impacts or less than significant impacts to the topics of Aesthetics, Agricultural and Mineral Resources, Energy, Geology and Soils, Hazards and Hazardous Materials, Land Use and Planning, Mineral Resources, Population and Housing, Public Services, Utilities and Service Systems, and Wildfire. These environmental topics are analyzed as part of the 2015 IS/MND, and/or the 2019 Initial Study prepared for the Project and are not analyzed as part of this Draft EIR.

Topics that are brought forth for analysis in this Draft EIR include:

4.1 Air Quality
4.2 Biological Resources
4.3 Cultural Resources
4.4 Greenhouse Gas Emissions
4.5 Hydrology and Water Quality
4.6 Noise
4.7 Recreation
4.8 Transportation
4.9 Tribal Cultural Resources

The Draft EIR assesses how the Project would impact each of these issue areas, and the mitigation required to reduce potential impacts. Each environmental issue addressed in Sections 4.1 through 4.9 is presented in terms of the following subsections:

- **Methodology** – This subsection describes the methodology used in preparation of the impacts analysis, including existing resources, technical data, applicable laws and guidelines, or specific technical reports prepared for the Project.
- **Existing Conditions** – This subsection describes the physical environmental conditions in the vicinity of the proposed Project at the time of publication of the NOP. The existing conditions establishes the baseline conditions by which the City will determine whether specific Project-related impacts are significant.

- **Relevant Plans, Policies, and Ordinances** - This subsection describes the laws, regulations, ordinances, plans, and policies applicable to the environmental issue area and the proposed Project.
- **Thresholds of Significance** – This subsection identifies a set of thresholds by which the level of impact is determined.
- **Environmental Impacts Analysis** – This subsection provides a detailed analysis regarding the environmental effects of the proposed Project, and whether the impacts of the Project would meet or exceed the thresholds of significance.
- **Cumulative Impacts** – Provides an evaluation of the potential cumulative impacts of the Project in combination with identified related projects.
- **Mitigation Measures** – This subsection identifies potentially feasible mitigation measures that would avoid or substantially reduce significant adverse project impacts.
- **Level of Significance After Mitigation** – This subsection discusses whether Project-related impacts would be reduced to below a level of significance with implementation of the mitigation measures identified in the Draft EIR. If applicable, this subsection also identifies any residual significant and unavoidable adverse impacts of the proposed Project that would result even with implementation of any feasible mitigation measures.
- **References** – This subsection outlines all references cited throughout the EIR Section.

4.1 Air Quality

4.1.1 Methodology

This section describes the existing conditions of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential impacts, and identifies mitigation measures related to implementation of the proposed Project. The analysis of the Project impacts related to air quality is based on:

Appendix C CalEEMod Data, February 2020.

Although not a part of the proposed Project, there are specific components in Area 2 that are approved to move forward without additional environmental review that are included in this EIR section and in the California Emissions Estimator Model (CalEEMod) construction assumptions. The improvements to be conducted in Area 2, which have been previously approved to proceed in accordance with the 2015 ASCP MND, include:

1. Removal of existing K-rails along an approximate 150-foot-long segment of the Gabrielino Trail/Access Road between Bridge No. 3 and the intake structure;
2. Stabilization and repaving of the Gabrielino Trail/Access Road with asphalt and would be sloped to direct surface runoff away from the stream towards the hillside; and,

These non-Project improvements are included in the CalEEMod assumptions because their construction is anticipated to occur simultaneously with the proposed Project improvements, likely using the same equipment. As such, it was determined to be unrealistic to parse out the short-term construction activities of the various Project components; therefore, the air quality impacts of constructing all improvements within Area 2 are considered in this section.

Similarly, although not a part of the proposed Project, there are specific components in Area 3 that are approved to move forward without additional environmental review that are included in this EIR section and in the CalEEMod construction assumptions. The improvements to be conducted in Area 3, which have been previously approved to proceed in accordance with the 2015 ASCP MND, include:

1. Demolition of various facilities, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chainlink fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins;
2. Construction and operation of new pre-fabricated restroom, new sewer lift station, and associated pipelines, including a new 12-inch-diameter potable water pipeline and a new sewer line within the JPL Bridge;
3. Construction and operation of new pipelines, including a 12-inch-diameter well line, 16-inch-diameter utility service line, and 12-inch-diameter booster line;
4. Removal of the Behner WTP's influent and effluent lines and removal of the 8-inch-diameter sludge line from the Behner WTP;
5. Construction and operation of the recreational parking lot at the northern end of Area 3;

6. Construction/realignment and operation of Explorer Road; and
7. Construction of new fencing, gates, a roundabout, a guard station, a trail pathway, and signs at the northern end of the parking lot.

Additional details related to these non-Project components are included in Appendix A-3, 2015 ASCP Initial Study/Mitigated Negative Declaration.

The non-Project components within Areas 2 and 3 listed above were previously approved for both short-term construction and long-term operations. Only the short-term construction activities for these non-Project components are modeled in the CalEEMod analysis, as all operational aspects were approved through the 2015 IS/MND and there would be no changes associated with the long-term operations of the proposed Project when compared to the 2015 IS/MND, as further described in Section 3, Project Description, of this Draft EIR.

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, and the comment letters received in response to the NOP are included in Appendix A-2 of this Draft EIR.

4.1.2 Existing Conditions

The Project site is located within the South Coast Air Basin (SCAB). SCAB is a 6,745-square-mile area bounded by the Pacific Ocean to the west and the San Gabriel, San Bernardino, and San Jacinto Mountains to the north and east. SCAB includes Orange County, Los Angeles County (except the Antelope Valley portion), and the western, non-desert portions of San Bernardino and Riverside Counties.

Meteorological and Topographical Conditions

The primary factors that determine air quality are the locations of air pollutant sources and the amount of pollutants emitted. Meteorological and topographical conditions, however, are also important. Factors such as wind speed and direction, air temperature gradients and sunlight, and precipitation and humidity interact with physical landscape features to determine the movement and dispersal of air pollutants. SCAB's air pollution problems are a consequence of the combination of emissions from the nation's second largest urban area, meteorological conditions discouraging dispersion of those emissions, and mountainous terrain surrounding SCAB that traps pollutants as they are pushed inland by the sea breeze (SCAQMD 2017a). The meteorological and topographical factors affecting air quality in SCAB are described in the following subsections.[1]

Climate

SCAB is characterized as having a Mediterranean climate (typified as semiarid with mild winters, warm summers, and moderate rainfall). The general region lies in the semi-permanent high-pressure zone of the eastern Pacific; as a result, the climate is mild and tempered by cool sea breezes. The usually mild climatological pattern is interrupted

[1] The discussion of meteorological and topographical conditions of SCAB is based on information provided in the Final 2016 Air Quality Management Plan (SCAQMD 2017a).

infrequently by periods of extremely hot weather, winter storms, or Santa Ana winds. The extent and severity of the air pollution problem in SCAB is a function of the area's natural physical characteristics (e.g., weather and topography) and of manufactured influences (e.g., development patterns and lifestyle). Moderate temperatures, comfortable humidity, and limited precipitation characterize the climate in SCAB. The average annual temperature varies little, averaging 75°F; however, with a less-pronounced oceanic influence, the eastern inland portions of SCAB show greater variability in annual minimum and maximum temperatures, and all portions have recorded temperatures over 100°F in recent years. Although SCAB has a semiarid climate, the air near the surface is moist because of the presence of a shallow marine layer. Except for infrequent periods when dry air is brought into SCAB by offshore winds, the ocean effect is dominant. Periods with heavy fog are frequent, and low stratus clouds, occasionally referred to as "high fog," are a characteristic climate feature. Annual average relative humidity is 70% at the coast and 57% in the eastern part of SCAB. Precipitation is typically 9–14 inches annually and is rarely in the form of snow or hail because of typically warm weather. The frequency and amount of rainfall is greater in the coastal areas of SCAB.

The greatest precipitation in the City occurs from November to March, during which time the rainfall averages 2–4 inches per month. The average annual precipitation is 20.24 inches. The City has a mild climate with an annual average temperature of 72°F. The coolest months of the year are typically January and February, with an annual average low of 38.8°F. The warmest months are typically July through September, with an annual average high of 78°F. Prevailing wind direction in the City (as measured in Pasadena approximately 4.3 miles southwest of the site) is from the west and north (WRCC 2016).

Sunlight

The presence and intensity of sunlight are necessary prerequisites for the formation of photochemical smog. Under the influence of the ultraviolet radiation of sunlight, certain "primary" pollutants (mainly reactive hydrocarbons and oxides of nitrogen (NO_x)[2]) react to form "secondary" pollutants (primarily oxidants). Since this process is time dependent, secondary pollutants can be formed many miles downwind of the emission sources. Southern California also has abundant sunshine, which drives the photochemical reactions that form pollutants such as ozone (O_3) and a substantial portion of fine particulate matter (particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)). In SCAB, high concentrations of O_3 are normally recorded during the late spring, summer, and early autumn months, when more intense sunlight drives enhanced photochemical reactions. Due to the prevailing daytime winds and time-delayed nature of photochemical smog, oxidant concentrations are highest in the inland areas of Southern California.

Temperature Inversions

Under ideal meteorological conditions and irrespective of topography, pollutants emitted into the air mix and disperse into the upper atmosphere. However, the Southern California region frequently experiences temperature inversions in which pollutants are trapped and accumulate close to the ground. The inversion, a layer of warm, dry air overlaying cool, moist marine air, is a normal condition in coastal Southern California. The cool, damp, and hazy sea air capped by coastal clouds is heavier than the warm, clear air, which acts as a lid through which the cooler marine layer cannot rise. The height of the inversion is important in determining pollutant concentration. When the inversion is

[2] NO_x is a general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO_2) and other oxides of nitrogen.

approximately 2,500 feet above mean sea level, the sea breezes carry the pollutants inland to escape over the mountain slopes or through the passes. At a height of 1,200 feet above mean sea level, the terrain prevents the pollutants from entering the upper atmosphere, resulting in the pollutants settling in the foothill communities. Below 1,200 feet above mean sea level, the inversion puts a tight lid on pollutants, concentrating them in a shallow layer over the entire coastal basin. Usually, inversions are lower before sunrise than during the daylight hours.

Mixing heights for inversions are lower in the summer, and inversions are more persistent, being partly responsible for the high levels of O_3 observed during summer months in SCAB. Smog in Southern California is generally the result of these temperature inversions combining with coastal day winds and local mountains to contain the pollutants for long periods, allowing them to form secondary pollutants by reacting in the presence of sunlight. SCAB has a limited ability to disperse these pollutants due to typically low wind speeds and the surrounding mountain ranges.

As with other cities within SCAB, the City of Los Angeles is susceptible to air inversions, which trap a layer of stagnant air near the ground where pollutants are further concentrated. These inversions produce haziness, which is caused by moisture, suspended dust, and a variety of chemical aerosols emitted by trucks, automobiles, furnaces, and other sources. Elevated particulate matter less than or equal to 10 microns in diameter (PM_{10}) and $PM_{2.5}$ concentrations can occur in SCAB throughout the year, but occur most frequently in fall and winter. Although there are some changes in emissions by day-of-week and season, the observed variations in pollutant concentrations are primarily the result of seasonal differences in weather conditions.

Pollutants and Effects

Criteria Air Pollutants

Criteria air pollutants are defined as pollutants for which the federal and state governments have established ambient air quality standards, or criteria, for outdoor concentrations to protect public health. The federal and state standards have been set (pursuant to the federal and state Clean Air Acts, which are discussed in the following pages), with an adequate margin of safety, at levels above which concentrations could be harmful to human health and welfare. These standards are designed to protect the most sensitive persons from illness or discomfort. Pollutants of concern include O_3, nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), PM_{10}, $PM_{2.5}$, and lead (Pb). These pollutants, as well as toxic air contaminants (TACs), are discussed in the following paragraphs.[3] In California, sulfates, vinyl chloride, hydrogen sulfide, and visibility-reducing particles are also regulated as criteria air pollutants. A more detailed discussion of health effects of criteria air pollutants is provided in Appendix C.

Ozone. O_3 is a strong-smelling, pale blue, reactive, toxic chemical gas consisting of three oxygen atoms. It is a secondary pollutant formed in the atmosphere by a photochemical process involving the sun's energy and O_3 precursors. These precursors are mainly NO_X and volatile organic compounds (VOCs). The maximum effects of precursor emissions on O_3 concentrations usually occur several hours after they are emitted and many miles from the source. Meteorology and terrain play major roles in O_3 formation, and ideal conditions occur during

[3] The descriptions of each of the criteria air pollutants and associated health effects are based on the EPA's Criteria Air Pollutants (2016a) and the CARB Glossary of Air Pollutant Terms (2016a).

summer and early autumn on days with low wind speeds or stagnant air, warm temperatures, and cloudless skies. O_3 exists in the upper atmosphere O_3 layer (stratospheric ozone) and at Earth's surface in the lower atmosphere (tropospheric ozone).[4] The O_3 that the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) regulate as a criteria air pollutant is produced close to the ground level, where people live, exercise, and breathe. Ground-level O_3 is a harmful air pollutant that causes numerous adverse health effects and is thus considered "bad" O_3. Stratospheric, or "good," O_3 occurs naturally in the upper atmosphere, where it reduces the amount of ultraviolet light (i.e., solar radiation) entering Earth's atmosphere. Without the protection of the beneficial stratospheric O_3 layer, plant and animal life would be seriously harmed.

O_3 in the troposphere causes numerous adverse health effects; short-term exposures (lasting for a few hours) to O_3 at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes (EPA 2013). These health problems are particularly acute in sensitive receptors such as the sick, the elderly, and young children.

Nitrogen Dioxide. NO_2 is a brownish, highly reactive gas that is present in all urban atmospheres. The major mechanism for the formation of NO_2 in the atmosphere is the oxidation of the primary air pollutant nitric oxide (NO), which is a colorless, odorless gas. NO_x plays a major role, together with VOCs, in the atmospheric reactions that produce O_3. NO_x is formed from fuel combustion under high temperature or pressure. In addition, NO_x is an important precursor to acid rain and may affect both terrestrial and aquatic ecosystems. The two major emissions sources are transportation and stationary fuel combustion sources such as electric utility and industrial boilers.

NO_2 can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections (EPA 2016).

Carbon Monoxide. CO is a colorless, odorless gas formed by the incomplete combustion of hydrocarbon, or fossil fuels. CO is emitted almost exclusively from motor vehicles, power plants, refineries, industrial boilers, ships, aircraft, and trains. In urban areas such as the City of Los Angeles, transportation accounts for the majority of CO emissions. CO is a nonreactive air pollutant that dissipates relatively quickly; therefore, ambient CO concentrations generally follow the spatial and temporal distributions of vehicular traffic. CO concentrations are influenced by local meteorological conditions—primarily wind speed, topography, and atmospheric stability. CO from motor vehicle exhaust can become locally concentrated when surface-based temperature inversions are combined with calm atmospheric conditions, which is a typical situation at dusk in urban areas from November to February. The highest levels of CO typically occur during the colder months of the year, when inversion conditions are more frequent.

In terms of adverse health effects, CO competes with oxygen, often replacing it in the blood, reducing the blood's ability to transport oxygen to vital organs. The results of excess CO exposure can include dizziness, fatigue, and impairment of central nervous system functions.

[4] The troposphere is the layer of Earth's atmosphere nearest to the surface of Earth, extending outward approximately 5 miles at the poles and approximately 10 miles at the equator.

Sulfur Dioxide. SO_2 is a colorless, pungent gas formed primarily from incomplete combustion of sulfur-containing fossil fuels. The main sources of SO_2 are coal and oil used in power plants and industries; as such, the highest levels of SO_2 are generally found near large industrial complexes. In recent years, SO_2 concentrations have been reduced by the increasingly stringent controls placed on stationary source emissions of SO_2 and limits on the sulfur content of fuels.

SO_2 is an irritant gas that attacks the throat and lungs and can cause acute respiratory symptoms and diminished ventilator function in children. When combined with particulate matter, SO_2 can injure lung tissue and reduce visibility and the level of sunlight. SO_2 can also yellow plant leaves and erode iron and steel.

Particulate Matter. Particulate matter pollution consists of very small liquid and solid particles floating in the air, which can include smoke, soot, dust, salts, acids, and metals. Particulate matter can form when gases emitted from industries and motor vehicles undergo chemical reactions in the atmosphere. $PM_{2.5}$ and PM_{10} represent fractions of particulate matter. Coarse particulate matter (PM_{10}) is about 1/7 the thickness of a human hair. Major sources of PM_{10} include crushing or grinding operations; dust stirred up by vehicles traveling on roads; wood-burning stoves and fireplaces; dust from construction, landfills, and agriculture; wildfires and brush/waste burning; industrial sources; windblown dust from open lands; and atmospheric chemical and photochemical reactions. Fine particulate matter ($PM_{2.5}$) is roughly 1/28 the diameter of a human hair. $PM_{2.5}$ results from fuel combustion (e.g., from motor vehicles and power generation and industrial facilities), residential fireplaces, and woodstoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as sulfur oxides (SO_x), NO_x, and VOCs.

$PM_{2.5}$ and PM_{10} pose a greater health risk than larger-size particles. When inhaled, these tiny particles can penetrate the human respiratory system's natural defenses and damage the respiratory tract. $PM_{2.5}$ and PM_{10} can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections. Very small particles of substances such as lead, sulfates, and nitrates can cause lung damage directly or be absorbed into the blood stream, causing damage elsewhere in the body. Additionally, these substances can transport adsorbed gases such as chlorides or ammonium into the lungs, also causing injury. PM_{10} tends to collect in the upper portion of the respiratory system, whereas $PM_{2.5}$ is small enough to penetrate deeper into the lungs and damage lung tissue. Suspended particulates also produce haze and reduce regional visibility and damage and discolor surfaces on which they settle.

People with influenza, people with chronic respiratory and cardiovascular diseases, and the elderly may suffer worsening illness and premature death as a result of breathing particulate matter. People with bronchitis can expect aggravated symptoms from breathing in particulate matter. Children may experience a decline in lung function due to breathing in PM_{10} and $PM_{2.5}$ (EPA 2009).

Lead. Lead in the atmosphere occurs as particulate matter. Sources of lead include leaded gasoline; the manufacturing of batteries, paints, ink, ceramics, and ammunition; and secondary lead smelters. Prior to 1978, mobile emissions were the primary source of atmospheric lead. Between 1978 and 1987, the phaseout of leaded gasoline reduced the overall inventory of airborne lead by nearly 95%. With the phaseout of leaded gasoline, secondary lead smelters, battery recycling, and manufacturing facilities are becoming lead-emissions sources of greater concern.

Prolonged exposure to atmospheric lead poses a serious threat to human health. Health effects associated with exposure to lead include gastrointestinal disturbances, anemia, kidney disease, and, in severe cases, neuromuscular and neurological dysfunction. Of particular concern are low-level lead exposures during infancy and childhood. Such exposures are associated with decrements in neurobehavioral performance, including intelligence quotient performance, psychomotor performance, reaction time, and growth. Children are highly susceptible to the effects of lead.

Volatile Organic Compounds. Hydrocarbons are organic gases that are formed from hydrogen and carbon and sometimes other elements. Hydrocarbons that contribute to formation of O_3 are referred to and regulated as VOCs (also referred to as reactive organic gases). Combustion engine exhaust, oil refineries, and fossil-fueled power plants are the sources of hydrocarbons. Other sources of hydrocarbons include evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint.

The primary health effects of VOCs result from the formation of O_3 and its related health effects. High levels of VOCs in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. Carcinogenic forms of hydrocarbons, such as benzene, are considered TACs. There are no separate health standards for VOCs as a group.

Toxic Air Contaminants. A substance is considered toxic if it has the potential to cause adverse health effects in humans, including increasing the risk of cancer upon exposure, or acute and/or chronic non-cancer health effects. A toxic substance released into the air is considered a TAC. TACs are identified by federal and state agencies based on a review of available scientific evidence. In the State of California, TACs are identified through a two-step process that was established in 1983 under the Toxic Air Contaminant Identification and Control Act. This two-step process of risk identification and risk management and reduction was designed to protect residents from the health effects of toxic substances in the air. In addition, the California Air Toxics "Hot Spots" Information and Assessment Act, Assembly Bill (AB) 2588, was enacted by the Legislature in 1987 to address public concern over the release of TACs into the atmosphere. The law requires facilities emitting toxic substances to provide local air pollution control districts with information that will allow an assessment of the air toxics problem, identification of air toxics emissions sources, location of resulting hotspots, notification of the public exposed to significant risk, and development of effective strategies to reduce potential risks to the public over 5 years.

Examples include certain aromatic and chlorinated hydrocarbons, certain metals, and asbestos. TACs are generated by a number of sources, including stationary sources, such as dry cleaners, gas stations, combustion sources, and laboratories; mobile sources, such as automobiles; and area sources, such as landfills. Adverse health effects associated with exposure to TACs may include carcinogenic (i.e., cancer-causing) and noncarcinogenic effects. Noncarcinogenic effects typically affect one or more target organ systems and may be experienced on either short-term (acute) or long-term (chronic) exposure to a given TAC, such as diesel particulate matter (DPM).

Diesel Particulate Matter. DPM, which is the predominant TAC, is part of a complex mixture that makes up diesel exhaust. Diesel exhaust is composed of two phases, gas and particle, both of which contribute to health risks. More than 90% of DPM is less than 1 micrometer in diameter (about 1/70 the diameter of a human hair) and, thus, is a subset of $PM_{2.5}$ (CARB 2016). DPM is typically composed of carbon particles ("soot," also called black carbon) and numerous organic compounds, including over 40 known cancer-causing organic substances. Examples of these

chemicals include polycyclic aromatic hydrocarbons, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene (CARB 2016). CARB classified "particulate emissions from diesel-fueled engines" (i.e., DPM; 17 CCR 93000) as a TAC in August 1998. DPM is emitted from a broad range of diesel engines: on-road diesel engines of trucks, buses, and cars and off-road diesel engines, including locomotives, marine vessels, and heavy-duty construction equipment, among others. Approximately 70% of all airborne cancer risk in California is associated with DPM (CARB 2000). To reduce the cancer risk associated with DPM, CARB adopted a diesel risk reduction plan in 2000 (CARB 2000). Because it is part of $PM_{2.5}$, DPM also contributes to the same non-cancer health effects as $PM_{2.5}$ exposure. These effects include premature death; hospitalizations and emergency department visits for exacerbated chronic heart and lung disease, including asthma; increased respiratory symptoms; and decreased lung function in children. Several studies suggest that exposure to DPM may also facilitate development of new allergies (CARB 2016). Those most vulnerable to non-cancer health effects are children whose lungs are still developing and the elderly who often have chronic health problems.

Odorous Compounds

Odors are generally regarded as an annoyance rather than a health hazard. Manifestations of a person's reaction to odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache). The ability to detect odors varies considerably among the population and overall is quite subjective. People may have different reactions to the same odor. An odor that is offensive to one person may be perfectly acceptable to another (e.g., coffee roaster). An unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. Known as odor fatigue, a person can become desensitized to almost any odor, and recognition may only occur with an alteration in the intensity. The occurrence and severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors.

Sensitive Receptors

Some land uses are considered more sensitive to changes in air quality than others, depending on the population groups and the activities involved. People most likely to be affected by air pollution include children, the elderly, athletes, and people with cardiovascular and chronic respiratory diseases. Facilities and structures where these air-pollution-sensitive people live or spend considerable amounts of time are known as sensitive receptors. Land uses where air-pollution-sensitive individuals are most likely to spend time include schools and schoolyards, parks and playgrounds, daycare centers, nursing homes, hospitals, and residential communities (sensitive sites or sensitive land uses) (CARB 2005). The South Coast Air Quality Management District (SCAQMD) identifies sensitive receptors as residences, schools, playgrounds, childcare centers, long-term healthcare facilities, rehabilitation centers, convalescent centers, and retirement homes (SCAQMD 1993).

The nearest off-site sensitive receptors to Area 2 of the proposed Project are residences approximately 800 feet to the east on Canyon Dell Drive in Altadena, part of unincorporated Los Angeles County. Residential neighborhoods to the west in the City of La Cañada Flintridge are more than 1,700 feet from Area 2. Single-family residential neighborhoods exist to the east of Area 3. Some homes are in the City of Pasadena and others are in Altadena. The closest off-site sensitive receptors to Area 3 are on Ridgeview Drive in Altadena and Crestford Drive in Pasadena, approximately 250 feet from the Project site. All other air quality sensitive receptors are located at greater distances from the Project site and would be less impacted by emissions generated by the proposed Project. Impacts are quantified in Section 4.2.4, Impacts Analysis, for the above sensitive receptors.

Regional and Local Air Quality Conditions

South Coast Air Basin Attainment Designation

Pursuant to the 1990 federal Clean Air Act amendments, the EPA classifies air basins (or portions thereof) as "attainment" or "non-attainment" for each criteria air pollutant, based on whether the National Ambient Air Quality Standards (NAAQS) have been achieved. Generally, if the recorded concentrations of a pollutant are lower than the standard, the area is classified as "attainment" for that pollutant. If an area exceeds the standard, the area is classified as "non-attainment" for that pollutant. If there is not enough data available to determine whether the standard is exceeded in an area, the area is designated as "unclassified" or "unclassifiable." The designation of "unclassifiable/attainment" means that the area meets the standard or is expected to be meet the standard despite a lack of monitoring data. Areas that achieve the standards after a non-attainment designation are re-designated as maintenance areas and must have approved Maintenance Plans to ensure continued attainment of the standards. The California Clean Air Act, like its federal counterpart, called for the designation of areas as "attainment" or "non-attainment," but based on California Ambient Air Quality Standards (CAAQS) rather than the NAAQS. Table 4.1-1 depicts the current attainment status of the Project site with respect to the NAAQS and CAAQS as well as the attainment classifications for the criteria pollutants.

Table 4.1-1. South Coast Air Basin Attainment Classification

Pollutant	Designation/Classification	
	Federal Standards[a]	*State Standards*[b]
Ozone (O_3) – 1 hour	No federal standard	**Non-attainment**
Ozone (O_3) – 8 hour	**Extreme non-attainment**	**Non-attainment**
Nitrogen dioxide (NO_2)	Unclassifiable/attainment	Attainment
Carbon monoxide (CO)	Attainment/maintenance	Attainment
Sulfur dioxide (SO_2)	Unclassifiable/attainment	Attainment
Coarse particulate matter (PM_{10})	Attainment/maintenance	**Non-attainment**
Fine particulate matter ($PM_{2.5}$)	**Serious non-attainment**	**Non-attainment**
Lead (Pb)	Nonattainment	Attainment
Hydrogen sulfide	No federal standard	Unclassified
Sulfates	No federal standard	Attainment
Visibility-reducing particles	No federal standard	Unclassified
Vinyl chloride	No federal standard	No designation

Notes: bold text = not in attainment; attainment = meets the standards; attainment/maintenance = achieve the standards after a non-attainment designation; non-attainment = does not meet the standards; unclassified or unclassifiable = insufficient data to classify; unclassifiable/attainment = meets the standard or is expected to be meet the standard despite a lack of monitoring data.

[a] EPA 2018.

[b] CARB 2018.

In summary, SCAB is designated as a non-attainment area for federal and state O_3 standards and federal and state $PM_{2.5}$ standards. SCAB is designated as a non-attainment area for state PM_{10} standards; however, it is designated as an attainment area for federal PM_{10} standards. SCAB is designated as an attainment area for

federal and state CO standards, federal and state NO_2 standards, and federal and state SO_2 standards. While SCAB has been designated as non-attainment for the federal rolling 3-month average lead standard, it is designated attainment for the state lead standard (EPA 2018; CARB 2018).

Despite the current non-attainment status, air quality within SCAB has generally improved since the inception of air pollutant monitoring in 1976. This improvement is mainly due to lower-polluting on-road motor vehicles, more stringent regulation of industrial sources, and the implementation of emission reduction strategies by the SCAQMD. This trend toward cleaner air has occurred in spite of continued population growth. Despite this growth, air quality has improved significantly over the years, primarily due to the impacts of the region's air quality control program. PM_{10} levels have declined almost 50% since 1990, and $PM_{2.5}$ levels have also declined 50% since measurements began in 1999 (SCAQMD 2013). Similar improvements are observed with O_3, although the rate of O_3 decline has slowed in recent years.

California air districts have based their thresholds of significance for CEQA purposes on the levels that scientific and factual data demonstrate that the air basin can accommodate without affecting the attainment date for the NAAQS or CAAQS. Since an ambient air quality standard is based on maximum pollutant levels in outdoor air that would not harm the public's health, and air district thresholds pertain to attainment of the ambient air quality standard, this means that the thresholds established by air districts are also protective of human health. The NAAQS and CAAQS are presented in Table 4.1-2.

Table 4.1-2. Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
		Concentration[c]	*Primary*[c,d]	*Secondary*[c,e]
O_3	1 hour	0.09 ppm (180 µg/m³)	—	Same as Primary Standard[f]
	8 hours	0.070 ppm (137 µg/m³)	0.070 ppm (137 µg/m³)[f]	
NO_2[g]	1 hour	0.18 ppm (339 µg/m³)	0.100 ppm (188 µg/m³)	Same as Primary Standard
	annual arithmetic mean	0.030 ppm (57 µg/m³)	0.053 ppm (100 µg/m³)	
CO	1 hour	20 ppm (23 mg/m³)	35 ppm (40 mg/m³)	None
	8 hours	9.0 ppm (10 mg/m³)	9 ppm (10 mg/m³)	
SO_2[h]	1 hour	0.25 ppm (655 µg/m³)	0.075 ppm (196 µg/m³)	—
	3 hours	—	—	0.5 ppm (1,300 µg/m³)
	24 hours	0.04 ppm (105 µg/m³)	0.14 ppm (for certain areas)[g]	—
	annual	—	0.030 ppm (for certain areas)[g]	—
PM_{10}[i]	24 hours	50 µg/m³	150 µg/m³	Same as Primary Standard
	annual arithmetic mean	20 µg/m³	—	

Table 4.1-2. Ambient Air Quality Standards

Pollutant	Averaging Time	California Standardsa	National Standardsb	
		Concentration[c]	*Primary[c,d]*	*Secondary[c,e]*
$PM_{2.5}$[i]	24 hours	—	35 µg/m³	Same as Primary Standard
	annual arithmetic mean	12 µg/m³	12.0 µg/m³	15.0 µg/m³
Lead[j,k]	30-day average	1.5 µg/m³	—	—
	calendar quarter	—	1.5 µg/m³ (for certain areas)[k]	Same as Primary Standard
	rolling 3-month average	—	0.15 µg/m³	
Hydrogen sulfide	1 hour	0.03 ppm (42 µg/m³)	—	—
Vinyl chloride[j]	24 hours	0.01 ppm (26 µg/m³)	—	—
Sulfates	24 hours	25 µg/m³	—	—
Visibility-reducing particles	8 hour (10:00 a.m. to 6:00 p.m. PST)	Insufficient amount to produce an extinction coefficient of 0.23 per kilometer due to the number of particles when the relative humidity is less than 70%	—	—

Source: CARB 2019a.

Notes: µg/m³ = micrograms per cubic meter; mg/m³= milligrams per cubic meter; ppm = parts per million by volume; O_3 = ozone; NO_2 = nitrogen dioxide; CO = carbon monoxide; SO_2 = sulfur dioxide; PM_{10} = particulate matter with an aerodynamic diameter less than or equal to 10 microns; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than or equal to 2.5 microns.

a California standards for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, suspended particulate matter (PM_{10}, $PM_{2.5}$), and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

b National standards (other than O_3, NO_2, SO_2, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once per year. The O_3 standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m³ is equal to or less than 1. For $PM_{2.5}$, the 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard.

c Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based on a reference temperature of 25 °C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25 °C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

d National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[e] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[f] On October 1, 2015, the national 8-hour O_3 primary and secondary standards were lowered from 0.075 to 0.070 ppm.

[g] To attain the national 1-hour standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 parts per billion (ppb). Note that the national 1-hour standard is in units of ppb. California standards are in units of ppm. To directly compare the national 1-hour standard to the California standards, the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

[h] On June 2, 2010, a new 1-hour SO_2 standard was established, and the existing 24-hour and annual primary standards were revoked. To attain the national 1-hour standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until 1 year after an area is designated for the 2010 standard, except that in areas designated non-attainment of the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

[i] On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour $PM_{2.5}$ standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM_{10} standards (primary and secondary) of 150 $\mu g/m^3$ were also retained. The form of the annual primary and secondary standards is the annual mean averaged over 3 years.

[j] CARB has identified lead and vinyl chloride as TACs with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[k] The national standard for lead was revised on October 15, 2008, to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated non-attainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

Local Ambient Air Quality

CARB, air districts, and other agencies monitor ambient air quality at approximately 250 air quality monitoring stations across the state. Air quality monitoring stations usually measure pollutant concentrations 10 feet above ground level; therefore, air quality is often referred to in terms of ground-level concentrations. The most recent background ambient air quality data from 2016 to 2018 are presented in Table 4.1-3. The Pasadena monitoring station, located at 752 S. Wilson Avenue, Pasadena, California 91106, is the nearest air quality monitoring station to the Project site, located approximately 2 miles northeast from the Project site. Air quality data for O_3, NO_2, CO, and $PM_{2.5}$ from the Pasadena monitoring station are provided in Table 4.1-3. Because SO_2 and CO are not monitored at the Pasadena monitoring station, these measurements were taken from the Los Angeles North Main Street monitoring station (1630 North Main Street, California 90012, approximately 15 miles south of the Project site). The data collected at these stations are considered representative of the air quality experienced in the Project vicinity. The number of days exceeding the ambient air quality standards is also shown in Table 4.1-3.

Table 4.1-3. Local Ambient Air Quality Data

Averaging Time	Unit	Agency/ Method	Ambient Air Quality Standard	Measured Concentration by Year			Exceedances by Year		
				2016	*2017*	*2018*	*2016*	*2017*	*2018*
Ozone (O3) – Pasadena									
Maximum 1-hour Concentration	ppm	State	0.09	0.126	0.126	0.139	0.112	1	2
Maximum 8-hour Concentration	ppm	State	0.070	0.070	0.090	0.100	0.090	*17*	*36*
		Federal	0.070	0.070	0.091	0.100	0.091	*19*	*38*
Nitrogen Dioxide (NO_2) – Pasadena									
Maximum 1-hour Concentration	ppm	State	0.18	0.100	0.072	0.072	0.068	*0*	*0*
		Federal	0.100	0.030	0.015	0.015	0.014	0	0
Annual Concentration	ppm	State	0.030	0.053	0.015	0.015	0.14	0	0
		Federal	0.053	0.100	0.072	0.072	0.068	*0*	*0*
Carbon Monoxide (CO) –									
Maximum 1-hour Concentration	ppm	State	20	1.5	1.7	1.5	0	0	0
		Federal	35	1.5	1.7	1.5	0	0	0
Maximum 8-hour Concentration	ppm	State	9.0	1.0	1.0	1.4	0	0	0
		Federal	9	1.0	1.0	1.4	0	0	0
Sulfur Dioxide (SO_2) – Pasadena									
Maximum 1-hour Concentration	ppm	Federal	0.075	0.001	0.002	0.001	0	0	0
Maximum 24-hour Concentration	ppm	State	0.04	0.000	0.001	0.000	0	0	0
	ppm	Federal	0.140	0.000	0.001	0.000	0	0	0
Annual Concentration	ppm	Federal	0.030	0.000	0.000	0.000	0	0	0
Coarse Particulate Matter (PM_{10})[a] – Los Angeles – North Main Street									
Maximum 24-hour Concentration	µg/m^3	State	50	74.6	96.2	81.2	21	40	31.8
		Federal	150	64.0	64.6	68.2	0	0	0
Annual Concentration	µg/m^3	State	20	30	27	34	30	27	34
Fine Particulate Matter ($PM_{2.5}$)[a] – Pasadena									
Maximum 24-hour Concentration	µg/m^3	Federal	35	29.2	22.8	32.5	0	0	0
Annual Concentration	µg/m^3	State	12	9.5	10	10	0	0	0
		Federal	12.0	9.5	9.6	10.2	0	0	0

Sources: CARB 2019b; EPA 2019.

Notes: ppm = parts per million; µg/m3 = micrograms per cubic meter; — = not available.

Data taken from CARB iADAM (http://www.arb.ca.gov/adam) and Environmental Protection Agency AirData (http://www.epa.gov/airdata/) represent the highest concentrations experienced over a given year.

Daily exceedances for particulate matter are estimated days because PM_{10} and $PM_{2.5}$ are not monitored daily. All other criteria pollutants did not exceed federal or state standards during the years shown. There is no federal standard for 1-hour O_3, annual PM_{10}, or 24-hour SO_2, nor is there a state 24-hour standard for $PM_{2.5}$.

[a] Measurements of PM_{10} and $PM_{2.5}$ are usually collected every six days and every one to three days, respectively. Number of days exceeding the standards is a mathematical estimate of the number of days concentrations would have been greater than the level of the standard had each day been monitored. The numbers in parentheses are the measured number of samples that exceeded the standard.

4.1.3 Relevant Plans, Policies, and Ordinances

Federal

Clean Air Act

The federal Clean Air Act, passed in 1970 and last amended in 1990, forms the basis for the national air pollution control effort. The EPA is responsible for implementing most aspects of the Clean Air Act, including setting NAAQS for major air pollutants; setting hazardous air pollutant (HAP) standards; approving state attainment plans; setting motor vehicle emission standards; issuing stationary source emission standards and permits; and establishing acid rain control measures, stratospheric O_3 protection measures, and enforcement provisions. Under the Clean Air Act, NAAQS are established for the following criteria pollutants: O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead.

The NAAQS describe acceptable air quality conditions designed to protect the health and welfare of the citizens of the nation. The NAAQS (other than for O_3, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and those based on annual averages or arithmetic mean) are not to be exceeded more than once per year. NAAQS for O_3, NO_2, SO_2, PM_{10}, and $PM_{2.5}$ are based on statistical calculations over 1- to 3-year periods, depending on the pollutant. The Clean Air Act requires the EPA to reassess the NAAQS at least every 5 years to determine whether adopted standards are adequate to protect public health based on current scientific evidence. States with areas that exceed the NAAQS must prepare a state implementation plan that demonstrates how those areas will attain the standards within mandated timeframes.

The 1977 federal Clean Air Act amendments required the EPA to identify National Emission Standards for Hazardous Air Pollutants to protect public health and welfare. HAPs include certain VOCs, pesticides, herbicides, and radionuclides that present a tangible hazard, based on scientific studies of exposure to humans and other mammals. Under the 1990 federal Clean Air Act amendments, which expanded the control program for HAPs, 189 substances and chemical families were identified as HAPs.

State/Regional

California Ambient Air Quality Standards

The federal Clean Air Act delegates the regulation of air pollution control and the enforcement of the NAAQS to the states. In California, the task of air quality management and regulation has been legislatively granted to CARB, with subsidiary responsibilities assigned to air quality management districts and air pollution control districts at the regional and county levels. CARB, which became part of the California Environmental Protection Agency in 1991, is responsible for ensuring implementation of the California Clean Air Act of 1988, responding to the federal Clean Air Act, and regulating emissions from motor vehicles and consumer products.

CARB has established CAAQS, which are generally more restrictive than the NAAQS. As stated previously, an ambient air quality standard defines the maximum amount of a pollutant averaged over a specified period of time that can be present in outdoor air without harm to the public's health. The CAAQS describe adverse conditions; that is, pollution levels must be below these standards before a basin can attain the standard. Air quality is considered "in attainment" if pollutant levels are continuously below the CAAQS and violate the standards no more than once each year. The CAAQS for O_3, CO, SO_2 (1-hour and 24-hour), NO_2, PM_{10}, and $PM_{2.5}$ and visibility-reducing particles are values that are not to be exceeded. All others are not to be equaled or exceeded.

California air districts have based their thresholds of significance for CEQA purposes on the levels that scientific and factual data demonstrate that the air basin can accommodate without affecting the attainment date for the NAAQS or CAAQS. Since an ambient air quality standard is based on maximum pollutant levels in outdoor air that would not harm the public's health, and air district thresholds pertain to attainment of the ambient air quality standard, this means that the thresholds established by air districts are also protective of human health.

AB 1809 - Air Toxics Program

The state Air Toxics Program was established in 1983 under AB 1807 (Tanner). The California TAC list identifies more than 700 pollutants, a subset of which have carcinogenic and noncarcinogenic toxicity criteria established pursuant to the California Health and Safety Code. In accordance with AB 2728, the state list includes the (federal) HAPs. The Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588) was enacted by the legislature in 1987 to address public concern over the release of TACs into the atmosphere. AB 2588 law requires facilities emitting toxic substances to provide local air pollution control districts with information that will allow an assessment of the air toxics problem, identification of air toxics emissions sources, location of resulting hotspots, notification of the public exposed to significant risk, and development of effective strategies to reduce potential risks to the public over 5 years. TAC emissions from individual facilities are quantified and prioritized. "High-priority" facilities are required to perform a health risk assessment (HRA), and if specific thresholds are exceeded, are required to communicate the results to the public in the form of notices and public meetings.

In 2000, CARB approved a comprehensive Diesel Risk Reduction Plan to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines (CARB 2000). The regulation is anticipated to result in an 80% decrease in statewide diesel health risk in 2020 compared with the diesel risk in 2000. Additional regulations apply to new trucks and diesel fuel, including the On-Road Heavy Duty Diesel Vehicle (In-Use) Regulation (CARB 2014), On-Road Heavy Duty (New) Vehicle Program (CARB 2005), In-Use Off-Road Diesel Vehicle Regulation (CARB 2011), and New Off-Road Compression-Ignition (Diesel) Engines and Equipment program (CARB 2008). These regulations and programs have timetables to which manufacturers must comply and existing operators must upgrade their diesel-powered equipment. There are several Airborne Toxic Control Measures that reduce diesel emissions, including In-Use Off-Road Diesel-Fueled Fleets (13 CCR 2449 et seq.) and In-Use On-Road Diesel-Fueled Vehicles (13 CCR 2025).

California Health and Safety Code Section 41700

This section of the Health and Safety Code states that a person shall not discharge from any source whatsoever quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or that endanger the comfort, repose, health, or safety of any of those persons or the public; or that cause, or have a natural tendency to cause, injury or damage to business or property. This section also applies to sources of objectionable odors.

Local

Air Quality Management Plan

The SCAQMD is the regional agency responsible for the regulation and enforcement of federal, state, and local air pollution control regulations in SCAB, where the proposed Project is located. The SCAQMD operates monitoring stations in SCAB, develops rules and regulations for stationary sources and equipment, prepares emissions inventory and air quality management planning documents, and conducts source testing and inspections. The SCAQMD's Air Quality Management Plans (AQMPs) include control measures and strategies to be implemented to attain state and federal ambient air quality standards in SCAB. The SCAQMD then implements these control measures as regulations to control or reduce criteria pollutant emissions from stationary sources or equipment.

The 2012 AQMP proposed policies and measures to achieve federal and state standards for improved air quality in SCAB and portions of the Salton Sea Air Basin (formerly named the Southeast Desert Air Basin) that are under SCAQMD jurisdiction. The 2012 AQMP is designed to meet applicable federal and state requirements for O_3 and particulate matter. The 2012 AQMP stated that attainment of the federal 24-hour $PM_{2.5}$ standard was impracticable by 2015 and that SCAB should be classified as a serious non-attainment area along with the appropriate federal requirements. The 2012 AQMP included the planning requirements to meet the 1-hour O_3 standard. The 2012 AQMP demonstrated a plan for attainment of the federal 24-hour $PM_{2.5}$ standard by 2014 in SCAB through adoption of all feasible measures. Finally, the 2012 AQMP updated the EPA-approved 8-hour O_3 control plan with new measures designed to reduce reliance on the Clean Air Act Section 182(e)(5) long-term measures for NO_x and VOC reductions. The 2012 AQMP reduction and control measures, which are outlined to mitigate emissions, are based on existing and projected land use and development. The EPA, with a final ruling on April 14, 2016, approved the Clean Air Act planning requirements for the 24-hour $PM_{2.5}$ standard portion and on September 3, 2014, approved the 1-hour O_3 Clean Air Act planning requirements. The 2012 AQMP was updated in 2016 (approved March 2017); this AQMP accounts for updates to CARB's and SCAQMD's emission reductions resulting from adopted rules and regulations since the 2012 AQMP, growth factors, and demographic trends.

The 2016 AQMP is a regional blueprint for achieving air quality standards and healthful air. The 2016 AQMP represents a new approach, focusing on available, proven, and cost-effective alternatives to traditional strategies, while seeking to achieve multiple goals in partnership with other entities promoting reductions in greenhouse gas emissions and toxic risk, as well as efficiencies in energy use, transportation, and goods movement (SCAQMD 2017a). Because mobile sources are the principal contributor to SCAB's air quality challenges, SCAQMD has been and will continue to be closely engaged with CARB and the EPA, who have primary responsibility for these sources. The 2016 AQMP recognizes the critical importance of working with other agencies to develop funding and other incentives that encourage the accelerated transition of vehicles, buildings, and industrial facilities to cleaner technologies in a manner that benefits not only air quality but also local businesses and the regional economy. These "win-win" scenarios are key to implementation of this 2016 AQMP with broad support from a wide range of stakeholders.

While striving to achieve the NAAQS for O_3 and $PM_{2.5}$ and the CAAQS for O_3, PM_{10}, and $PM_{2.5}$ through a variety of air quality control measures, the 2016 AQMP also accommodates planned growth in SCAB. Projects are considered consistent with, and would not conflict with or obstruct, implementation of the AQMP if growth in

socioeconomic factors (e.g., population, employment) is consistent with the underlying regional plans used to develop the AQMP. The demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment by industry) developed by the Southern California Association of Governments (SCAG) based on general plans for cities and counties in SCAB were used in the 2016–2040 Regional Transportation Plan/Sustainable Communities Strategy (2016 RTP/SCS) (SCAG 2016) to estimate future emissions in the 2016 AQMP (SCAQMD 2017a).

SCAQMD Rules

Emissions that would result from mobile, area, and stationary sources during maintenance activities of the proposed program are subject to the rules and regulations of SCAQMD (2017b), which include the following:

- **Rule 401 – Visible Emissions:**[5] This rule establishes the limit for visible emissions from stationary sources.
- **Rule 402 – Nuisance:**[6] This rule prohibits the discharge of air pollutants from a facility that cause injury, detriment, nuisance, or annoyance to the public or damage to business or property.
- **Rule 403 – Fugitive Dust:**[7] This rule requires fugitive dust sources to implement best available control measures for all sources and prohibits all forms of visible particulate matter from crossing any property line. Rule 403 applies to any activity or human-made condition capable of generating fugitive dust, and identifies measures to reduce fugitive dust. This includes soil treatment for exposed soil areas. Treatment shall include, but not necessarily be limited to, periodic watering, application of environmentally safe soil stabilization materials, and/or roll compaction as appropriate.
- **Rule 431.2 – Sulfur Content of Liquid Fuels:**[8] The purpose of this rule is to limit the sulfur content in diesel and other liquid fuels for the purpose of reducing the formation of sulfur oxides (SO_x) and particulates during combustion and of enabling the use of add-on control devices for diesel-fueled internal combustion engines. The rule applies to all refiners, importers, and other fuel suppliers such as distributors, marketers, and retailers, as well as to users of diesel, low-sulfur diesel, and other liquid fuels for stationary-source applications in the SCAQMD. The rule also affects diesel fuel supplied for mobile sources.
- **Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines:**[9] This rule applies to stationary and portable engines rated at greater than 50 horsepower. The purpose of Rule 1110.2 is to reduce NO_x, VOC, and CO emissions from engines. Emergency engines, including those powering standby generators, are generally exempt from the emissions and monitoring requirements of this rule because they have permit conditions that limit operation to 200 hours or less per year as determined by an elapsed operating time meter.

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5 Rule 401 Visible Emissions: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-401.pdf?sfvrsn=4.

6 Rule 402 Nuisance: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-402.pdf?sfvrsn=4.

7 Rule 403 Fugitive Dust: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-403.pdf?sfvrsn=4.

8 Rule 431.2 Sulfur Content of Liquid Fuels: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/rule-431-2.pdf?sfvrsn=4.

9 Rule 1110.2 Emissions from Gaseous and Liquid-Fueled Engines: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/rule-1110-2.pdf.

- **Rule 1113 – Architectural Coatings:**[10] This rule requires manufacturers, distributors, and end users of architectural and industrial maintenance coatings to reduce VOC emissions from the use of these coatings, primarily by placing limits on the VOC content of various coating categories.
- **Rule 1403 – Asbestos Emissions from Demolition/Renovation Activities:**[11] This rule specifies work practices to limit asbestos emissions from building demolition and renovation activities, including removal and associated disturbance of asbestos-containing material (ACM).

Regional Transportation Plan/Sustainable Communities Strategy

The SCAG is the regional planning agency for Los Angeles, Orange, Ventura, Riverside, San Bernardino, and Imperial Counties and serves as a forum for regional issues relating to transportation, the economy, community development, and the environment. SCAG serves as the federally designated metropolitan planning organization for the Southern California region and is the largest metropolitan planning organization in the United States.

With respect to air quality planning and other regional issues, SCAG has prepared the *Final 2008 Regional Comprehensive Plan: Helping Communities Achieve a Sustainable Future* (2008 RCP) for the region (SCAG 2008). The 2008 RCP sets the policy context in which SCAG participates in and responds to the SCAQMD air quality plans and builds off the SCAMQD AQMP processes that are designed to meet health-based criteria pollutant standards in several ways (SCAG 2008). First, it complements AQMPs by providing guidance and incentives for public agencies to consider best practices that support the technology-based control measures in AQMPs. Second, the 2008 RCP emphasizes the need for local initiatives that can reduce the region's GHG emissions that contribute to climate change, an issue that is largely outside the focus of local attainment plans, which it assessed in Section 3 of the plan. Third, the 2008 RCP emphasizes the need for better coordination of land use and transportation planning, which heavily influences the emissions inventory from the transportation sectors of the economy. This also minimizes land use conflicts, such as residential development near freeways, industrial areas, or other sources of air pollution.

On April 7, 2016, SCAG's Regional Council adopted the 2016 RTP/SCS. The 2016 RTP/SCS is a long-range visioning plan that balances future mobility and housing needs with economic, environmental, and public health goals. The 2016 RTP/SCS charts a course for closely integrating land use and transportation so that the region can grow smartly and sustainably. The 2016 RTP/SCS was prepared through a collaborative, continuous, and comprehensive process with input from local governments, county transportation commissions, tribal governments, nonprofit organizations, businesses, and local stakeholders within the Counties of Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. In June 2016, SCAG received its conformity determination from the Federal Highway Administration and the Federal Transit Administration indicating that all air quality conformity requirements for the 2016 RTP/SCS and associated 2015 Federal Transportation Improvement Program Consistency Amendment through Amendment 15-12 have been met (SCAG 2016). As previously noted, SCAQMD's 2016 AQMP applies the updated SCAG growth forecasts assumed in the 2016 RTP/SCS.

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10 Rule 1113 Architectural Coatings: http://www.aqmd.gov/docs/default-source/rule-book/reg-xi/r1113.pdf?sfvrsn=17.

11 Rule 1403 Asbestos Emissions from Demolition/Renovation Activities: http://www.aqmd.gov/docs/default-source/rule-book/reg-xiv/rule-1403.pdf.

4.1.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to hazards and hazardous materials are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to hazards and hazardous material would occur if the project would:

a) Conflict with or obstruct implementation of the applicable air quality plan.
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.
c) Expose sensitive receptors to substantial pollutant concentrations.
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

Through the analysis in the Initial Study (see Appendix A-1), it was determined that the proposed Project would not result in other emissions (such as those leading to odors) adversely affecting a substantial number of people (i.e., Threshold d). Accordingly, this issue is not further analyzed in the EIR. Based on the remaining thresholds, a significant impact related to air quality would occur if the project would:

a) Conflict with or obstruct implementation of the applicable air quality plan.
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.
c) Expose sensitive receptors to substantial pollutant concentrations.

Pursuant to the State CEQA Guidelines (Section 15064.7), a lead agency may consider using, when available, the significance criteria established by the applicable air quality management district or air pollution control district when making determinations of significance. The City of Los Angeles uses the SCAQMD's thresholds to evaluate proposed development projects and assess the significance of quantifiable impacts. The potential air quality impacts of a project are, therefore, evaluated according to the thresholds adopted by the SCAQMD in connection with its CEQA Air Quality Handbook, Air Quality Analysis Guidance Handbook, and subsequent SCAQMD guidance as discussed previously.

Threshold 1: Consistency with Air Quality Management Plan. The evaluation of whether the proposed Project would conflict with or obstruct implementation of the applicable air quality plan is based on the SCAQMD CEQA Air Quality Handbook (SCAQMD 1993), Chapter 12, Section 12.2 (Consistency Criterion No. 1), which asks whether the proposed Project would result in an increase in the frequency or severity of existing air quality violations or cause or contribute to new violations, or delay the timely attainment of air quality standards of the interim emissions reductions specified in the AQMP. This issue is addressed in detail under Threshold 1 in Section 4.1.4, Impacts Analysis. Consistency Criterion No. 2 in the SCAQMD CEQA Air Quality Handbook, Chapter 12, Section 12.3, asks whether the proposed Project would exceed the assumptions in the AQMP or increments based on the year of proposed Project buildout and phase, as discussed further in Section 4.2.4.

Threshold 2: Cumulative Impacts on Air Quality. Appendix G of the CEQA Guidelines (14 CCR 15000 et seq.) indicates that, where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied on to determine whether the proposed Project would have a significant impact on air quality.

The SCAQMD has established Air Quality Significance Thresholds, as revised in March 2015, which set forth quantitative emission significance thresholds below which a project would not have a significant impact on ambient air quality under existing and cumulative conditions. The quantitative air quality analysis provided herein applies the SCAQMD thresholds identified in Table 4.1-4 to determine the potential for the proposed Project to result in a significant impact under CEQA.

Table 4.1-4. South Coast Air Quality Management District Air Quality Significance Thresholds

Criteria Pollutants Mass Daily Thresholds		
Pollutant	*Construction (pounds per day)*	*Operation (pounds per day)*
VOCs	75	55
NO_x	100	55
CO	550	550
SO_x	150	150
PM_{10}	150	150
$PM_{2.5}$	55	55
Lead[a]	3	3
TACs and Odor Thresholds		
TACs[b]	Maximum incremental cancer risk ≥10 in 1 million Cancer Burden > 0.5 excess cancer cases (in areas ≥1 in 1 million) Chronic and acute hazard index ≥1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality Standards for Criteria Pollutants[c]		
NO_2 1-hour average NO_2 annual arithmetic mean	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.18 ppm (state) 0.030 ppm (state) and 0.0534 ppm (federal)	
CO 1-hour average CO 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) and 35 ppm (federal) 9.0 ppm (state/federal)	
PM_{10} 24-hour average PM_{10} annual average	10.4 μg/m³ (construction)[d] 2.5 μg/m³ (operation) 1.0 μg/m³	
$PM_{2.5}$ 24-hour average	10.4 μg/m³ (construction)[d] 2.5 μg/m³ (operation)	

Source: SCAQMD 2015.

Notes: SCAQMD = South Coast Air Quality Management District; VOC = volatile organic compounds; NO_x = oxides of nitrogen; CO = carbon monoxide; SO_x = sulfur oxides; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TAC = toxic air contaminant; NO_2 = nitrogen dioxide; ppm = parts per million; μg/m³ = micrograms per cubic meter.

GHG emissions thresholds for industrial projects, as added in the March 2015 revision to the SCAQMD Air Quality Significance Thresholds, were not include included in Table 4.1-4 because they are addressed within the GHG emissions analysis and not the air quality study.

[a] The phaseout of leaded gasoline started in 1976. Since gasoline no longer contains lead, the proposed Project is not anticipated to result in impacts related to lead; therefore, it is not discussed in this analysis.

[b] TACs include carcinogens and noncarcinogens.

[c] Ambient air quality standards for criteria pollutants are based on SCAQMD Rule 1303, Table A-2, unless otherwise stated.

[d] Ambient air quality threshold are based on SCAQMD Rule 403.

A project would result in a substantial contribution to an existing air quality violation of the NAAQS or CAAQS for O_3, which is a non-attainment pollutant, if the project's construction or operational emissions would exceed the SCAQMD VOC or NO_x thresholds shown in Table 4.1-4. These emissions-based thresholds for O_3 precursors are intended to serve as a surrogate for an "ozone significance threshold" (i.e., the potential for adverse O_3 impacts to occur). This approach is used because O_3 is not emitted directly (see the discussion of O_3 and its sources in Section 4.1.1, Existing Conditions) and the effects of an individual project's emissions of O_3 precursors (VOC and NO_x) on O_3 levels in ambient air cannot be determined through air quality models or other quantitative methods.

Regarding cumulative impacts for non-attainment pollutants, if emissions exceed the thresholds shown in Table 4.1-4, the proposed Project could have the potential to result in a cumulatively considerable net increase in these pollutants and, thus, could have a significant impact on ambient air quality.

Threshold 3: Sensitive Receptors. The assessment of the proposed Project's potential to expose sensitive receptors to substantial pollutant concentrations (threshold criterion 4) includes a localized significance threshold (LST) analysis, as recommended by the SCAQMD, to evaluate the potential of localized air quality impacts to sensitive receptors in the immediate vicinity of the proposed Project. A LST analysis was performed to evaluate potential localized impacts associated with construction activities. For project sites of 5 acres or less the SCAQMD LST Methodology (2009) includes lookup tables that can be used to determine the maximum allowable daily emissions that would satisfy the localized significance criteria (i.e., the emissions would not cause an exceedance of the applicable concentration limits for NO_2, CO, PM_{10}, and $PM_{2.5}$) without performing project-specific dispersion modeling.

The LST significance thresholds for NO_2 and CO represent the allowable increase in concentrations above background levels in the vicinity of a project that would not cause or contribute to an exceedance of the relevant ambient air quality standards, while the threshold for PM_{10} represents compliance with Rule 403 (Fugitive Dust). The LST significance threshold for $PM_{2.5}$ is intended to ensure that construction emissions do not contribute substantially to existing exceedances of the $PM_{2.5}$ ambient air quality standards. The allowable emission rates depend on the following parameters:

- Source receptor area (SRA) in which the project is located
- Size of the project site
- Distance between the project site and the nearest sensitive receptor (e.g., residences, schools, hospitals)

The Project site is within SRA, 8 (West San Gabriel Valley). The SCAQMD provides guidance for applying California Emissions Estimator Model (CalEEMod) to the LSTs. LST pollutant screening level concentration data is currently published for 1-, 2-, and 5-acre sites for varying distances. The maximum number of acres disturbed on the peak day was estimated using the "Fact Sheet for Applying CalEEMod to Localized Significance Thresholds" (SCAQMD 2011), which provides estimated acres per 8-hour day for crawler tractors, graders, rubber tired dozers, and scrapers. The proposed Project would disturb approximately 1.5 based on the most intense construction equipment load. Therefore, using the LST for a 1-acre site was utilized as the thresholds are more conservative than using the 2-acre LST.

As described in Section 2, Environmental Setting, the Project site consists of two primary areas, as shown on Figure 2-1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements, which are connected by the North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road). The proposed Project involves construction activity and facility improvements in Areas 2 and 3, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The former Travelling Screen and Chlorine Building (Screen Building) adjacent to Area 2 and the Behner WTP adjacent to Area 3 would be used for temporary construction materials and equipment staging only.

Area 2. The nearest homes to Area 2 are approximately 800 feet to the east on Canyon Dell Drive in Altadena, part of unincorporated Los Angeles County. Residential neighborhoods to the west in the City of La Cañada Flintridge are more than 1,700 feet from Area 2.

Area 3. Single-family residential neighborhoods exist to the east of Area 3. Some homes are in the City of Pasadena and others are in Altadena. The closest homes to Area 3 are on Ridgeview Drive in Altadena and Crestford Drive in Pasadena, approximately 250 feet from the Project site. North Windsor Avenue, between the I-210 freeway and Explorer Drive, would be used by traffic generated by the proposed Project. There are homes adjacent to North Windsor Avenue in the City of Pasadena and in the community of Altadena. Passive and active recreational areas, including the Gabrielino Trail, are near all Project areas and are described in Section 4.7, Recreation.

Because the nearest sensitive-receptor is located approximately 250 feet from the Project site, the LST receptor distance was assumed to be 164 feet (50 meters), which is the closest available distance provided by the SCAQMD lookup tables. The construction LST values from the SCAQMD lookup tables for Source Receptor Area (SRA) 8, West San Gabriel Valley, for a 1-acre construction site and a receptor distance of 50 meters are shown in Table 4.1-5.

Table 4.1-5. Localized Significance Thresholds for Source Receptor Area 8 (West San Gabriel Valley)

Pollutant	Threshold (pounds per day)
NO_2	69
CO	783
PM_{10}	11
$PM_{2.5}$	4

Source: SCAQMD 2008.

Notes: NO_2 = nitrogen dioxide; CO = carbon monoxide; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter.

LST thresholds were determined based on the values for 1-acre site at a distance of 50 meters from the nearest sensitive receptor.

The assessment of the proposed Project's potential to expose sensitive receptors to substantial pollutant concentrations (threshold criterion 3) also includes an evaluation of CO hotspots, and an assessment of the potential health effects of criteria air pollutants.

4.1.5 Environmental Impacts Analysis

Threshold 4.1a. Would the project conflict with or obstruct implementation of the applicable air quality plan?

As previously discussed, the Project site is located within the SCAB under the jurisdiction of the SCAQMD, which is the local agency responsible for administration and enforcement of air quality regulations for the area. The SCAQMD has established criteria for determining consistency with the AQMP, currently the 2016 AQMP, in Chapter 12, Sections 12.2 and 12.3, in the SCAQMD CEQA Air Quality Handbook (SCAQMD 1993). The criteria are as follows (SCAQMD 1993):

- **Consistency Criterion No. 1:** The proposed Project will not result in an increase in the frequency or severity of existing air quality violations or cause or contribute to new violations, or delay the timely attainment of air quality standards of the interim emissions reductions specified in the AQMP.
- **Consistency Criterion No. 2:** The proposed Project will not exceed the assumptions in the AQMP or increments based on the year of project buildout and phase.

Consistency Criterion No. 1

Threshold 4.1b evaluates the Project's potential to violate air quality standards or contribute substantially to an existing or projected air quality violation impact analysis. As discussed under Threshold 4.1b , the proposed Project would not result in a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard. Because the Project would not result in an increase in the frequency and severity of existing air quality violations, the Project would not conflict with Consistency Criterion No. 1 of the SCAQMD CEQA Air Quality Handbook.

Consistency Criterion No. 2

While striving to achieve the NAAQS for O_3 and $PM_{2.5}$ and the CAAQS for O_3, PM_{10}, and $PM_{2.5}$ through a variety of air quality control measures, the 2016 AQMP also accommodates planned growth in the SCAB. Projects are considered consistent with, and would not conflict with or obstruct implementation of, the AQMP if the growth in socioeconomic factors (e.g., population, employment) is consistent with the underlying regional plans used to develop the AQMP (per Consistency Criterion No. 2 of the SCAQMD CEQA Air Quality Handbook).

The SCAQMD primarily uses demographic growth forecasts for various socioeconomic categories (e.g., population, housing, employment by industry) developed by the SCAG for its RTP/SCS (SCAG 2016), which is based on general plans for cities and counties in the SCAB, for the development of the AQMP emissions inventory (SCAQMD 2017a).[12] The SCAG 2016 RTP/SCS, and associated Regional Growth Forecast, are

[12] Information necessary to produce the emission inventory for the SCAB is obtained from the SCAQMD and other governmental agencies, including CARB, Caltrans, and SCAG. Each of these agencies is responsible for collecting data (e.g., industry growth factors, socioeconomic projections, travel activity levels, emission factors, emission speciation profile, and emissions) and developing methodologies (e.g., model and demographic forecast improvements) required to generate a comprehensive emissions inventory. SCAG incorporates these data into their Travel Demand Model for estimating/projecting vehicle miles

generally consistent with the local plans; therefore, the 2016 AQMP is generally consistent with local government plans. The proposed Project site is zoned for open space use within the Pasadena General Plan. Therefore, the Project would be consistent with the current zoning and land use designation. Accordingly, the Project would meet Consistency Criterion No. 2 of the SCAQMD CEQA Air Quality Handbook.

Therefore, implementation of the Project would not result in a conflict with, or obstruct implementation of, the applicable air quality plan (i.e., the 2016 AQMP). Accordingly, the Project would meet Consistency Criterion No. 2 of the SCAQMD CEQA Air Quality Handbook.

Summary

As described previously, the proposed Project would not result in a significant increase in the frequency and severity of existing air quality violations and would not conflict with Consistency Criterion No. 1. Additionally, implementation of the Project would not exceed the demographic growth forecasts in the SCAG 2016 RTP/SCS; therefore, the Project would be consistent with the SCAQMD 2016 AQMP, which based future emission estimates on the SCAG 2016 RTP/SCS. Thus, the Project would not conflict with Consistency Criterion No. 2. Based on these considerations, impacts related to the Project's potential to conflict with or obstruct implementation of the applicable air quality plan would be less than significant.

Threshold 4.1b Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

Construction of the proposed Project would result in emissions of criteria air pollutants from mobile, area, and/or stationary sources, which may cause exceedances of federal and state ambient air quality standards or contribute to existing non-attainment of ambient air quality standards. The following discussion identifies potential short-term construction impacts that would result from implementation of the Project.

Short-Term Construction Impacts

Construction of the Project would result in the temporary addition of pollutants to the local airshed caused by on-site sources (i.e., off-road construction equipment, soil disturbance, and VOC off-gassing) and off-site sources (i.e., vendor trucks and worker vehicle trips). Construction emissions can vary substantially from day to day depending on the level of activity, the specific type of operation, and for dust, and the prevailing weather conditions. Therefore, such emission levels can only be approximately estimated with a corresponding uncertainty in precise ambient air quality impacts.

Construction criteria air pollutant emissions associated with temporary construction activity were quantified using CalEEMod (CAPCOA 2017). Construction emissions were calculated for the estimated worst-case day over the construction period associated with each phase and reported as the maximum daily emissions estimated during each year of construction (2021, and 2022). Construction schedule assumptions, including phase type, duration,

traveled (VMT) and driving speeds. SCAG's socioeconomic and transportation activities projections in their 2016 RTP/SCS are integrated in the 2016 AQMP (SCAQMD 2017a).

and sequencing, were based on information provided by the City and default values provided in CalEEMod and are intended to represent a reasonable scenario based on the best information available.

To estimate Project emissions, and based on information provided by the City, it is assumed that construction in Area 2 would begin in August 2021 and would last approximately 3 months, ending in October 2021. Construction in Area 3 would begin in March 2022 and would last approximately 9 months. The inputs into CalEEMod include the following assumptions (duration of phases is approximate):

- Area 2
  - Site preparation: 1 Week (August 2021 – August 2021)
  - Dewatering: 2 Months (August 2021 – September 2021)
  - Demolition: 1 Week (August 2021)
  - Grading/Excavation: 2 Months (July 2021 – December 2021)
  - Building Construction: 2 Months (August 2021 – October 2021)
  - Paving: 1 Week (October 2021)
- Area 3
  - Site Preparation: 1 Week (March 2022)
  - Demolition: 2 Weeks (March 2022 – April 2022)
  - Grading/Excavation 6 Months (April 2022 – August 2022)
  - Building Construction 2 Months (August 2022 – October 2022)
  - Paving: 2 Months (August 2022 – October 2022)
  - Architectural Coating 1 Week (November 2022)

Construction of the Project would commence with site preparation, grading and earthwork excavation. It is anticipated that approximately 1,608 cubic yards of earthwork material would be exported to support the construction of Area 2. Additionally, it is anticipated that approximately 11,000 cubic yards and 37,000 cubic yards of earthwork material would be required to be exported and imported respectively during Area 3 construction. The material is assumed to be transported during the grading and excavation phases. Upon completion of these phases, vertical building construction and paving/concrete installation would commence. Construction activity is assumed to occur at the site for approximately 8 hours per day, 5 days per week (22 days a month), during Project construction. CalEEMod default trip length values were used for all worker and vendor trips and earthwork import trips. Demolition and exported material will be disposed of at the Vulcan Durbin landfill in Irwindale which is approximately 18 miles from the Project. Therefore, an 18-mile trip distance was used for exported material and demolition haul truck trips. The construction equipment mix and vehicle trips used for estimating the Project-generated construction emissions are shown in Table 4.1-6.

Table 4.1-6. Construction Scenario Assumptions

Construction Phase	One-Way Vehicle Trips			Equipment		
	Average Daily Worker Trips	*Average Daily Vendor Truck Trips*	*Total Haul Truck Trips*	*Equipment Type*	*Quantity*	*Usage Hours*
Area 2: Site Preparation	8	2	14	Rubber-tired dozers	1	7
				Graders	1	8
				Tractors/loaders/backhoes	5	8
Area 2: Dewatering	5	0	0	Tractors/loaders/backhoes	1	8
				Pump	1	24
Area 2: Demolition	13	2	64	Concrete/Industrial Saws	1	8
				Rubber-tired dozers	1	8
				Tractors/loaders/backhoes	3	8
Area 2: Grading and Excavation	10	2	420	Excavators	1	8
				Rubber Tired Dozers	1	6
				Rubber Tired Loaders	1	8
				Tractors/loaders/backhoes	1	7
Area 2: Building Construction	26	2	0	Cranes	1	6
				Excavators	1	8
				Tractor/loaders/backhoes	1	6
				Trenchers	1	8
				Tractors/loaders/backhoes	1	8
Area 2: Paving	18	2	0	Pavers	1	6
				Cement and Mortar Mixers	1	6
				Pressure Washers	1	8
				Paving Equipment	1	8
				Rollers	1	7
				Tractor/loader/backhoe	1	8
Area 3: Site Preparation	5	2	0	Rubber Tired Dozers	1	7
				Tractor/loader/backhoes	1	8
Area 3: Demolition	10	2	142	Concrete/industrial saws	1	8
				Tractor/loaders/backhoes	3	8
Area 3: Grading and Excavation	10	2	4,746	Shaker	1	8
				Rubber Tired Dozers	1	6
				Rubber Tired Loaders	1	8
				Tractors/loaders/backhoes	1	7

Table 4.1-6. Construction Scenario Assumptions

Construction Phase	One-Way Vehicle Trips			Equipment		
	Average Daily Worker Trips	*Average Daily Vendor Truck Trips*	*Total Haul Truck Trips*	*Equipment Type*	*Quantity*	*Usage Hours*
Area 3: Building Construction				Cranes	1	6
				Forklifts	1	6
				Generator Sets	1	8
				Tractors/loaders/backhoes	1	6
Area 3: Paving	15	2	0	Pavers	1	6
				Cement and Mortar Mixers	1	8
				Pressure Washers	1	6
				Paving Equipment	1	8
				Rollers	1	7
				Tractor/loader/backhoe	1	8
Area 3: Architectural Coating	5	0	0	Air Compressors	1	6

Notes: See Appendix C.

Entrained dust results from the exposure of earth surfaces to wind from the direct disturbance and movement of soil, resulting in PM_{10} and $PM_{2.5}$ emissions. The Project would be required to comply with SCAQMD Rule 403 to control dust emissions generated during the grading activities. Standard construction practices that would be employed to reduce fugitive dust emissions include watering of the active sites three times per day, depending on weather conditions. Internal-combustion engines used by construction equipment, vendor trucks (i.e., delivery trucks), and worker vehicles would result in emissions of VOCs, NO_x, CO, PM_{10}, and $PM_{2.5}$. The application of architectural coatings, such as exterior application and other finishes, and asphalt pavement would also produce VOC emissions; however, the contractor is required to procure architectural coatings from a supplier in compliance with the requirements of SCAQMD's Rule 1113 (Architectural Coatings).

Table 4.1-7 presents the estimated maximum daily construction emissions generated during construction of the Project. The values shown are the maximum summer or winter daily emissions results from CalEEMod. Details of the emissions are provided in Appendix C.

Table 4.1-7. Estimated Maximum Daily Construction Criteria Air Pollutant Emissions

Year	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
	Pounds per Day					
2021	5.02	45.17	38.88	0.08	5.10	3.36
2022	3.62	26.20	19.68	0.06	3.71	2.05
Maximum	*5.02*	*45.17*	*38.88*	*0.08*	*5.10*	*2.36*
SCAQMD threshold	*75*	*100*	*550*	*150*	*150*	*55*
Threshold exceeded?	**No**	**No**	**No**	**No**	**No**	**No**

Notes: VOC = volatile organic compound; NO_x = oxides of nitrogen; CO = carbon monoxide; SO_x = sulfur oxides; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; SCAQMD = South Coast Air Quality Management District.

See Appendix C for complete results.

The values shown are the maximum summer or winter daily emissions results from CalEEMod. The PM_{10} and $PM_{2.5}$ emissions reflect CalEEMod "mitigated" output, which accounts for compliance with SCAQMD Rule 403 (Fugitive Dust).

As shown in Table 4.1-7, construction activities would not generate emissions in excess of the SCAQMD daily construction emissions thresholds for VOCs, NO_x, CO SO_x, PM_{10}, and $PM_{2.5}$.

Air pollution is largely a cumulative impact. The non-attainment status of regional pollutants is a result of past and present development, and the SCAQMD develops and implements plans for future attainment of ambient air quality standards. A cumulative analysis must evaluate a project's contribution to the cumulative increase in pollutants for which the SCAB is designated as non-attainment for the CAAQS and NAAQS. As discussed in Section 2.3.1, South Coast Air Basin Attainment Designation, the SCAB has been designated as a national non-attainment area for O_3 and $PM_{2.5}$ and a California non-attainment area for O_3, PM_{10}, and $PM_{2.5}$. Of these non-attainment pollutants, construction of the Project would generate VOC and NO_x emissions (which are precursors to O_3) and emissions of PM_{10} and $PM_{2.5}$.

If a project's emissions would not exceed the SCAQMD significance thresholds for criteria pollutants, it would be expected to not have a cumulatively considerable contribution to the non-attainment status in the SCAB. As indicated in Table 4.1-7, Project-generated construction emissions, would not exceed the SCAQMD emission-based significance thresholds for any criteria air pollutant, and no mitigation is required. Additionally, the Project would not conflict with or obstruct implementation of the SCAQMD 2016 AQMP.

However, even if a project does not exceed thresholds, it may still contribute to a significant cumulative impact on air quality, depending on whether the project's contribution accounts for a significant proportion of the cumulative total emissions (i.e., it represents a "cumulatively considerable contribution" to the cumulative air quality impact) and whether it is consistent with the SCAQMD 2016 AQMP, which addresses the cumulative emissions in the SCAB.

Cumulative localized impacts would potentially occur if a construction project were to occur concurrently with another off-site but nearby project. The geographic scope of the area potentially affected by cumulative air quality impacts from construction and operation consists of sensitive receptor locations that could be exposed to localized air pollution from the proposed Project and from related projects. In general, air quality emissions attenuate over distance, with emissions levels dropping back to background levels within approximately 200

meters (656 feet) when upwind from a source and within approximately 500 meters (1,640 feet) (WHO 2013) As discussed in greater detail in Section 4, Environmental Impact Analysis of this Draft EIR, the cumulative projects were chosen based on direction from the City. ASCP Area 1 construction, while relatively near Area 2, is anticipated to begin in 2023 (and thus, after the completion of the proposed Project). The Devil's Gate Reservoir Sediment Removal and Management Project is located to the southwest of Area 3; sediment removal and placement is ongoing and expected to conclude in Fall 2022, with habitat restoration continuing through Fall 2023; the Oak Grove Area Improvements Projects could begin construction as early as 2021 if funds become available, but is located over 2,218 feet from the Project site. The LACFCD Pumpback/Intake at Devil's Gate (Devil's Gate Dam to Eaton) project would begin after the Devil's Gate and the proposed Project; and the Explorer Groundwater Well construction could potentially be concurrent with proposed Project Area 3, although no CEQA documentation has yet been prepared. Of the projects identified and described in Section 4, Environmental Impact Analysis, the Devil's Gate Reservoir Sediment Removal and Management Project is the one nearest to the Project site[13] and with a potential overlap in construction activities. Therefore, the Devil's Gate project is the one with the greatest potential to result in localized cumulative air quality impacts with regards to the proposed Project.

Localized construction air pollution emissions are assessed under Threshold 4.1c below. It was determined that at sensitive receptors nearest to Area 3 (the portion of the Project site nearest to the Devil's Gate project), during the more intensive phases of construction, the estimated pollutant emissions of NO_x, CO, PM_{10}, and $PM_{2.5}$ would not exceed the SCAQMD LSTs and localized construction air quality impacts would be less than significant. The Devil's Gate project's localized construction emissions were also deemed to be less than significant; furthermore, the closest portion of the Project site representing an active work area (Basin J) is located approximately 500 feet from the Devil's Gate project site to the southwest. Therefore, it is unlikely that construction emissions from the two projects would combine in a measurable fashion at nearby receptors receivers, which are located approximately 250 feet or more further to the east of the Project site and approximately 1,000 from the northern boundary of the Devil's Gate project. This is considered to be a less than significant impact, and not cumulatively considerable.

Otherwise, construction schedules from other potential future projects near the Project site are currently unknown; therefore, potential construction impacts associated with future projects would be considered speculative.[14] However, future projects would be subject to CEQA and would require air quality analysis and, where necessary, mitigation if the project would exceed SCAQMD thresholds. Criteria air pollutant emissions associated with construction activity of future projects would be reduced through implementation of control measures required by the SCAQMD. Cumulative PM_{10} and $PM_{2.5}$ emissions would be reduced because all future projects would be subject to SCAQMD Rule 403 (Fugitive Dust), which sets forth general and specific requirements for all construction sites in the SCAQMD.

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13 Note that construction equipment assumptions associated with specific components in Areas 2 and 3 that are approved to move forward without additional environmental review have been incorporated as part of the construction noise analysis addressed in Section 4.6.5, and are thus not considered as part of this cumulative impacts discussion.

14 The CEQA Guidelines state that if a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact (14 CCR 15145). This discussion is nonetheless provided in an effort to show good-faith analysis and comply with CEQA's information disclosure requirements.

Based on the Project-generated construction emissions of criteria air pollutants, which did not exceed the SCAQMD daily thresholds, the Project would not result in generation of a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard due to short-term construction. Impacts would be less than significant and no mitigation is required.

Long-Term Operational Impacts

As described in Section 3, Project Description, PWP's future schedule of operation and maintenance activities for Project-related facilities would not substantively differ from the current maintenance routine and procedures. No new employees are required for the long-term operation of the Project components. The proposed Project would include new hydraulic motors and winches are part of the design for Area 2 but they would be electrically powered. Electricity use would contribute indirectly to criteria air pollutant emissions; however, the emissions from electricity use are only quantified for greenhouse gases in CalEEMod, since criteria pollutant emissions occur at the site of the power plant, which is typically off site. As such, the Project not result in generation of a cumulatively considerable net increase of any criteria pollutant for which the region is non-attainment under an applicable federal or state ambient air quality standard due to long-term operations. Impacts would be less than significant and no mitigation is required.

Threshold 4.1c Would the project expose sensitive receptors to substantial pollutant concentrations?

As discussed under Sensitive Receptors in Section 4.1.2, sensitive receptors are those individuals more susceptible to the effects of air pollution than the population at large. According to SCAQMD, sensitive receptors include residences, schools, playgrounds, childcare centers, long-term healthcare facilities, rehabilitation centers, convalescent centers, and retirement homes (SCAQMD 1993). The nearest off-site sensitive receptors would be single-family homes approximately 250 feet east from Area 3.

Short-Term Construction Impacts

Localized Significance Thresholds Analysis

LST analysis has been prepared to determine potential impacts to nearby sensitive receptors during construction of the Project. As indicated in Section 4.1.4, Thresholds of Significance, the SCAQMD recommends the evaluation of localized NO_2, CO, PM_{10}, and $PM_{2.5}$ impacts to sensitive receptors in the immediate vicinity of the Project site that would occur as a result of construction activities. The impacts were analyzed using methods consistent with those in the SCAQMD's Final LST Methodology (2008). According to the Final LST Methodology, "off-site mobile emissions from the project should not be included in the emissions compared to the LSTs" (SCAQMD 2008). Hauling of construction materials associated with Project construction is not expected to cause substantial air quality impacts to sensitive receptors along off-site roadways. Emissions from the trucks would be relatively brief in nature and would cease once the trucks pass through the main streets.

Construction activities associated with the Project would result in temporary sources of on-site fugitive dust and construction equipment emissions. Off-site emissions from vendor trucks and worker vehicle trips are not included in the LST analysis. The maximum allowable daily emissions that would satisfy the SCAQMD LSTs for SRA 8 are presented in Table 4.1-8 and compared with the maximum daily on-site construction emissions generated during the Project.

Table 4.1-8. Localized Significance Thresholds Analysis for Project Construction

Pollutant	Project Construction Emissions (Pounds per Day)	LST Criteria (Pounds per Day)	Exceeds LST?
NO_2	37.12	69	No
CO	22.05	783	No
PM_{10}	4.41	11	No
$PM_{2.5}$	3.00	4	No

Source: SCAQMD 2008.

Notes: LST = localized significance threshold; NO_2 = nitrogen dioxide; CO = carbon monoxide; PM_{10} = particulate matter; $PM_{2.5}$ = fine particulate matter.

See Appendix C for detailed results.

Localized significance thresholds are shown for 1-acre Project sites corresponding to a distance to a sensitive receptor of 50 meters.

These estimates reflect control of fugitive dust required by Rule 403.

Greatest on-site NO_x, CO, PM_{10}, and $PM_{2.5}$ emissions are associated with the overlap of the Area 2 Building Construction and Grading phases.

As shown in Table 4.1-8, construction activities would not exceed the SCAQMD daily LSTs for NO_2, Co PM_{10} and $PM_{2.5}$ emissions in excess of site-specific LSTs; therefore, site-specific construction impacts during construction of the Project would be less than significant.

CO Hotspots

Traffic-congested roadways and intersections have the potential to generate localized high levels of CO. Localized areas where ambient concentrations exceed federal and/or state standards for CO are termed CO "hotspots." CO transport is extremely limited, because CO disperses rapidly with distance from the source. Under certain extreme meteorological conditions, however, CO concentrations near a congested roadway or intersection may reach unhealthy levels, affecting sensitive receptors. Typically, high CO concentrations are associated with severely congested intersections. Projects contributing to adverse traffic impacts may result in the formation of a CO hotspot. Additional analysis of CO hotspot impacts would be conducted if a project would result in a significant impact or contribute to an adverse traffic impact at a signalized intersection that would potentially subject sensitive receptors to CO hotspots.

During construction of the Project, construction traffic would affect the intersections near the Project site. However, the proposed Project would be temporary and would not be a source of daily, long-term mobile-source emissions. In addition, due to continued improvement in vehicular emissions at a rate faster than the rate of vehicle growth and/or congestion, the potential for CO hotspots in the SCAB is steadily decreasing. Finally, as discussed in Section 4.8 of this Draft EIR, transportation impacts would be less than significant with mitigation.

Toxic Air Contaminants

Toxic air contaminants (TACs) are defined as substances that may cause or contribute to an increase in deaths or in serious illness, or that may pose a present or potential hazard to human health. As discussed under the LST analysis, the nearest sensitive receptors to the proposed Project are residences located adjacent to the Project as it passes through residential neighborhoods.

Health effects from carcinogenic air toxics are usually described in terms of cancer risk. The SCAQMD recommends an incremental cancer risk threshold of 10 in 1 million. "Incremental cancer risk" is the net increased likelihood that a person continuously exposed to concentrations of TACs resulting from a project over a 9-, 30-, and 70-year exposure period will contract cancer based on the use of standard Office of Environmental Health Hazard Assessment risk-assessment methodology (OEHHA 2015). In addition, some TACs have non-carcinogenic effects. The SCAQMD recommends a Hazard Index of 1 or more for acute (short-term) and chronic (long-term) non-carcinogenic effects. [15] TACs that would potentially be emitted during construction activities associated with the proposed Project would be diesel particulate matter.

Diesel particulate matter emissions would be emitted from heavy equipment operations and heavy-duty trucks. Heavy-duty construction equipment is subject to a CARB Airborne Toxics Control Measure for in-use diesel construction equipment to reduce diesel particulate emissions. As described for the LST analysis, PM10 and PM2.5 (representative of diesel particulate matter) exposure would be minimal. According to the Office of Environmental Health Hazard Assessment, health risk assessments (which determine the exposure of sensitive receptors to toxic emissions) should be based on a 30-year exposure period for the maximally exposed individual resident; however, such assessments should also be limited to the period/duration of activities associated with the Project. The duration of the proposed construction activities would constitute a small percentage of the total 30-year exposure period. The construction period for the proposed Project would be approximately 16 months, after which construction-related TAC emissions would cease. However, because of the nature of the proposed Project, emissions would not be concentrated in any one work area for the entire construction duration. Project construction would not generally remain in a single location for more than a few weeks. Due to this relatively short period of exposure and minimal particulate emissions on-site, TACs generated during construction would not be expected to result in concentrations causing significant health risks.

Health Effects of Criteria Air Pollutants

Construction emissions of the Project would not exceed the SCAQMD thresholds for any criteria air pollutants, including VOC, NO_x, CO, SO_x, PM_{10}, and $PM_{2.5}$.

Health effects associated with O_3 include respiratory symptoms, worsening of lung disease leading to premature death, and damage to lung tissue (CARB 2019c). VOCs and NO_x are precursors to O_3, for which the SCAB is designated as non-attainment with respect to the NAAQS and CAAQS. The contribution of VOCs and NO_x to regional ambient O_3 concentrations is the result of complex photochemistry. The increases in O_3 concentrations in the SCAB due to O_3 precursor emissions tend to be found downwind of the source location because of the time required for the photochemical reactions to occur. Further, the potential for exacerbating excessive O_3 concentrations would also depend on the time of year that the VOC emissions would occur, because exceedances of the O_3 NAAQS and CAAQS tend to occur between April and October when solar radiation is highest. Due to the lack of quantitative methods to assess this complex photochemistry, the holistic effect of a single project's emissions of O_3 precursors is speculative. That being said, because the proposed Project would not exceed the SCAQMD thresholds, the proposed Project would not contribute to health effects associated with O_3.

[15] Non-cancer adverse health risks are measured against a hazard index, which is defined as the ratio of the predicted incremental exposure concentrations of the various non-carcinogens from the project to published reference exposure levels that can cause adverse health effects.

Health effects associated with NO_x include lung irritation and enhanced allergic responses (CARB 2019c). Because Project-related NO_x emissions would not exceed the SCAQMD mass daily thresholds, and because the SCAB is a designated attainment area for NO_2 and the existing NO_2 concentrations in the area are well below the NAAQS and CAAQS standards, it is not anticipated that the proposed Project would cause an exceedance of the NAAQS and CAAQS for NO_2 or result in potential health effects associated with NO_2 and NO_x.

Health effects associated with CO include chest pain in patients with heart disease, headache, light-headedness, and reduced mental alertness (CARB 2019c). CO tends to be a localized impact associated with congested intersections. The associated potential for CO hotspots was discussed previously and determined to be less than significant. Thus, the Project's CO emissions would not contribute to significant health effects associated with CO.

Health effects associated with PM_{10} include premature death and hospitalization, primarily for worsening of respiratory disease (CARB 2019c). Construction of the Project would not exceed thresholds for PM_{10} or $PM_{2.5}$, would not contribute to exceedances of the NAAQS and CAAQS for particulate matter, and would not obstruct the SCAB from coming into attainment for these pollutants. The Project would also not result in substantial diesel particulate matter emissions during construction. Additionally, the Project would be required to comply with SCAQMD Rule 403, which limits the amount of fugitive dust generated during construction. Due to the minimal contribution of particulate matter during construction, the Project is not anticipated to result in health effects associated with PM_{10} or $PM_{2.5}$.

In summary, construction of the proposed Project would not result in exceedances of the SCAQMD significance thresholds for certain criteria pollutants. Therefore, the Project would not expose sensitive receptors to substantial pollutant concentrations or potential health effects associated with criteria air pollutants due to short-term construction. Impacts would be less than significant and no mitigation is required.

Long-Term Operational Impacts

As described in Section 3, Project Description, PWP's future schedule of operation and maintenance activities for Project-related facilities would not substantively differ from the current maintenance routine and procedures. No new employees are required for the long-term operation of the Project components; therefore, no long-term operational air quality impacts from traffic would result. No new emissions-generating land uses are proposed; therefore, no long-term operational air quality emissions from mobile equipment or stationary machinery would result. As such, the Project would not expose sensitive receptors to substantial pollutant concentrations or potential health effects associated with criteria air pollutants due to long-term operations. Impacts would be less than significant and no mitigation is required.

4.1.6 Cumulative Impacts

Because of the cumulative nature of air quality impacts, cumulative impacts to air quality are addressed in Section 4.1 under Threshold 4.1b. As discussed in Threshold 4.1b, impacts resulting from the proposed Project air pollutant emissions would not be cumulatively considerable and no mitigation is required.

4.1.7 Mitigation Measures

No mitigation measures are required.

4.1.8 Level of Significance After Mitigation

The proposed Project would not result in any potentially significant impacts related to Air Quality, and all impacts would be less than significant with Project implementation.

4.1.9 References

13 CCR 2449–2449.3 and Appendix A. General Requirements for In-Use Off-Road Diesel-Fueled Fleets.

14 CCR 15000–15387 and Appendices A–N. Guidelines for Implementation of the California Environmental Quality Act, as amended.

17 CCR 93000. Substances Identified as Toxic Air Contaminants. In Subchapter 7, Toxic Air Contaminants.

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4.2 Biological Resources

4.2.1 Methodology

This section describes the existing conditions of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential impacts, and identifies mitigation measures related to implementation of the proposed Project. The analysis of the Project impacts related to biological resources is based on:

Appendix D Biological Resources Technical Report, prepared by Dudek, dated May 2020.

Information contained in this section is based on the findings of the biological surveys conducted at the Project site by Dudek, including a general biological reconnaissance survey conducted on April 23, 2019, focused special-status plant surveys conducted in May and July 2019, focused amphibian survey in May 3, 2019, focused special-status bird surveys from April to July 2019, focused fish survey conducted on October 14, 2019, jurisdictional delineation update on July 5, 2019, and tree survey on April 2 and 3, 2020. Other documentation reviewed and incorporated where noted, for this analysis include the following:

- Fish and Fish Passage Related to Pasadena Water and Power Department Diversion on Arroyo Seco above Pasadena, dated October 29, 2019 (Swift 2019)
- Draft Basis of Design Report, Arroyo Seco Canyon Project – Intake/Diversion Design, dated May 2020 (Northwest Hydraulics Consultants 2020)
- Arroyo Seco Canyon Diversions Biological Impacts Memorandum, dated November 8, 2018 (Psomas 2018)
- Biological Technical Report, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014a)
- Special Status Botanical Surveys for the Arroyo Seco Canyon Project, dated January 20, 2014 (BonTerra Psomas 2014b)
- Native Tree Survey, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014c)
- Jurisdictional Delineation Report, Arroyo Seco Canyon Project, dated May 2014 (BonTerra Psomas 2014d)
- Jurisdictional Delineation Report, Arroyo Seco Canyon Project, dated April 2016 (BonTerra Psomas 2016a)
- Results of the 2013 Amphibian Surveys for the Arroyo Seco Canyon Project, dated February 4, 2014 (BonTerra Psomas 2014e)
- Results of the 2013 Least Bell's Vireo/Southwestern Willow Flycatcher Survey for the Arroyo Seco Canyon Project Dated September 2013 (BonTerra Consulting 2013)
- Results of the 2016 Least Bell's Vireo/Southwestern Willow Flycatcher Survey for the Arroyo Seco Canyon Project Dated August 2016 (BonTerra Psomas 2016b)
- Biological Technical Report for the Devil's Gate Reservoir Project Site in the City of Pasadena, Los Angeles County, California, dated November 2010, and appendices (Chambers Group 2010)
- IS/MND for Berkshire Creek Area Improvements, dated May 2019 (Psomas 2019a)
- Upper Arroyo Seco Habitat Enhancement Plan, dated July 2019 (Psomas 2019b)

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

4.2.2 Existing Conditions

The following discussion summarizes the existing biological resources present within the proposed Project area, and includes a description of the vegetation communities, special-status species, wildlife corridors and movement, and jurisdictional waters, including wetlands. For the purposes of analyzing existing biological resources conditions and the impacts resulting from the proposed Project, the study area has been defined as follows:

- The construction footprint of proposed improvements within Area 2 and Area 3, including a minimum 50-foot buffer around each component;
- A 100-foot wide study area along North Arroyo Boulevard[1] (i.e. Gabrielino Trail/Access Road), as measured 50-feet from the centerline; and,
- The fence line of the two staging areas (i.e. Screen Building and Behner Water Treatment Plant [WTP]).

Vegetation Communities, Land Covers, and Floral Diversity

Ten vegetation communities and land cover types are identified within the study area during the biological resource evaluation: California sagebrush–California buckwheat scrub–laurel sumac scrub association, coast live oak woodland alliance, white alder–California sycamore woodland association, California sycamore woodlands alliance, arroyo willow–mulefat scrub association, laurel sumac scrub alliance, California sagebrush–California buckwheat scrub alliance, urban/developed, disturbed habitat, and parks and ornamental plantings. These vegetation communities and land cover types are described below, their acreages tabulated in Table 4.2-1, Vegetation Types, and their spatial distributions depicted on Figure 4.2-1, Vegetation Types (Sheets 1 and 2).

Table 4.2-1. Vegetation Communities and Land Covers within the Study Area

Vegetation Community or Land Cover	CA Natural Community Codes[a]	Global-State Rarity Ranks[b]	Area 2 Study Area (acres)	Area 3 Study Area (acres)	Access Road Study Area (acres)	Screen Building Staging Area (acres)	Behner WTP Staging Area (acres)	Total Area (acres)
Native Vegetation Communities								
California sagebrush–California buckwheat–laurel sumac scrub association	32.110.06	G4/S4	0.05	5.93	4.42	—	0.02	10.41

[1] Also known as "Arroyo Seco Road".

Table 4.2-1. Vegetation Communities and Land Covers within the Study Area

Vegetation Community or Land Cover	CA Natural Community Codes[a]	Global-State Rarity Ranks[b]	Area 2 Study Area (acres)	Area 3 Study Area (acres)	Access Road Study Area (acres)	Screen Building Staging Area (acres)	Behner WTP Staging Area (acres)	Total Area (acres)
Coast live oak woodland alliance	71.060.00	G5/S4	0.03	—	3.01	0.06	—	3.1
White alder–California sycamore woodland association[c]	61.420.15	G3[c]	0.86	—	0.02	—	—	0.88
California sycamore woodlands alliance[c]	61.310.00	G3/S3[c]	0.24	—	—	—	—	0.24
Arroyo willow–mulefat scrub association	61.201.06	G4	—	0.10	—	—	—	0.10
Laurel sumac scrub alliance	45.455.00	G4/S4	—	0.17	—	—	—	0.17
California sagebrush–California buckwheat scrub alliance[c]	32.110.00	G4/S4	0.06	—	0.03	—	—	0.09
Non-Natural Land Covers								
Urban/developed	—	—	0.15	10.25	4.09	0.04	0.82	15.35
Disturbed habitat	—	—	—	6.83	—	—	—	6.83
Parks and ornamental plantings	—	—	—	—	0.22	—	—	0.22
Total	**—**	**—**	**1.40**	**23.27**	**11.78**	**0.09**	**0.84**	**37.38**

Source: Appendix D

Notes: Numbers may not sum due to rounding.

[a] Unique codes assigned to alliances and associations.

[b] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

[c] Sensitive community

California Sagebrush–California Buckwheat–Laurel Sumac Scrub Association (32.110.06)

The California sagebrush–California buckwheat–laurel sumac scrub association consists of a codominance of California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), and laurel sumac (*Malosma laurina*). The association is part of the California Sagebrush–California Buckwheat scrub alliance (32.110.00) but is not considered a sensitive natural community (CDFW 2019a). Laurel sumac is a large, large-leaved sclerophyllous shrub that grows to 16 feet in height. California sagebrush is a much-

branched shrub up to 8 feet tall with shallow roots. California buckwheat is a semi-woody, multi-branched shrub with woody, many-branched roots. Many additional shrubs may be present in the community and the herbaceous layer is seasonally present (CNPS 2019).

In the study area, California sagebrush–California buckwheat–laurel sumac scrub is found along North Arroyo Boulevard, on the slope adjacent to the eastern side of Area 3, and on the slopes above the riparian corridor within the canyon. Additional common shrubs found in the community in the study area include blue elderberry (*Sambucus nigra*), lemonade berry (*Rhus integrifolia*), deerweed (*Acmispon glaber*), white sage (*Salvia apiana*), black sage (*Salvia mellifera*), bush monkeyflower (*Diplacus aurantiacus*), hoary leaf ceanothus (*Ceanothus crassifolius*), and California coffee berry (*Frangula californica*). Common native herbaceous species included yellow pincushion (*Chaenactis glabriuscula*), small wirelettuce (*Stephanomeria exigua*), Clearwater cryptantha (*Cryptantha intermedia*), caterpillar phacelia (*Phacelia cicutaria*), and miniature lupine (*Lupinus bicolor*). Non-native species present include tree tobacco (*Nicotiana glauca*), Spanish broom (*Spartium junceum*), shortpod mustard (*Hirschfeldia incana*), and various grasses (*Avena* spp. and *Bromes* spp.).

Coast Live Oak Woodland Alliance (71.060.00)

Coast live oak woodland alliance is dominated by coast live oak (*Quercus agrifolia*), but it may include other tree species with less frequency. Coast live oak is a drought-resistant evergreen tree that grows to 80 feet in height. The canopy structure can be open to continuous and the shrub and herbaceous layers are sparse to intermittent. Coast live oak woodland are found on alluvial terraces, canyon bottoms, stream banks, slopes, flats. Soils are typically deep, sandy, or loamy with high organic matter (CNPS 2019).

In the study area, coast live oak woodland is found along Gabrielino Trail/Access Road and Arroyo Boulevard. Additional tree species found in the community include canyon live oak (*Quercus chrysolepis*), California sycamore (*Platanus racemosa*), and bigleaf maple (*Acer macrophyllum*). The shrub component is sparse and consists of species also found in California sagebrush–California buckwheat–laurel sumac scrub. The understory was also sparse and common native herbaceous species include poison oak (*Toxicodendron diversilobum*), American black nightshade (*Solanum americanum*), golden currant (*Ribes aureum*), miner's lettuce (*Claytonia perfoliata*), and California polypody (*Polypodium californicum*).

White Alder–California Sycamore Woodland Association (61.420.11)

White alder–California sycamore woodland association is dominated by white alder (*Alnus rhombifolia*) and California sycamore. The association is part of the white alder groves alliance (61.420.00). White alder is a deciduous hardwood that attains 115 feet in height. California sycamore is a fast-growing, deciduous tree that attains 80 feet in height and is well adapted to intermittent flooding conditions. The community typically occurs in inland foothills and lower montane zones, usually as narrow strips along perennial stream courses throughout cismontane California. It is well adapted to many flood regimes. White alder–California sycamore woodland is considered a sensitive vegetation community by CDFW (2019a).

In the study area, white alder–California sycamore woodland is found in Area 2. The understory was very sparse and native herbaceous species include California blackberry (*Rubus ursinus*), and scarlet monkeyflower (*Erythranthe cardinalis*).

California Sycamore Woodlands Alliance (61.310.00)

California sycamore woodlands alliance is dominated by California sycamore, but it may include other tree species with less frequency. California sycamore is a fast-growing, deciduous tree that attains 80 feet in height and is well adapted to intermittent flooding conditions. The canopy structure can be open to continuous, the shrub layer is sparse to continuous, and the herbaceous layers is variable. California sycamore woodlands are found in gullies, intermittent streams, springs, seeps, stream banks, and terraces adjacent to floodplains that are subject to high-intensity flooding. Soils are typically rocky or cobbly alluvium with permanent moisture at depth (CNPS 2019). California sycamore woodlands is considered a sensitive vegetation community by CDFW (CDFW 2019a).

In the study area, California sycamore woodlands are found within the Area 2 portion of the study area, on the west side of the Gabrielino Trail/Access Road and at the base of a steep slope. The understory consisted of poison oak and the non-native English ivy (*Hedera helix*).

Arroyo Willow–Mulefat Scrub Association (61.201.06)

Arroyo willow–mulefat scrub association is dominated by arroyo willow (*Salix lasiolepis*) and mulefat (*Baccharis salicifolia*). The association is part of the arroyo willow thickets alliance (61.201.00). Arroyo willow is a riparian tall shrub or tree that grows up to 26 feet in height. Mulefat is an evergreen shrub with willow-like leaves that have widely spaced, fine teeth and shiny upper surfaces. The canopy is open to continuous and the herbaceous layer is variable. The community is typically found on stream banks and benches, slope seeps, and stringers along drainages.

In the study area, arroyo willow–mulefat scrub association is located within the wash of the Arroyo Seco, adjacent to Area 3. Additional species present are similar to those found in the California sagebrush–California buckwheat–laurel sumac scrub association.

Laurel Sumac Scrub Alliance (45.455.00)

Laurel sumac scrub alliance is dominated by laurel sumac, but may include other shrub species. Laurel sumac is a large, large-leaved sclerophyllous shrub that grows to 16 feet in height. The canopy of Laurel sumac scrub is open or continuous and the herbaceous layer is sparse or grassy. The community is typically found on steep slopes and soils are shallow and fine textured (CNPS 2019).

In the study area, laurel sumac scrub is found in only one location on the western edge of Area 3. No other substantial shrub species are present. The understory is composed primarily of non-native vegetation that was dominated by shortpod mustard (*Hirschfeldia incana*) and various grasses (primarily *Avena* spp. and *Bromes* spp.).

California sagebrush–California Buckwheat Scrub Alliance (32.110.00)

California sagebrush–California buckwheat scrub alliance is dominated by California sagebrush and California buckwheat. California sagebrush is a much-branched shrub up to eight feet tall with shallow roots. California buckwheat is a semi-woody, multi-branched shrub with woody, many-branched roots. The herbaceous layer is seasonally present. The community is typically found on slopes that are steep and occurs on fine-textured soils developed from granitic or sedimentary rocks (CNPS 2019). California sagebrush–California buckwheat scrub is considered a sensitive vegetation community by CDFW (CDFW 2019a).

In the study area, California sagebrush–California buckwheat scrub is found on the eastern slope adjacent to Area 2. Other species present are similar to those found in the California sagebrush–California buckwheat–laurel sumac scrub association.

Urban/Developed

Urban/developed land refers to areas that have been constructed upon or disturbed so severely that native vegetation is no longer supported (Holland 1986). Developed land includes areas with permanent or semi-permanent structures, pavement or hardscape, landscaped areas, and areas with a large amount of debris or other materials (Holland 1986). Developed areas are generally graded and compacted, sometimes covered with gravel road base or built, and have little to no vegetation present. Developed land dominates the majority of the study area for the project and refers to those areas supporting manmade structures or features including paved/compacted roadways, driveways, parking lots, residences, and commercial or industrial buildings. These areas support limited natural ecological processes, native vegetation, or habitat for wildlife species and thus are not considered sensitive by local, state, and/or federal agencies.

In the study area, the urban/developed land is primarily found in Area 3 and the Gabrielino Trail/Access Road. Non-native herbaceous species are present scattered throughout. Common species include redstem stork's bill (*Erodium cicutarium*), puncturevine (*Tribulus terrestris*), and various grasses (primarily *Avena* spp. and *Bromes* spp.).

Disturbed Habitat

Disturbed habitat refers to areas that are not developed yet, lack vegetation, and generally are the result of severe or repeated mechanical perturbation. Areas mapped as disturbed land may include unpaved roads, trails, and graded areas. Vegetation in these areas, if present at all, is usually sparse and dominated by non-native weedy herbaceous species (Jones & Stokes 1993).

In the study area, disturbed habitat is found within Area 3 and is primarily associated with the existing spreading basins. Routine maintenance of the basins keeps a vegetation community from becoming established. Dominant species found in disturbed habitat are non-native and include prickly lettuce (*Lactuca serriola*), shortpod mustard, wild radish (*Raphanus sativa*), tocalote (*Centaurea melitensis*), and various grasses (*Avena* spp. and *Bromes* spp.). Common native species include Canadian horseweed (*Erigeron canadensis*), common sunflower (*Helianthus annuus*), and telegraph weed (*Heterotheca grandiflora*). Components of California sagebrush–California buckwheat scrub are present, but native shrub cover is present in low abundance and density (i.e., less than 20% cover within minimum mapping units of 0.1 acres or more).

Parks and Ornamental Plantings

Parks and ornamental plantings consist of introduced trees, shrubs, flowers, and turf grass. Ornamental landscaping occurs in greenbelts, parks, and horticultural plantings throughout the county (Jones & Stokes 1993). In the study area, ornamental landscaping occurs at the southern end of North Arroyo Boulevard.

Special-Status Plants

Prior to conducting focused surveys for special-status plants, Dudek performed an extensive desktop review of literature, existing documentation, and GIS data to evaluate the potential for special-status plant species to occur

within the proposed program area. Each special-status plant species was assigned a rating of "not expected," "low," "moderate," or "high" potential to occur based on relative location to known occurrences, vegetation community, soil, and elevation. Based on the results of the literature review and database searches, 44 special-status plant species were identified as having recorded occurrences within the region of the study area and were the focus of the focused surveys for special-status plants. Based upon the results of the habitat assessment and focused surveys, no plant species observed and none were determined to have either moderate or high potential to occur within the study area based on the focused plant surveys and the existing soils, vegetation communities (habitat) present, elevation range, and previous known locations based on the CNDDB (CDFW 2019b); CNPS Rare Plant Inventory of Rare, Threatened, and Endangered Plants of California (2019b); and Calflora (2019).

Special-Status Wildlife

Dudek performed an extensive desktop review of literature, existing documentation, and GIS data to evaluate the potential for special-status wildlife species to occur within the study area. Each special-status wildlife species was given a rating of not expected, low, medium, or high based on relative location to known occurrences, vegetation communities, soils, and elevation. Based on the results of the literature review and database searches, 41 special-status wildlife species were identified as having recorded occurrences within the study area. Of these, one species was observed (yellow warbler, *Setophaga petechia*), four others are assumed to be present based upon previous observation within or adjacent to the study area (California newt, *Taricha torosa*; two-striped gartersnake, *Thamnophis hammondii*; southern California legless lizard, *Anniella stebbinsi*; and coastal whiptail, *Aspidoscelis tigris stejnegeri*), and one species (hoary bat, *Lasiurus cinereus*) that has a moderate potential to occur within the study area based on the vegetation communities (habitat) present and previous known locations based on the CNDDB and USFWS occurrence data. Table 4.2-2 includes the special-status wildlife species that are present or have a moderate potential to occur. Appendix H of the BRTR (included as Appendix D of this Draft EIR) lists the 41 special-status wildlife species identified as occurring within the region of the study area and their potential to occur rating.

Table 4.2-2. Special-Status Wildlife Species Present or with Medium or High Potential to Occur within the Study Area

Scientific Name	Common Name	Status Federal/State	Habitat	Potential to Occur
Amphibians				
Taricha torosa	California newt	None/SSC	Wet forests, oak forests, chaparral, and rolling grassland	Previously observed and assumed to be present. The species was observed during surveys for the study area in 2013 in the Arroyo Seco, but was not observed in 2019. Suitable habitat is present within Area 2, and the species could be encountered on the Gabrielino Trail/Access Road to Area 2.

Table 4.2-2. Special-Status Wildlife Species Present or with Medium or High Potential to Occur within the Study Area

Scientific Name	Common Name	Status Federal/State	Habitat	Potential to Occur
Reptiles				
Anniella stebbinsi	Southern California legless lizard	None/SSC	Coastal dunes, stabilized dunes, beaches, dry washes, valley–foothill, chaparral, and scrubs; pine, oak, and riparian woodlands; associated with sparse vegetation and moist sandy or loose, loamy soils	Previously observed and assumed to be present. There are five recent (2017 and 2018) records from study area and adjacent areas of Hahamonga Park. Suitable habitat is present within Area 2 and Area 3, and it could be encountered on the Gabrielino Trail/Access Road to Area 2.
Aspidoscelis tigris stejnegeri	coastal whiptail	None/SSC	Hot and dry areas with sparse foliage, including chaparral, woodland, and riparian areas	Previously observed and assumed to be present. The species was observed during the 2013 surveys for the study area and suitable habitat for the species occurs throughout the study area and surrounding area.
Thamnophis hammondii	two-striped gartersnake	None/SSC	Streams, creeks, pools, streams with rocky beds, ponds, lakes, vernal pools	Previously observed and assumed to be present. The species was observed during the 2013 surveys for the study area and suitable habitat for the species occurs throughout the study area and surrounding area.
Birds				
Setophaga petechia (nesting)	yellow warbler	None/SSC	Riparian plant associations in close proximity to water; frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders	Present. Observed during the 2019 surveys in the study area near Area 2.

Table 4.2-2. Special-Status Wildlife Species Present or with Medium or High Potential to Occur within the Study Area

Scientific Name	Common Name	Status Federal/State	Habitat	Potential to Occur
Mammals				
Lasiurus cinereus	hoary bat	None/None	Forest, woodland riparian, and wetland habitats; also juniper scrub, riparian forest, and desert scrub in arid areas; generally roosts in dense foliage of medium to large trees; preferred sites are hidden from above, with few branches below, and have ground cover of low reflectivity; females and young tend to roost at higher sites in trees	Medium potential to occur. Suitable associated day/night roosting, maternity roosts, and foraging habitat for the individuals of the species occurs within the study area, and there are records of the species from other watersheds within the San Gabriel Mountains that have similar habitat to Arroyo Seco.

Source: Appendix D

Status: State

SSC = Species of Special Concern

Special-Status Species Protocol/Focused Survey Results

Based upon the results of the literature review and habitat assessment for special-status wildlife, protocol surveys were conducted for least Bell's vireo (*Vireo bellii pusillus*) and southwestern flycatcher (*Empidonax traillii extimus*) and focused surveys were conducted for arroyo toad (*Anaxyrus californicus*), California red-legged frog (*Rana draytonii*), arroyo chub (*Gila orcuttii*), and rainbow trout/southern steelhead (*Oncorhynchus mykiss irideus* pop. 10). None of the focal species were observed. Table 4.2-3, Protocol/Focused Survey Special-Status Wildlife Species, summarizes the species status, habitat, and potential to occur.

Table 4.2-3. Protocol/Focused Survey Special-Status Wildlife Species

Scientific Name	Common Name	Status Federal/State	Habitat	Potential to Occur
Fish				
Gila orcuttii	arroyo chub	None/SSC	Warm, fluctuating streams with slow-moving or backwater sections of warm to cool streams at depths >40 centimeters (16 inches); substrates of sand or mud	Focused surveys for the species were negative in 2019. Not expected to occur in the study area or upstream and downstream from the study area. Habitat for the species is marginal in the study area. The species is considered to be extirpated from the Arroyo Seco.
Oncorhynchus mykiss irideus pop. 10	steelhead – Southern California DPS	FE/None	Clean, clear, cool, well-oxygenated streams; needs relatively deep pools in migration and gravelly substrate to spawn	Focused surveys for the species were negative in 2019. Not expected to occur in the study area or downstream from the study area. Population within Arroyo Seco are from historic stocking of hatchery-raised rainbow trout by CDFW. Access to the study area from downstream waters is blocked by Devil's Gate Dam.
Amphibians				
Anaxyrus californicus	arroyo toad	FE/SSC	Semi-arid areas near washes, sandy riverbanks, riparian areas, palm oasis, Joshua tree, mixed chaparral and sagebrush; stream channels for breeding (typically third order); adjacent stream terraces and uplands for foraging and wintering	Focused surveys for the species were negative in 2019. Not expected to occur on the study area or upstream and downstream from the study area. Habitat for the species is marginal in the study area. Historically occurred at this location are considered extirpated due to the loss of habitat and the introduction of predators and competitors Protocol surveys for the species conducted in 2013 for the study area were negative.

Table 4.2-3. Protocol/Focused Survey Special-Status Wildlife Species

Scientific Name	Common Name	Status Federal/State	Habitat	Potential to Occur
Rana draytonii	California red-legged frog	FT/SSC	Lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby or emergent vegetation associated with deep, still or slow-moving water; uses adjacent uplands	Focused surveys for the species were negative in 2019. Not expected to occur on the study area or upstream and downstream from the study area. Habitat for the species is marginal in the study area. The species is considered extirpated from the system due to the loss of habitat and the introduction of predators and competitors. Protocol surveys for the species conducted in 2013 for the study area were negative.
Birds				
Empidonax traillii extimus (nesting)	southwestern willow flycatcher	FE/SE	Nests in dense riparian habitats along streams, reservoirs, or wetlands; uses variety of riparian and shrubland habitats during migration	Low potential to occur. Protocol surveys for the species were negative in 2019. Marginal nesting habitat for the species does occur in the study area.
Vireo bellii pusillus (nesting)	least Bell's vireo	FE/SE	Nests and forages in low, dense riparian thickets along water or along dry parts of intermittent streams; forages in riparian and adjacent shrubland late in nesting season	Low potential to occur. Protocol surveys for the species were negative in 2019. Suitable nesting habitat for the species does occur in the study area.

Source: Appendix D

Status:

Federal

FE = Federal Endangered

FT = Federal Threatened

State

SE = State Endangered

SSC = Species of Special Concern

Potential Jurisdictional Waters

With respect to USACE-jurisdictional waters of the U.S., including wetlands, the USACE makes the jurisdictional determination. The USACE issues two types of jurisdictional determinations: preliminary and approved.[2] Both types of determinations require a submittal of a formal jurisdiction delineation report. CDFW and RWQCB also may request a site visit to review the jurisdictional delineation and may potentially change the limits of delineation. Therefore, the jurisdiction determinations provided are preliminary and only identify the potential for jurisdictional areas to be affected by the Project in accordance with the CEQA thresholds.

As shown in Figure 4.2-2, Potential Jurisdictional Waters (Sheets 1 and 2), no wetlands were identified within the study area. Potential non-wetland jurisdictional waters identified in the study area include the Arroyo Seco, Millard Canyon Stream (a tributary to Arroyo Seco), and the spreading basins. The delineation of the study area identified a total of 0.79 acres of waters of the United States; 4.65 acres under RWQCB jurisdiction; and 6.44 acres under the jurisdiction of the CDFW present in the study area. Table 4.2-4, Potential Jurisdictional Waters Delineated within the Study Area, summarizes the acreage of jurisdictional waters by regulatory agency.

Table 4.2-4. Potential Jurisdictional Waters Delineated within the Study Area

Area	USACE Jurisdiction Non- Wetland Waters of the U.S. (acres)	RWQCB Jurisdiction (acres)	CDFW Jurisdiction (acres)
Area 2	0.25	0.25	0.79
Area 3	0.42	4.29	4.64
Gabrielino Trail/Access Road	0.11	0.11	1.01
Screen Building Staging Area	—	—	<0.01
Behner Treatment Plant Staging Area	—	—	—
Total	**0.79**	**4.66**	**6.44**

Source: Appendix D

Notes: Numbers may not sum due to rounding.

Non-wetland waters of the U.S. regulated by the USACE are drainage features that conduct water at some point during the year, evidenced by the presence of an OHWM, but do not satisfy the criteria to be considered a wetland (wetland soils and/or vegetation is absent). In the study area, there were areas of waters of the U.S. that had open water during the surveys and delineations. The limits of non-wetland waters of the U.S. are defined by the presence of the OHWM. Evidence of the OHWM in the survey area includes surface relief, scour lines, flowing water, and breaks in bank slopes.

[2] The USACE issues two types of JDs—preliminary and approved. A preliminary JD is an expedited process typically initiated at the time that a 404 permit is requested for impacts to federal jurisdictional waters; the preliminary JD is non-binding and does not involve USACE review. This process is used when the permittee does not wish to request a determination that some or all of the potentially jurisdictional waters on the Project site are isolated (under the Rapanos decision) or otherwise not subject to federal jurisdiction. An approved JD is requested through submittal of a JD report and the accompanying form. It requires USACE review of the report and application of the criteria used to request a non-federal JD.

The RWQCB jurisdictional boundaries are defined as those determined for the USACE under waters of the U.S. However, the RWQCB takes jurisdiction over both connected and isolated waters. Isolated features (those that do not have a direct connection to an already determined waters of the U.S.) are under the jurisdiction of the RWQCB, but not the USACE. The spreading basins in Area 3 are considered isolated waters since they have no downstream connection with the Arroyo Seco; therefore, they are under the jurisdiction of the RWQCB, but not the USACE.

The CDFW jurisdiction extends from the top of the bank to the top of the bank, except where there is adjacent riparian vegetation. CDFW jurisdictional areas include the Arroyo Seco and the spreading basins in Area 3. Riparian habitats in the study area under CDFW jurisdiction include white alder–California sycamore woodland Area 2 and along the norther portions of the Gabrielino Trail/Access Road and arroyo willow–mulefat scrub associated with the Arroyo Seco adjacent to Area 3. Additionally, the portions of the coast live oak woodlands and California sycamore woodlands in Area 2 and along the northern portions of the Gabrielino Trail/Access Road that contain the top of banks of the Arroyo Seco are also included under CDFW jurisdiction. The spreading basins in Area 3 are primarily devoid of native vegetation.

Wildlife Corridors and Habitat Linkages

Wildlife corridors are linear features that connect large patches of natural open space and provide avenues for dispersal or migration of animals and dispersal of plants (e.g., through wildlife vectors). Wildlife corridors contribute to population viability by assuring continual exchange of genes between populations, which helps maintain genetic diversity; providing access to adjacent habitat areas representing additional territory for foraging and mating; allowing for a greater carrying capacity; and providing routes for colonization of habitat lands following local population extinctions or habitat recovery from ecological catastrophes (i.e., the rescue effect).

Habitat linkages are small patches that join larger blocks of habitat and help reduce the adverse effects of habitat fragmentation. They serve as connections between habitat patches and help reduce the adverse effects of habitat fragmentation. Although individual animals may not move through a habitat linkage, the linkage is a potential route for gene flow and long-term dispersal. Habitat linkages may serve as both habitat and avenues of gene flow for small animals such as reptiles, amphibians, and rodents. Habitat linkages may be represented by continuous patches of habitat or by nearby habitat “islands” that function as stepping stones for dispersal and movement (especially for birds and flying insects). Wildlife corridors and habitat linkages provide avenues for dispersal or migration of animals that also contribute to population viability in several ways, including (1) ensuring continual exchange of genes between populations to aid in maintaining genetic diversity, (2) providing habitat for some species, (3) providing access to adjacent habitat areas representing additional territory for foraging and mating, (4) allowing for a greater carrying capacity, and (5) providing routes for colonization of habitat lands following local population extinctions or habitat recovery from ecological catastrophes.

The study area does not reside within any designated wildlife corridors and/or habitat linkages identified in the South Coast Missing Linkages analysis project (South Coast Wildlands 2008) or California Essential Habitat Connectivity project (Spencer et al. 2010). On a regional level, the study area and Hahamongna Watershed Park form an open space area that is located just south of the ANF, which has large, continuous natural habitats. Urban development is located to the east, west, and south of this area, which includes the artificial channelization of Arroyo Seco.

Terrestrial Species

Larger, urban-adapted terrestrial wildlife (e.g., coyotes [*Canis latrans*]) are expected to pass through the study area and Hahamongna Watershed Park to the urban environment, but the study area is not part of a regional corridor or habitat linkage between another large open space. On a local level, terrestrial wildlife would be expected to move between the ANF and the Hahamongna Watershed Park using the study area and the portions of the Arroyo Seco outside of the study area and downstream of the JPL bridge.

Aquatic Species

The Arroyo Seco historically provided habitat for seven species of native freshwater fish, namely Pacific brook lamprey (*Lampetra spp*.), Pacific lamprey (*Entosphenus tridentata*), rainbow trout/steelhead, arroyo chub, Santa Ana speckled dace (*Rhinichthys osculus*), Santa Ana sucker (*Catostomus santaanae*), and unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*). All occurred in Arroyo Seco and were recorded by Culver and Hubbs (1917). None, except rainbow trout, have been recorded as present in Arroyo Seco upstream of Devil's Gate Dam for at least 50 years (Swift and Seigel 1993; Moyle 2002) and probably much longer. Rainbow trout that have been observed in upper Arroyo Seco are believed to be present at least partly due to fish planting over the years. Rainbow trout were present in upper Arroyo Seco (upstream of the diversion) prior to the 2009 Station Fire but have not been detected there since (Scauzillo 2017).

For potential aquatic species, the study area is in between two impassable barriers: Devil's Gate Dam downstream and Brown Mountain Dam upstream, which prohibits regional movement of fish in the Arroyo Seco. The majority of the Arroyo Seco Channel and Los Angeles River downstream of the Devil's Gate Dam consists of a concrete-lined channel and the majority of it does not provide suitable habitat for fish or other sensitive species (Chambers Group 2013). On a local level, the portion of the Arroyo Seco between the two dams, including Area 2, does provide habitat for fish, and if occupied by fish (no fish were detected during the focused fish survey conducted in 2019), it would be expected that there would be local movement between the two dams; however, the current diversion structure in Area 2, an abandoned stream gage at Bridge 3, and several concrete structures upstream of Area 2 would inhibit upstream movement.

Semi-Aquatic Species

Semi-aquatic species (e.g., western toad [*Anaxyrus boreas*], California treefrog [*Pseudacris cadaverina*], Baja California treefrog [*Pseudacris hypochondriaca*], and California newts) can move overland, traveling in the uplands in upstream and downstream directions, as juveniles and adults after an aquatic larval phase. Downstream drift due to the stream current is the primary movement during the larval stage of amphibians. The existing artificial barriers within the study area are not expected to impede movement for these amphibian species. During normal diversion operations in the current conditions, when the weir is fully raised, it is expected that adult and juvenile amphibians use overland routes on the eastern and western slopes to move both up and downstream.

Protected Trees

A total of 93 trees were inventoried within Area 2 and Area 3 of the Study Area, of which 49 are in Area 2, and 44 in Area 3. Figure 4.2-3, Protected Trees (Sheet 1 and 2), presents the location of the individual trees mapped and assessed for the proposed Project. Overall, the trees exhibit growth and structural conditions that are typical of

their location in a native riparian watershed setting prone to drought and wildfires. The trees include various trunk and branch maladies and health and structural conditions. As presented in Appendix D of this Draft EIR, the Protected Tree Report, 34% of the individually mapped trees (32 trees) exhibit good health; 64% (59 trees) are in fair health; 2% (2 trees) are in poor health. Structurally, 5% (5 trees) of the individually mapped trees are considered to exhibit good structure, 88% (82 trees) exhibit fair structure, 7% (6 trees) poor structure. The trees in good condition exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Trees in fair condition are typical, with few maladies but declining vigor. Trees in poor condition exhibit declining vigor, unhealthy foliage, poor branch structure, and excessive lean. No pests or pathogens were observed on site.

4.2.3 Relevant Plans, Policies, and Ordinances

Federal

Federal Endangered Species Act

The federal Endangered Species Act (FESA) of 1973 (16 USC 1531 et seq.), as amended, is administered by the U.S. Fish and Wildlife Service (USFWS) for most plant and animal species and by the National Oceanic and Atmospheric Administration National Marine Fisheries Service for certain marine species. This legislation is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species, thus preventing the extinction of plants and wildlife. The FESA defines an endangered species as "any species that is in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as "any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Under FESA, it is unlawful to "take" any listed species, and "take" is defined as, "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

FESA allows for the issuance of incidental take permits for listed species under Section 7, which is generally available for projects that also require other federal agency permits or other approvals, and under Section 10, which provides for the approval of habitat conservation plans on private property without any other federal agency involvement.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC 703 et seq.), as amended, prohibits the intentional take of any migratory bird or any part, nest, or eggs of any such bird. Under the Migratory Bird Treaty Act, "take" is defined as pursuing, hunting, shooting, capturing, collecting, or killing, or attempting to do so. In December 2017, Department of the Interior Principal Deputy Solicitor Jorjani issued a memorandum (M-37050) that interprets the Migratory Bird Treaty Act's "take" prohibition to apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs. Unintentional or accidental take is not prohibited (DOI 2017). Additionally, Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires that any project with federal involvement address impacts of federal actions on migratory birds with the purpose of promoting conservation of migratory bird populations (66 FR 3853–3856). The Executive Order requires federal agencies to work with USFWS to develop a memorandum of understanding. USFWS reviews actions that might affect these species.

Clean Water Act

The Clean Water Act provides guidance for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Section 401 requires a project operator for a federal license or permit that allows activities resulting in a discharge to waters of the United States to obtain state certification, thereby ensuring that the discharge will comply with provisions of the Clean Water Act. The RWQCBs administer the certification program in California. Section 402 establishes a permitting system for the discharge of any pollutant (except dredged or fill material) into waters of the United States. Section 404 establishes a permit program administered by USACE that regulates the discharge of dredged or fill material into waters of the United States, including wetlands. USACE implementing regulations are found at 33 CFR 320 and 330. Guidelines for implementation are referred to as the Section 404(b)(1) Guidelines, which were developed by the U.S. Environmental Protection Agency in conjunction with USACE (40 CFR 230). The guidelines allow the discharge of dredged or fill material into the aquatic system only if there is no practicable alternative that would have less adverse impacts.

Wetlands and Other Waters of the United States

Aquatic resources, including riparian areas, wetlands, and certain aquatic vegetation communities, are considered sensitive biological resources and can fall under the jurisdiction of several regulatory agencies. USACE exerts jurisdiction over waters of the United States, including all waters that are subject to the ebb and flow of the tide; wetlands and other waters such as lakes, rivers, streams (including intermittent or ephemeral streams), mudflats, sandflats, sloughs, prairie potholes, vernal pools, wet meadows, playa lakes, or natural ponds; and tributaries of the above features.

The extent of waters of the United States is generally defined as that portion that falls within the limits of an ordinary high-water mark (OHWM). Typically, the OHWM corresponds to the water surface elevation of a 2-year flood event (USACE 2008). In addition, waters of the United States may include wetlands, including swamps, bogs, seasonal wetlands, seeps, marshes, and similar areas, defined by USACE as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3[b]; 40 CFR 230.3[t]). Indicators of three wetland parameters (i.e., hydric soils, hydrophytic vegetation, and wetlands hydrology), as determined by field investigation, must be present for a site to be classified as a wetland by USACE (USACE 1987).

State/Regional

California Endangered Species Act

The California Endangered Species Act (CESA) (California Fish and Game Code, Section 2050-2068) provides protection and prohibits the take of plant, fish, and wildlife species listed by the State of California. Unlike FESA, under CESA state-listed plants have the same degree of protection as wildlife, but insects and other invertebrates may not be listed. Take is defined similarly to FESA and is prohibited for both listed and candidate species. Take authorization may be obtained by the project applicant from CDFW under CESA Section 2081, which allows take of a listed species for educational, scientific, or management purposes. In this case, private developers consult with CDFW to develop a set of measures and standards for managing the listed species, including full mitigation for impacts, funding of implementation, and monitoring of mitigation measures.

California Fish and Game Code

Fully Protected Species

Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code outline protection for fully protected species of mammals, birds, reptiles, amphibians, and fish. Species that are fully protected by these sections may not be taken or possessed at any time. CDFW cannot issue permits or licenses that authorize the "take" of any fully protected species, except under certain circumstances, such as scientific research and live capture and relocation of such species pursuant to a permit for the protection of livestock. Furthermore, it is the responsibility of the CDFW to maintain viable populations of all native species. Toward that end, the CDFW has designated certain vertebrate species as Species of Special Concern (SSC), because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.

Section 5901

Section 5901 makes it unlawful to construct or maintain any device or contrivance that prevents, impedes, or tends to prevent or impede, the passing of fish up and down stream. Fish are defined in Section 45 as a wild fish, mollusk, crustacean, invertebrate, amphibian, or part, spawn, or ovum of any of those animals.

Section 5937

Section 5937 requires that the owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam. During the minimum flow of water in any river or stream, permission may be granted by the department to the owner of any dam to allow sufficient water to pass through a culvert, waste gate, or over or around the dam, to keep in good condition any fish that may be planted or exist below the dam, when, in the judgment of the department, it is impracticable or detrimental to the owner to pass the water through the fishway.

Section 1602

Under Section 1602 of the California Fish and Game Code, a project operator is required to notify CDFW prior to any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. Pursuant to the code, a "stream" is defined as a body of water that flows at least periodically, or intermittently, through a bed or channel having banks and supporting fish or other aquatic life. Based on this definition, a watercourse with surface or subsurface flows that supports or has supported riparian vegetation is a stream and is subject to CDFW jurisdiction. Altered or artificial watercourses valuable to fish and wildlife are subject to CDFW jurisdiction. CDFW also has jurisdiction over dry washes that carry water during storm events.

Preliminary notification and project review generally occur during the environmental process. When an existing fish or wildlife resource may be substantially adversely affected, CDFW is required to propose reasonable project changes to protect the resource. These modifications are formalized in a Streambed Alteration Agreement, which becomes part of the plans, specifications, and bid documents for the project.

California Native Plant Protection Act

The Native Plant Protection Act of 1977 (see Section 1900 et seq. of the California Fish and Game Code) directed CDFW to carry out the Legislature's intent to "preserve, protect and enhance rare and endangered plants in this State." The Native Plant Protection Act gave the California Fish and Game Commission the power to designate native plants as "endangered" or "rare" and protect endangered and rare plants from take. CESA expanded on the original Native Plant Protection Act and enhanced legal protection for plants, but the Native Plant Protection Act remains part of the California Fish and Game Code. To align with federal regulations, CESA created the categories of "threatened" and "endangered" species. It converted all "rare" animals into the act as threatened species but did not do so for rare plants. Thus, there are three listing categories for plants in California: rare, threatened, and endangered. Because rare plants are not included in CESA, mitigation measures for impacts to rare plants are specified in a formal agreement between CDFW and the project proponent.

Nesting Birds

Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nests or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. Section 3503.5 protects all birds of prey (raptors) and their eggs and nests. Section 3511 states that fully protected birds or parts thereof may not be taken or possessed at any time. Section 3513 states that it is unlawful to take or possess any migratory non-game bird as designated in the MBTA.

Local

Municipal Code Chapter 8.52.020 – City Trees and Tree Protection

For this proposed Project, trees subject to City permit requirements include those defined by municipal code Chapter 8.52.020 (City of Pasadena 2010), as follows:

- "Public tree" means a tree located in a place or area under ownership or control of the city including but without limitation streets, parkways, open space, parkland and including city owned property under the operational control of another entity by virtue of a lease, license, operating or other agreement.
- "Protected tree" means a native, specimen, landmark, landmark-eligible, mature (except for the trees in RS or RM-12 zones), or public tree.

All surveyed trees are located in a City owned property, and therefore meet the definition of a "Public tree", which are considered a "Protected tree" by the City Municipal Code.

Tree replacement ratios are determined based on the size of the tree to be removed (i.e., larger trees require a higher replacement ratio). Tree replacement guidelines as specified in the City Tree Ordinance are provided in Table 4.2-5, City of Pasadena Protected Tree Replacement Matrix.

Table 4.2-5. City of Pasadena Protected Tree Replacement Matrix

Trunk Diameter of Removed Tree	Replacement Ratio	Container Replacement Size
8.0–12.9 inches	6:1	15 gallons
	3:1	24-inch box
13.0–18.9 inches	8:1	15 gallons
	4:1	24-inch box
	2:1	36-inch box
19.0–36.9 inches	8:1	24-inch box
	4:1	36-inch box
>37 inches	12:1	24-inch box
	8:1	36-inch box

Source: City of Pasadena 2010

4.2.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to biological resources are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to Biological Resources would occur if the project would:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service.

c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

Through the analysis in the Initial Study (see Appendix A-1), it was determined that the proposed Project would not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan. (i.e., Threshold f).

f) Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Accordingly, this issue is not further analyzed in the Draft EIR and the pertinent impact analysis can be reviewed in the Initial Study.

4.2.5 Environmental Impacts Analysis

Threshold 4.2a **Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?**

Short-Term Construction Impacts

One special-status amphibian (California newt) and three reptiles (two-striped gartersnake, Southern California legless lizard, and coastal whiptail) have occurred in the study area. These species are all designated as CDFW SSC. Due to the presence of suitable habitat, and/or documented occurrences for these species within the vicinity of the Project site, there is potential for these species to occur on site. If these species are determined to occur on the Project site prior to construction, Project-related impacts could be considered significant if the impact causes the greater population of either species to drop below self-sustaining levels. These species are vulnerable to mortality or injury if struck by moving vehicles or equipment if present on-site during construction, and also during vegetation and ground disturbing activities associated because they tend to be cryptic, slow moving, and below ground or under rocks or debris during cooler periods.

It is unlikely that short-term construction activities could cause the greater population of these special-status species to drop below self-sustaining levels due to the relatively small area of construction activity and the short-term nature of the construction schedule. However, in order to ensure that potential impacts to special status species are reduced to the extent feasible, MM-BIO-1 requires the preparation of a Pre-Construction Survey and Relocation Plan, which would set forth protocols and procedures for surveying, identifying, and relocating wildlife that may be within the construction impact area. Project implementation of MM-BIO-1 would reduce potential direct impacts to special-status reptile wildlife (i.e. California newt, two-striped gartersnake, Southern California legless lizard, and coastal whiptail) to a level less than significant.

One special-status bird species, the yellow warbler has a moderate potential to nest and forage within the open shrublands throughout the Project site. This species is a CDFW SSC and there is a potential for this species to nest and/or forage within or immediately adjacent to the construction and staging areas. Project-related direct impacts would occur if construction would result in direct or indirect impacts to nesting and foraging habitat for yellow warbler. Additionally, the trees and shrubs within the Project site provides suitable nesting habitat for bird species and/or raptors protected under the Migratory Bird Treaty Act (MBTA; 16 USC 703-712) and California Fish and Game Code Sections 3503.5, 3503, and 3513. Trimming, pruning, and/or removal of trees and shrubs would occur as a result of construction activities, and could disrupt breeding activity if nesting birds/raptors are present.

Therefore, the Project could result in direct impacts to nesting birds (i.e., direct impacts to individuals, active nests, eggs, or young), particularly during the general nesting season of February 1 through August 31. Construction activities that could result in direct impacts to nesting birds include vegetation and tree removal during grading activities. Project implementation of MM-BIO-2 (i.e., seasonal recommendations, pre-construction survey, avoidance buffers, and monitoring) would reduce potential direct impacts to a less-than-significant level.

One special-status bat species (hoary bat) has a moderate potential for day/night roosting, maternity roosts, and foraging habitat within the study area. If this species is determined to occur on the Project site prior to construction, it is highly unlikely that short-term construction activities could cause the greater population of this special-status species to drop below self-sustaining levels due to the relatively small area of construction activity and the short-term nature of the construction schedule. No direct temporary impacts would occur; however, because habitat loss and/or mortality or injury to individual species is a reasonable possibility, direct permanent impacts would be considered potentially significant. Project implementation of MM-BIO-3 (i.e., seasonal recommendations, pre-construction survey, avoidance buffers, and monitoring) would reduce potential direct impacts to a less-than-significant level. Direct impacts to day roosts occupied by individual special-status bat species would be less than significant as the impact would not be expected to reduce populations to below self-sustaining levels.

Long-Term Operational Impacts

City personnel would continue to provide maintenance of the diversion and intake structures in Area 2 as occurs under existing conditions. When necessary, cleaning of the spreading basins in Area 3 would continue to be accomplished by mechanically scraping the top layer of soil using front-end loaders, graders, or scrapers. Regular maintenance of these areas to maintain the function of each facility will limit the growth of vegetation that could provide habitat for special-status species. As such, no long-term operational impacts are expected to special-status species.

Threshold 4.2b Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

Short-Term Construction Impacts

The proposed Project would have direct permanent impacts to two CDFW sensitive vegetation communities—white alder-California sycamore woodland association (0.39 acres) and California sycamore woodlands alliance (0.01 acres)—due to the construction of the diversion and intake replacement in Area 2. The Project would have direct temporary impacts to two CDFW sensitive vegetation communities—white alder-California sycamore woodland association (0.11 acres) and California sycamore woodlands alliance (0.01 acres)—due to the construction of the diversion and intake replacement in Area 2. This is due to potential encroachment into the dripline of the woodland without removal of the trees. Direct permanent and temporary impacts to sensitive vegetation communities within the study area are summarized in Table 4.2-5 and illustrated on Figure 4.2-4, Impacts to Vegetation Types (Sheets 1 and 2).

Table 4.2-5. Permanent and Temporary Direct Impacts to Sensitive Vegetation Communities

Vegetation Community	Direct Permanent Impacts (acres)	Direct Temporary Impacts (acres)	Not Impacted (acres)	Total (acres)
White alder–California sycamore woodland association[a]	0.39	0.11	0.38	0.88
California sycamore woodlands alliance[a]	0.01	0.01	0.23	0.24

Table 4.2-5. Permanent and Temporary Direct Impacts to Sensitive Vegetation Communities

Vegetation Community	Direct Permanent Impacts (acres)	Direct Temporary Impacts (acres)	Not Impacted (acres)	Total (acres)
Arroyo willow–mulefat scrub association[a]	—	—	0.10	0.10
California sagebrush–California buckwheat scrub alliance[a]	—	—	0.09	0.09
Grand Total	**0.39**	**0.12**	**0.81**	**1.31**

Source: Appendix D

Note: Numbers may not sum due to rounding.

[a] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

The white alder–California sycamore woodland and California sycamore woodlands alliance vegetation communities are considered sensitive by CDFW due to their relative rarity and therefore, the loss of these vegetation communities (both permanent and temporary) would be considered significant, absent mitigation. Project implementation of MM-BIO-4 (i.e., compensation for direct impacts to sensitive vegetation communities) would reduce potential direct impacts to a less-than-significant level.

Potential short-term or temporary indirect impacts to sensitive vegetation communities in the study area would primarily result from construction activities and include impacts related to or resulting from the generation of fugitive dust, increased human activity, and the introduction of pollutants from construction equipment. Excessive dust can decrease the vigor and productivity of vegetation through effects on light, penetration, photosynthesis, respiration, transpiration, increased penetration of phytotoxic gaseous pollutants, and increased incidence of pests and diseases. Erosion and chemical pollution (releases of fuel, oil, lubricants, paints, release agents, and other project-related materials) may affect sensitive vegetation communities. The use of chemical pollutants can decrease the number of plant pollinators, increase the existence of non-native plants, and cause damage to and destruction of native plants. These potential short-term, construction-related indirect impacts could affect the sensitive vegetation communities in the study area. Potential construction-related indirect impacts to sensitive vegetation communities would be less than significant with the implementation of MM-BIO-5 (i.e., demarcation of disturbance limits) and MM-BIO-6 (biological monitoring during construction).

Other vegetation communities and land cover types (California sagebrush–California buckwheat–laurel sumac scrub association, laurel sumac scrub alliance, urban/developed, and disturbed habitat) are not considered sensitive by CDFW because they are relatively common; therefore, the loss of these additional vegetation communities (both permanent and temporary) would be less than significant.

Long-Term Operational Impacts

The current operation of the diversion weir and intake allows for moderate flows in the stream to be diverted during the wet season; however, operations bypass the diversion of surface water during storm events where flows are generally greater than approximately 25 cfs to prevent excessive sediment from entering the spreading basins. During dry summer months, surface flows in the upper Arroyo Seco are sufficiently low to allow the City to divert virtually all surface flows in the stream.

Psomas conducted an analysis (Psomas 2018) (provided as Appendix J, Arroyo Seco Canyon Diversions Biological Impacts Memorandum [Memorandum] to the BRTR, which is Appendix D of this Draft EIR), analyzed the indirect Project impacts to downstream habitats due to the increase in the amount of water diverted into the spreading basins. The study took the conservative approach of analyzing project impacts by comparing it to a "without diversion" scenario, rather than the current diversion operations. This approach reflects the maximum possible change from existing conditions. This Memorandum included a hydraulics, sediment transport, and groundwater analysis, which provided the baseline for an analysis of potential ecological effects of flow diversions on downstream willow habitat (potential habitat occupied by least Bell's vireo) conducted by the Southern California Coastal Water Research Project (SCCWRP).

The study area for the analysis includes a portion of the upper Arroyo Seco from Devil's Gate Dam extending upstream to Area 2 (see Appendix D of this Draft EIR in Appendix J: Exhibit 1, study area). As the Arroyo Seco flows in a southerly direction past the existing diversion weir and past the JPL Bridge, the channel morphology changes from a narrow canyon to a wide alluvial plain. During high flow periods, surface flows can reach the Devil's Gate Reservoir, but at other times, water quickly infiltrates into the sandy sediment at the uppermost portion of the Reservoir. Therefore, a lack of observed surface water doesn't necessarily correlate to insufficient moisture within the substrate for the riparian vegetation in the Reservoir (Psomas 2018).

During the wet periods or during episodic storms, surface water will flow from the upper Arroyo Seco into the Reservoir. Ongoing surface flows from the Arroyo Seco will result in standing water in the Reservoir. A review of historic aerial photos from Google Earth shows at least some surface water in the lower portion of the Reservoir in May 2003, January 2005, November 2005, March 2006, October 2007, January 2008, November 2009, and March 2011. Surface water is not observed in aerial photos subsequent to 2011, which corresponds to the severe drought conditions experienced in California from 2011 through 2016 (Psomas 2018).

The dominant vegetation community in the Devil's Gate Reservoir is Black Willow Series (Sawyer et al. 2009), in which Goodding's black willow (Salix gooddingii) is the dominant species (Chambers Group 2010). This vegetation type occurs throughout the lower portion of Devil's Gate Reservoir, correlated with the wettest conditions observed in an aerial photo analysis conducted. In general, the spatial distribution of vegetation in Psomas' study area is correlated to the hydrology of the area. Modest dry season surface flows occur immediately downstream of the diversion weir, which encourages establishment of facultative wetland species such as California sycamore and white alder. As less water is available further downstream in the dry season, the vegetation is dominated by upland-riparian transitional species, such as mule fat and coast live oak. The greatest density and extent of facultative wetland species such as Goodding's black willow occurs in the downstream portion of Devil's Gate Reservoir, where Devil's Gate Dam blocks surface and subsurface flows, resulting in more available water to vegetation behind the Dam (Psomas 2018).

Hydraulics, Sediment Transport, and Groundwater Analysis

A Hydraulics, Sediment Transport, and Groundwater Analysis (Hydraulics Analysis) was prepared for the study area and is included as Appendix F to this Draft EIR. The purpose of the Hydraulics Analysis was to evaluate the relative impact of the City's proposed management of diversions from the Arroyo Seco on riparian resources located downstream of the diversion structure. Hydraulic modeling assumed 100 percent efficiency in diversions in order to reflect the maximum reduced flow and thereby the maximum potential downstream habitat impacts (Psomas 2018).

The maximum depth of the pooled water within the Reservoir pool for the with-diversion scenario is reduced by approximately 1.3 feet in a dry year in comparison to the without-diversion scenario (Appendix F, Exhibit 7). A review of Exhibit 5 of Appendix F indicates that the cause of the decrease in maximum depth is likely due to the fact that the total runoff for the representative dry year without-diversions is approximately 2,480 acre-feet (af), while the hydrograph with diversions for the representative dry year is approximately 550 af. Therefore, the difference in runoff volume accounts for the difference in maximum depths shown in Exhibit 7 of the Hydraulics Analysis. It is important to note that the area of inundation is approximately the same between the two scenarios owing largely to the shape of the Reservoir upstream of the Dam (Psomas 2018).

The maximum Reservoir pool water surface elevation for the representative average year without-diversion and representative average year with-diversions are approximately equal, with the WSE (water surface elevation) = 1,035 feet (Appendix F, Exhibit 9). In these scenarios, the factor that controls the depth and WSE is the operation of Devil's Gate Dam. Despite the same maximum depths, the with-diversion scenario has greater inundation durations at the Reservoir fringes because the depth reaches the operational curve elevation more slowly than does the without-diversion scenario (Psomas 2018).

Like the representative average year scenarios, the representative wet year maximum depth is the same in the with- and the without-diversion scenarios because the Dam operational curve is controlling the maximum depth in the Reservoir, approximately WSE=1,035 feet (Appendix F, Exhibit 11). Like the average year scenarios, the with-diversion scenario has greater inundation durations at the Reservoir fringes because the with-diversion scenario Reservoir depth reaches the operational curve elevation more slowly than does the without-diversion scenario (Psomas 2018).

A review of regional groundwater data indicates that the distance to groundwater within the Reservoir area is substantially greater than the depth of the tree root zones and consequently would not be expected to have an effect on rootzones of the riparian habitat within the Reservoir. Studies associated with the Devil's Gate Sediment Removal Project support the reported groundwater elevation with measured average depth to ground water of over 100 feet and depth to a subsection of a perched aquifer greater than 20 feet (Psomas 2018).

Within the upstream section of Psomas' study area, between the diversion point and the JPL bridge, the model showed little or no measurable change in hydraulic conditions (such as depth, velocity, inundation area, and shear) with project diversions. However, factors influencing the hydraulics are markedly different in this high gradient mountainous section versus the low gradient downstream areas. The stream is much narrower and does not expand with increasing flows due to the constrictions of the hardened canyon walls and granite boulders in the mountainous section. Increasing volume of water from storms have a greater effect on flow velocity as water exits the mountains and less of an effect on increasing area of pooling or the duration of pooling. This is consistent with the model findings showing little change with project diversions in the upstream segment (Psomas 2018).

The upstream area also behaves differently during low flows. The hydraulic model assumptions limit the lowest modeled flow to 1 cfs. Therefore, flows below 1 cfs are not included in the modeling analysis, but are considered here. During times of low flow, the role of groundwater is substantially different between the low gradient downstream area and the high gradient upstream area. Within the upstream section of the Arroyo Seco, subsurface water (i.e. groundwater) is very shallow and often just below the streambed surface, even in areas that appear dry on the surface. Due to the steep gradient, this groundwater moves downstream through the substrate as a subsurface flow beneath the streambed. Furthermore, this section of the Arroyo Seco is considered a "gaining"

stream indicating that surface flows increase moving downstream due to upwelling of subsurface flows. Upwelling occurs when subsurface flows move around less permeable sections of substrate and reach the surface to become surface pools or flows for segments of the stream and may penetrate more permeable substrate further downstream and return to subsurface flow or continue downstream as surface flow for long distances. Evidence of the intermingling of surface and subsurface flowing can often be seen from just below the diversion point downstream to an A-frame bridge (Bridge No. 3) where subsurface upwelling occurs at low points in the stream (Psomas 2018).

Groundwater within the low gradient portion of the Psomas' study area, downstream of the JPL bridge, is very deep. The extensive alluvial deposits allow water to readily migrate through and downward until reaching the water table approximately 100 feet below the surface. Low flows that make it downstream and past the JPL bridge are only visible on the surface for short distances before penetrating the sediment to become subsurface flow and quickly dropping vertically. Consequently, low flow in the lower study area is not expected to be influenced by groundwater to any measurable degree due to the distance between surface flows and the groundwater table (Psomas 2018).

Ecological Modeling Study

The Arroyo Seco Canyon Diversions Biological Impacts Memorandum included an Ecological Modeling Study that assessed the ecological effects of flow diversions based on modeled relationships between hydraulic changes described in the Hydraulic Analysis and the probability that the resultant physical conditions can support southern willow riparian habitat conditions conducive to occupancy by least Bell's vireo.

All hydraulic variables tested showed significant statistical differences (p value <0.001) in willow occurrence between predicted future conditions and historic flow characteristics. However, given the small sample size of vegetation polygons, inherent to the relatively small size of the Project (see Appendix J: Exhibit 2, Excavation Limits of the LACDPW Devil's Gate Sediment Removal Project), and the high number of hydraulic observations (over 18,000), it is believed the significance estimates may be overestimated. The significant overlap in distributions of occurrence and the large AIC3 value substantiate this suspicion (Psomas 2018).

As described in the Ecological Modeling Study, the model predicts a negative correlation between increasing velocity and willow habitat presence. Expected changes in velocity are illustrated in Exhibits 3a-3f, Modeled Change in Maximum Velocity Due to Proposed Project, of the Memorandum (Appendix D of this Draft EIR, Appendix J). This is because willow habitat favors areas where water infiltrates the soil; higher velocities mean lower infiltration, and thus do not favor willow presence. A similar result is predicted for shear stress, so that as shear stress increases, the model predicts a decreased probability in willow occurrence. Depth shows an increase in willow probability as water depth increases. Due to implementation of the Project, willows may increase in the channel (narrow linear flow upstream of the Reservoir pool) and decrease in the Reservoir pool as water recedes and depth decreases. This translates into an increase in the probability of willow occurrence in areas where occurrence was high and a decrease in the probability of willow occurrence where the occurrence was low. The most pronounced decrease

[3] The Akaike Information Criterion [AIC] is an estimator of the relative quality of statistical models and provides a measure of the relative information not well represented by the model. It represents the balance between goodness of fit and model complexity (Psomas 2018).

predicted is a 13.8% decline in probability of occurrence in the lower basin, near the spillway, associated with a slight decrease in depth and duration of inundation. This is offset by a 6.6% increase in probability of occurrence at the margins of the basin, also associated with change in depth and duration of inundation. This gives a net change in the probability of willow occurrence of less than 10% (Psomas 2018).

Impact of Diversions on Vegetation/Habitat

Changes in the hydrological regime of stream systems have been shown to result in changes in vegetation structure and composition. The shifts in vegetation related to changes in hydrology is based upon: (1) the degree of fluctuations in groundwater levels; (2) the depth of root systems of existing vegetation; and (3) the resulting potential of invasive species establishment to displace native vegetation. The concept behind this relationship is that minor fluctuations in groundwater levels will not affect the presence of phreatophytic vegetation if the root systems of those plants are deep enough to access water in the phreatic zone (zone of saturation) or the capillary fringe (zone above the saturation area where water fills soil pore spaces through capillary motion and is available for plant uptake). However, if groundwater levels drop below the maximum depth of the root zone for a sufficient amount of time, then those plants are susceptible to be displaced by other species. Factors that affect the depth of roots include the genetic ability of each plant to produce deep roots, the soil type and the depth to which gas exchange is possible, and available water and nutrients. Additionally, root depth has been shown to be affected by fluctuations in the water table as significant fluctuations encourage species to elongate deep roots to access waters (Psomas 2018).

Therefore, the principal question is whether the proposed Project's diversions would cause an increase in the depth to groundwater that is available for willows and cottonwoods. As shown in Exhibit 4, Baseline Hydrology Example, of the Memorandum (see Appendix D of this Draft EIR, Appendix J), changes to groundwater levels should not extend beyond the maximum depths to groundwater within the root zone of phreatophytic species to maintain their presence (Psomas 2018).

Willow habitat in the Reservoir is characterized by persistent coverage of mature willow trees, though aerial photo analysis indicates that the extent of willow coverage varies over time, likely in response to annual variability in precipitation and inflows from the upper Arroyo Seco. Little change is observed in the lowest portions of the Reservoir (downstream end) while coverage appears to vary slightly at the upper portions of the Reservoir. Because the accumulated sediment in the Reservoir is mainly comprised of sandy material, the willow tree rhizosphere likely reaches the maximum root depth of approximately seven feet below grade. The lack of a persistent herbaceous understory suggests that the depth to groundwater for much of the year is at least two feet, since herbaceous species roots generally extend less than two feet below grade. Therefore, the depth to groundwater likely fluctuates in the range of two to seven feet in the lower end of the Reservoir. It should be noted that the groundwater at these elevations does not represent the upper limit of the groundwater aquifer, which occurs approximately 300 feet below the surface in the Reservoir riparian areas as described previously. Based on topography, the shallower groundwater is expected to result from subsurface flows from the San Gabriel Mountains, which flow south off the mountains and on to the Montrose/La Canada valley floor then to the east flowing downhill, towards the Arroyo Seco, until eventually reaching the deposited sediments within the Reservoir (Psomas 2018).

Generally, surface flows will reach the Reservoir area during and after significant rain events during the winter months. Vegetation in the Reservoir will utilize this water as it ponds and saturates the uppermost soil layers. The presence of Devil's Gate Dam is the dominant influence to the hydrology of Psomas' study area because it blocks

surface and subsurface flows to downstream areas thus increasing the time that subsurface water is available to trees in the Reservoir. Additionally, the Reservoir is a collection area for subsurface water that flows from the upper Arroyo Seco area, as well as from the Montrose/La Canada slope to the west. Some of these inflows support the riparian tree species that occupy the Reservoir area (Psomas 2018).

Due to the highly variable precipitation in the region and the resulting variability in surface flows in the upper Arroyo Seco, identifying the typical flow regime is difficult. As discussed above, surface flow rates in the wet season can range from approximately 1 cfs to more than 200 cfs. The Hydraulic Analysis categorizes precipitation data for the Psomas' study area as either wet, average, or dry years. The maximum inundation zone in the Reservoir was shown to minimally fluctuate during wet, average, or dry years. The maximum flood zone for the Reservoir is determined by the management of Devil's Gate Dam, as any water that would exceed the maximum surface elevation of 1,035 feet is released downstream. Areas that would not be flooded during maximum inundation levels consist of a narrow band along the margins of the inundation footprint that measures 2.1 acres. As discussed in the Hydraulics Analysis, while the footprint of the inundated area during dry years is less than average or wet years, the duration of inundation along these fringes is increased in the with-diversions scenario. Inundation duration in dry years is increased by diversions because the amount of runoff required to initiate dam operations is increased. Overall, the hydraulics model indicates that any reduction to the inundation footprint is infrequent (occurring only during dry years) and duration period is slightly increased on the fringes (Psomas 2018).

The Hydraulic Analysis also discusses the effect on water velocities. The Ecological Modeling Study indicates that increasing water velocities result in lower water infiltration into the soil, and this reduces the probability of willow establishment. However, the Hydraulic Analysis indicates that the effects of water diversion on velocity are small overall and in some cases the change in velocity from diversions is a decrease from existing conditions. Therefore, no changes to the extent of willow habitat is expected to occur from modelled velocity changes (Psomas 2018).

The Hydraulic Analysis also indicates that proposed stream diversions are expected to be an unimportant factor to overall sediment transport potential because the controlling elements of sediment transport are geologic factors. Large runoff events typically drive sediment movement in southern California streams; since no diversions are proposed during peak events, the Project is not expected to affect stream sediment yield to the Reservoir. In fact, the design of the proposed crest gate diversion weir is expected to enhance sediment transport because the gate will be placed in the down position during peak flow events to prevent impediments to sediment transport, which occur presently by the diversion weir (Psomas 2018).

As described above, the hydrology of the Arroyo Seco is highly variable. The Ecological Modeling Study indicates that water depth and duration of inundation correlate most highly with changes in the extent of willow riparian habitat in the Reservoir. Because the rainfall and resulting stream flows can vary so dramatically in the Arroyo Seco and because willow riparian habitat is dependent on available water, it stands to reason that the extent of willow habitat would mirror the dynamics of the site hydrology. Therefore, changes in the willow habitat that may result from proposed diversion changes during dry year conditions would likely be temporary (due to the high growth rate of the species and the likelihood that dry year conditions would be followed by average or wet year conditions) and within the normal range of variability of the system (Psomas 2018).

Changing Existing Conditions

The Memorandum considered the change in existing conditions downstream due to the LACDPW Devil's Gate Dam Sediment Removal Project, which began after the completion of the study. A large portion of the riparian vegetation within areas potentially affected by the Project is not expected to exist when hydraulic changes resulting from the proposed Project diversions would occur. Additionally, the surface elevation of a large portion of the Reservoir area will be lowered as the LACDPW's sediment removal project excavates accumulated sediments over the course of the coming years. As a result, a much greater volume of water will be contained within a deeper pool in a smaller area of the Devil's Gate Dam Reservoir. It is expected that pool margins will recess accordingly towards the center of the pool and away from riparian habitat occurring at and beyond current maximum pool margins. Therefore, small changes in hydraulics at the margins of the pooled areas of the Reservoir resulting from Project diversions are not likely to occur within or adjacent to existing riparian woodland habitat at pool margins. In summary, the minimal potential effects on riparian habitat resulting from future Project diversions, as described in previous sections, are further reduced due to changing existing conditions that would occur due to the Devil's Gate Sediment Removal Project (Psomas 2018).

Conclusion

Downstream reduced flows associated with Project diversions are not expected to result in any measurable effects on downstream riparian habitat. Project studies examining existing conditions within Psomas' study area and potential changes in hydraulics, sediment transport, and groundwater coupled with ecological modeling and habitat requirements all provide support of this conclusion (Psomas 2018). Additionally, changing current and future conditions associated with the Devil's Gate sediment removal further reduce potential Project effects. Mitigation would therefore not be required because there would be no significant impacts to hydrology or biological resources in the context of the CEQA.

Threshold 4.2c Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Short-Term Construction Impacts

There are no potential jurisdictional wetlands on the Project site. Arroyo Seco and the spreading basins are potentially regulated by the USACE, RWQCB, and/or CDFW. The proposed Project would result in direct temporary and/or permanent impacts to these potentially jurisdictional waters, as summarized below. Direct impacts include discharge of fill (i.e., grading and construction/reconstruction of structures) to potentially jurisdictional waters, which would alter the size, scope, and character of these aquatic resources and therefore would be significant, absent mitigation. Table 4.2-6, Permanent and Temporary Direct Impacts to Jurisdictional Waters, includes the acres of permanent and temporary impact, which are illustrated in Figure 4.2-5, Impacts to Jurisdictional Resources (Sheets 1 and 2).

Table 4.2-6. Permanent and Temporary Direct Impacts to Potential Jurisdictional Waters

Jurisdictional Waters	Direct Permanent Impacts (acres)	Direct Temporary Impacts (acres)
Area 2		
USACE waters of the United States	0.17	0.03
RWQCB waters of the state	0.17	0.03
CDFW streambed, bank, and riparian vegetation	0.38	0.09
Area 3		
USACE waters of the United States	—	—
RWQCB waters of the state	1.79	0.59
CDFW streambed, bank	1.81	0.60
Gabrielino Trail/Access Road		
USACE waters of the United States	—	—
RWQCB waters of the state	—	—
CDFW streambed, bank, and riparian vegetation	—	—
Travelling Screen Building Staging Area		
USACE waters of the United States	—	—
RWQCB waters of the state	—	—
CDFW streambed, bank, and riparian vegetation	—	<0.01
Behner Treatment Plant Staging Area		
USACE waters of the United States	—	—
RWQCB waters of the state	—	—
CDFW streambed, bank, and riparian vegetation	—	—
Project Total		
USACE waters of the United States	0.17	0.03
RWQCB waters of the state	1.96	0.62
CDFW streambed, bank, and riparian vegetation[a]	2.19	0.69

Source: Appendix D

Note: Numbers may not sum due to rounding.

[a] white alder–California sycamore woodland (0.45 acres) and coast live oak woodland (<0.01 acres)

Direct impacts to Area 3 as tabulated above include the existing spreading basins. However, the proposed Project design in Area 3 includes the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of stream flows for infiltration. The new spreading basins are expected to have the same function as the basins being impacted. As such, the Project would result in a net increase of 3.64 acres for in-kind waters of the State and a net increase of 3.61 acres for in-kind CDFW jurisdictional areas in Area 3, as shown in Table 4.2-7, Jurisdictional Waters Created by Project in Area 3. Maintenance of the new spreading basins would

continue to be accomplished by mechanically removing the top layer of soil and disking or harrowing the exposed surface to loosen any soil compaction caused by cleaning, which is reflective of current maintenance activities.

Table 4.2-7. Jurisdictional Waters Created by Project in Area 3

Jurisdictional Waters	Direct Permanent Impacts (acres)	Direct Temporary Impacts (acres)	Total Impacts (acres)	Created Jurisdictional Waters (acres)	Net Difference (acres)
Area 3					
USACE waters of the United States	—	—	—	—	—
RWQCB waters of the State	1.79	0.59	2.38	6.02	+3.64
CDFW streambed, bank, and riparian vegetation	1.81	0.60	2.41	6.02	+3.61

Potential permanent and/or temporary direct impacts to potential jurisdictional waters would be reduced to less than significant with the implementation of MM-BIO-5 and MM-BIO-6 (i.e., on-site restoration and/or land acquisition, mitigation program funding, and/or mitigation bank credits). Consultation with, and permit issuance from, USACE, RWQCB, and CDFW may result in higher mitigation ratios and specific criteria for restoration beyond the minimum standards presented in this mitigation.

Potential temporary indirect impacts to potential jurisdictional waters in the study area would primarily result from construction activities and would include impacts from the generation of fugitive dust and the introduction of chemical pollutants (including herbicides). Excessive dust can decrease the vigor and productivity of vegetation through effects on light, penetration, photosynthesis, respiration, transpiration, increased penetration of phytotoxic gaseous pollutants, and increased incidence of pests and diseases. Erosion and chemical pollution (releases of fuel, oil, lubricants, paints, release agents, and other construction materials) may affect wetlands/jurisdictional waters. The release of chemical pollutants can reduce the water quality downstream and degrade adjacent habitats. However, during construction, erosion-control measures would be implemented as part of the Storm Water Pollution Prevention Plan (SWPPP) for the Project. Prior to the start of construction activities, the Contractor is required to file a Permit Registration Document (PRD) with the State Water Resources Control Board (SWRCB) in order to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with the Construction and Land Disturbance Activities (Order No 2009-009-DWQ, NPDES No. CAS000002) or the latest approved general permit. This permit is required for earthwork that results in the disturbance of one acre or more of total land area. The required SWPPP will mandate the implementation of best management practices (BMPs) to reduce or eliminate construction-related pollutants in the runoff, including sediment. Therefore, temporary indirect impacts would be less than significant due to compliance with regulations.

Long-Term Operational Impacts

Downstream reduced flows associated with Project diversions are not expected to result in any measurable effects on downstream riparian habitat. Project studies examining existing conditions within Psomas' study area and potential changes in hydraulics, sediment transport, and ground water coupled with ecological modeling and habitat requirements all provide support of this conclusion (Psomas 2018). Additionally, changing current and future conditions associated with the Devil's Gate Reservoir sediment removal further reduce the potential for Project effects. Mitigation would therefore not be required because there would be no significant impacts to hydrology or biological resources in the context of the CEQA.

Threshold 4.2d Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.?

Short-Term Construction Impacts

The proposed Project could potentially cause temporary direct and indirect impacts to the use of the Study Area by terrestrial wildlife moving from the ANF to the Hahamonga Watershed Park due to construction within Area 2 and Area 3. However, the impact would be less than significant since there are currently no fish within Arroyo Seco (see Appendix D: Section 5.3.1), and semi-aquatic (amphibians) and terrestrial wildlife (reptiles and mammals) would still be able to use adjacent natural sloped areas along the Arroyo Seco and the Gabrielino Trail/Access Road to avoid construction areas. The Arroyo Seco wash would not be obstructed from Area 2 to Hahamonga Watershed Park, which would allow existing wildlife species to utilize the streambed and avoid the spreading basin construction in Area 3.

Long-Term Operational Impacts

Potential long-term operational impacts to movement of native resident or migratory fish or wildlife species or the use of native wildlife nursery sites may occur if the proposed Project includes substantial adverse effects, compared to current conditions, in one of the following areas:

- Terrestrial species movement around the proposed diversion structure (in both upstream and downstream directions)
- Aquatic and semi-aquatic movement over the diversion structure (in both upstream and downstream directions)
- Aquatic and semi-aquatic movement through the diversion intake (in a downstream direction)

The proposed Project would not result in a substantial change to existing movement conditions for terrestrial wildlife, given that the proposed structures and other improvements are substantially similar in size and location to the existing condition.

Given that the current diversion structure does not include screens and the proposed Project includes a drum screen or vertical screen with automatic brush cleaning system at the intake structure, which would follow CDFW published design criteria to prevent aquatic and semi-aquatic wildlife from entering into the conveyance system, the proposed Project would not have an adverse effect on aquatic and semi-aquatic movement through the diversion intake.

Therefore, potential long-term operational impacts are related to aquatic and semi-aquatic movement over the diversion structure. Factors that affect suitability for movement include existing natural and proposed Project features such as, channel bank slope gradients, vegetative cover, surface flow conditions, subsurface (i.e., groundwater) conditions, the height of the diversion structure relative to stream elevations upstream and downstream of the diversion, and presence/absence of fish screens in the diversion intake.

Based on the data gathered from the USGS gaging station from 1990 through 2019, the average in-stream flows are 6,890 acre-feet/year (ft/yr). Using these years of data to represent the current condition of diverting when stream flows are 25 cubic feet per second (cfs) or less, the City diverts an average of 2,045 acre-ft/yr. Under the proposed Project, the City would be able to divert approximately 3,080 acre-ft/yr, resulting in approximately 1,035 acre-ft/yr of additional diverted flows into the spreading basins. These proposed increased diversions would result in a measurable increase in diversion only during larger wet-weather flows. There would be little to no difference in diversions between the current condition and the proposed Project during the drier periods of the year. Aquatic and semi-aquatic movement within surface waters would therefore only be affected during larger wet-weather flows. This impact is less than significant because the decreased wet-weather flow would remain sufficient to allow upstream and downstream movement by species currently occupying the Project Area (see additional discussion below regarding existing and future fish and amphibian species).

With regards to subsurface flows (i.e., groundwater) (see Appendix D: Section 6.3.2), within the upstream section of the Arroyo Seco, subsurface water is very shallow and often just below the streambed surface, even in areas that appear dry on the surface. Due to the steep gradient, this groundwater moves downstream through the substrate as a subsurface flow beneath the streambed. As such, although surface flows are not always present, subsurface flows can be assumed present. The present condition of subsurface flow below the diversion weir would be maintained by constructing a modified structure at similar depth to the current structure. Therefore, the proposed Project would not affect suitability of habitat for movement due to the lack of change the project would have to groundwater.

In addition, the current aged and ineffective diversion weir structure results in negligible seepage (or "weeping") of flows through the flashboards. During the drier periods of the year when low stream flows are fully diverted, the seepage has been estimated to be 0.1 to 0.2 cfs. While the current seepage is not sufficient to establish habitat for aquatic or semi-aquatic wildlife movement, the Project will allow for a similar release of flows through a valved bypass pipe from the intake structure. Therefore, there would be no change to this condition.

Fish Movement (Current Conditions)

There are no fish present in the Arroyo Seco Canyon in the current condition (see Appendix D: Section 5.3.1). No fish were observed during the 2019 surveys for the Project, including the focused fish survey (see Appendix C) that included all waters from the surface water terminus at the southern end in the Arroyo Seco wash adjacent to Area 3 to the Brown Mountain Dam. There was an incidental sighting of rainbow trout during the focused amphibian surveys conducted in 2013, but its provenance was not determined (BonTerra Psomas 2014e). Therefore, the proposed Project replacement of the existing diversion structure and intake facility would not result in a substantial impediment to the movement of native resident or migratory fish species, because of the absence of fish in the current condition, and impacts would be less than significant.

If fish were present in the Study Area in the current condition, the current diversion operations which lacks a fish screen, would result in fish being transported downstream to be potentially stranded in isolated pools of water (the

spreading basins or in the reach between the diversion and the JPL Bridge), or lost when passed into Devil's Gate Reservoir where flows spread out and habitat is unsuitable. The loss of connectivity and isolation of pools occurs primarily during the late summer/early fall months when there are periods of low to zero flows in the stream above the diversion (stream flows are below 1 cfs 35% of the year, and drop to zero about 10% of the time). This lack of water is the primary barrier for fish movement from about the JPL Bridge upstream where substrate and cover is good, but water is lacking. Below the JPL Bridge the flatter sediment load of the reservoir is open to solar heating, is dominated by finer substrates, and cover and pools are rare or absent. Also, the stream is subject to frequent dry conditions due to loss of aboveground flow as the channel emerges from the canyon into the alluvium, where water flow is primarily subterranean. During moderate flows, partial temporal barriers may be present in the canyon segment of the stream due to steep channel segments and step-pool or bedrock drops preventing upstream fish passage. Therefore, if fish were to be present, their movement would be restricted and they may perish due to isolation or stranding. The proposed Project will include fish screens to prevent isolation in the spreading basins and can be operated in a manner that excludes fish from the downstream reaches during diversion. The effects of the proposed Project related to downstream drift/movement are beneficial (i.e., no significant impact) due to inclusion of fish screens and proposed operations.

CDFW Coordination

The CDFW submitted a comment letter on the scope and content of the Draft EIR during the Notice of Preparation (NOP) public review period for this proposed Project and requested an evaluation to determine whether the Project would prevent or impede fish passage during low flow conditions. The cited Fish and Game Code section 5901 makes it unlawful to construct or maintain in any streams any device that prevents, impedes, or tends to prevent or impede the passing of fish up and downstream. In addition Fish and Game Code section 5937 is cited and requires the owner of any dam to allow sufficient water at all times to pass through a fishway or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or existing below the dam.

While no fish are currently present, the City's general approach to the proposed Project is to plan for future conditions with the ability to operate the Project based on present conditions for fish. Under present conditions, an in-stream flow of about 0.5 cfs would be released to match the estimated leakage from the existing weir, and flows above this, up to the full 25 cfs water right, would be diverted when possible. The operation will exclude fish from the downstream reach under most conditions and from the diversion using fish screens designed to meet CDFW criteria for salmonid fry. Because, flows will pass over the crest gates when streamflow is greater than about 25 cfs and when the gates are lowered at higher flows, the City proposes that a monitoring program be developed to confirm that fish are not present in the reach downstream of the diversion after these conditions occur.

For a future condition where fish return or are reintroduced to the Arroyo Seco under present channel conditions, there are still several barriers to fish migration and survival that influence proposed operations. As such, operations would not be altered from those proposed under the present condition, i.e. fish would continue to be excluded from passing downstream the diversion and no minimum in-stream flows would be proposed. Under these conditions, the monitoring program would continue and would include a program to rescue fish between the diversion and JPL Bridge. During high flows when the gate is lowered, a roughened channel section downstream will allow upstream passage of future fish. Roughened channels are an accepted method of providing passage for steelhead trout in CDFW's Salmonid Stream Restoration Manual (CDFG 2010), requiring site specific design and review. The roughened channel configuration proposed is a channel approximately the width of the active channel in adjacent

stream segments (upstream and downstream), with an asymmetric v-shaped cross section to concentrate lower flows and provide adequate depth. Compared to other potential types of upstream passage features, the roughened channel type has the advantage of providing a range of velocities and depths at a given flow rate. Thus, smaller or weaker swimming native fish and other aquatic organisms could pass along the margins of the channel or near the bottom, using spaces in the bed material for hydraulic cover. Additionally, revegetation for the Project would include biotechnical stabilization and riparian planting on the west and east banks along the roughened channel providing coverage for wildlife. The combination of screening and monitoring/rescue would significantly reduce risk for any resident populations compared to existing diversion operations and would assist in maintaining populations upstream of the diversion

Under a future condition with restored anadromy, the City proposes to significantly alter diversion operations to allow for upstream and downstream fish passage (see Future Conditions for Fish section below).

Until such time, however, the proposed Project would result in an improvement to the existing condition and impacts related to potential aquatic and semi-aquatic species movement are less than significant.

Amphibian Movement (Current Conditions)

There are several amphibian species present in the Arroyo Seco (see Appendix D: Section 5.3.2), including western toad (Anaxyrus boreas), California treefrog (Pseudacris cadaverina), and Baja California treefrog (Pseudacris hypochondriaca). These amphibian species are primarily terrestrial and would not be hindered beyond the current condition with the implementation of the proposed Project. Importantly, amphibian populations would potentially benefit from the proposed Project due to the inclusion of the drum screen or a vertical screen with automatic brush cleaning system at the intake structure, which would follow CDFW published design criteria to prevent aquatic and semi-aquatic wildlife from entering into the conveyance system and becoming stranded in the spreading basins.

When the diversion is in operation during periods of low flow, downstream drift for larval amphibians would be prohibited and would prevent larva from being stranded downstream. When high flows spill over the raised gate, adult, juvenile, and larval amphibians would pass downstream and adults and juveniles would be expected to move upstream along the western slope. The limits of the roughened channel would extend to the edge of the diversion structure to allow amphibians to pass along the side without leaving the stream corridor. When the weir is completely lowered its sill elevation will follow the stream's general profile, creating a smooth transition to the roughened channel section downstream and allowing for upstream passage. The maximum elevation of the weir when raised would not be higher in elevation than the existing diversion structure, and the elevation of the pool of water at the intake would not exceed existing levels. Therefore, the Project would not affect existing overland routes for semi-aquatic species in either upstream or downstream directions. Amphibians would continue to have the same routes for passage as in the existing condition.

Therefore, replacement of the existing diversion structure and intake facility with an enhanced facility in the same location would not result in a substantial change from existing conditions and would not substantially impede the movement of amphibians beyond the current pre-Project condition and impacts would be less than significant.

Future Conditions for Fish

The proposed Project has been designed in consideration of a future condition where fish are re-established in the Arroyo Seco. However, it is the City's position that under present conditions that includes periods of low to zero

flows, the unsuitability of Devil's Gate Dam habitat and lack of passage, and barriers to upstream passage, downstream fish passage is undesirable. With the goal of excluding fish from the downstream reaches during diversions under present conditions, the proposed new diversion structure would be designed for the possibility that some future fish may pass downstream when the diversion is not operating (i.e., during periods of higher flows when the gate is lowered to allow flows to continue downstream without diversion) or when the diversion is operating and flows are high enough to spill over the crest gate. The roughened channel would allow for upstream passage when the weir crest gate is lowered.

A further condition for the future will occur when connectivity is re-established for passage through Devil's Gate Dam (i.e. removal of the dam or construction of a fish-ladder), connecting the upper and lower Arroyo Seco to the Los Angeles River and ultimately, the Pacific Ocean. This circumstance would potentially allow for the reintroduction of the southern steelhead (Oncorhynchus mykiss irideus), which is federally listed as endangered. In streams, the species uses habitat consisting of relatively cool, well-oxygenated water with adequate depth and cover. Steelhead require relatively clean unconsolidated gravel and cobble for spawning. Steelhead have an ecological or migratory life cycle called anadromy, in which adults mature in the ocean and must return to freshwater to spawn. However, until such time as safe connection to suitable downstream habitat or to the ocean can be provided, a bypass fishway is not proposed as part of the Project. If access for steelhead is re-established, however, the Project can accommodate a future bypass fishway and maintenance of minimum flow conditions to allow for upstream passage while the diversion is in operation.

As previously discussed, the Southern California Steelhead Recovery Plan (NOAA 2012) describes priority actions for recovery of steelhead in the region, including the Los Angeles River basin. The Arroyo Seco watershed has a low ranking in relative viability for recovery. The Recovery Plan lists removal of barriers at dams, diversions, roads, and other structures as a priority action in the biogeographic region (NOAA 2012). Southern steelhead recovery in Arroyo Seco would involve modification of multiple flood control facilities and removal of multiple barriers between the Project area and the ocean. Importantly, the removal of Devil's Gate Dam or modifications to allow fish passage both up and downstream would be a major undertaking.

Nevertheless, in this potential future scenario, the proposed Project design may not comply with Fish and Game Codes 5901 and/or 5937. Therefore, MM-BIO-7 (Native Resident and Migratory Fish Monitoring Plan preparation and implementation) is recommended to be responsive to the CDFW comment letter received during the NOP review period for this Project to allow for the future use of the Study Area as a movement corridor for native resident or migratory fish species.

Threshold 4.2e. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Short-Term Construction Impacts

Direct impacts to trees can be classified as a removal or encroachment. Trees are identified for removal when they are located within the permanent impact boundary. Trees are identified as encroachment if the tree canopy is within 5 feet of the permanent impact boundary, or if the tree trunk is within 15 feet of the permanent impact boundary. Direct impacts to encroachment trees include root damage, soil excavation and compaction, grade changes, loss of canopy, and trunk wounds, among others.

Direct tree impacts would result in the removal of 19 protected trees in total, of which all are located in Area 2. A total of 15 protected trees are expected to be encroached upon (11 trees in Area 2 and 4 trees in Area 3). No trees

are anticipated to be removed in Area 3. See Table 4.2-8, Area 2 - Protected Trees Direct Permanent Impacts, and Table 4.2-9, Area 3 - Protected Trees Direct Permanent Impacts, and Figure 4.2-6, Impacts to Protected Trees (Sheets 1 and 2) for direct permanent impacted protected tree locations. These direct permanent impacts would be potentially significant.

Table 4.2-8. Area 2 - Protected Trees Direct Permanent Impacts

Native Tree Species		Number of Trees	
Scientific Name	*Common Name*	*Removal*	*Encroachment*
Alnus rhombifolia	white alder	15	5
Platanus racemosa	California sycamore	0	2
Populus trichocarpa	*black cottonwood*	0	1
Quercus agrifolia	coast live oak	3	2
Quercus chrysolepis	canyon live oak	0	1
Salix nigra	black willow	1	0
	Total	**19**	**11**

Source: Appendix D

Table 4.2-9. Area 3 - Protected Trees Direct Permanent Impacts

Native Tree Species		Number of Trees	
Scientific Name	*Common Name*	*Removal*	*Encroachment*
Platanus racemosa	California sycamore	0	1
Quercus agrifolia	coast live oak	0	3
	Total	**0**	**4**

Source: Appendix D

Impacts to these trees would be significant, absent mitigation, in accordance with the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code). Project implementation of MM-BIO-8 (i.e., tree replacement and protection) would reduce potential direct impacts to a less-than-significant level. Impacts to these trees would be significant, absent mitigation, in accordance with the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code). Additionally, the City will follow the City's Tree Protection Guidelines established for projects subject to Chapter 8.52 and prepared by the City Manager (City of Pasadena 2019). Applicable mandatory measures from the Guidelines that would be applied to construction of the proposed Project are generally summarized below to include, but not be limited to:

> P-313-1.5 Protection of Trees on City Property
>
> (1) A tree protection zone (TPZ) shall be defined as the drip line of the tree plus four (4) radial feet;
>
> (2) Protective (6-foot high minimum) chain-link fencing with an access gate of minimal width should be installed around the TPZ to the extent practicable subject to approval by staff prior

to the commencement of any grading, construction, or demolition. Fencing must also include 8 ½" x 11" (minimum) signage that includes the following information: Tree Protection Zone; name and contact information of project owner or authorized representative; and "Please contact the Pasadena Citizen Service Center to report any concerns (626) 744-7311".

(3) All work conducted in the ground within the TPZ of any protected tree should be accomplished with hand tools, unless an air spade is utilized. Trenches in the TPZ should be tunneled or completed with an air spade to avoid damage to roots within the TPZ.

(4) Any required trenching should be routed in such a manner as to minimize root damage. Radial trenching (radial to the tree trunk) is preferred as it is less harmful than tangential trenching. Construction activity should be diverted from the TPZ. Cutting of roots should be avoided (i.e. place pipes and cables below uncut roots). Wherever possible and in accordance with applicable code requirements, the same trench should be used for multiple utilities.

(5) No construction staging or disposal of construction materials or byproducts including but not limited to paint, plaster, or chemical solutions is allowed in the TPZ.

Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Site-wide changes affecting trees include diverting runoff and stormwater, creating retention and detention ponds, relocating streams or making improvements to streams, lowering or raising water tables, altering the capacity for soil moisture recharge, removing vegetation, or damming underground water flow (Matheny and Clark 1998). Indirect tree impacts may potentially occur to 13 additional protected trees. Indirect impacts could potentially result in tree mortality adjacent to the Project work areas, which would be significant, absent mitigation, under the City's Tree Ordinance. Project implementation of MM-BIO-8 would reduce potential indirect impacts to a less-than-significant level.

Long-Term Operational Impacts

Impacts to protected trees are not anticipated during the maintenance of the diversion and intake structures in Area 2 or the cleaning of the spreading basins in Area 3. Maintenance will be confined to areas that have previously been cleared of vegetation during Project construction. Regular maintenance activities within the operational areas of Area 2 and Area 3 would ensure that no protected trees will grow within these areas.

4.2.6 Cumulative Impacts

The proposed Project is upstream of the Devil's Gate Reservoir. In November 2018, the Los Angeles County Flood Control District began the removal of 1.7 million cubic yards of accumulated sediment located within 42 acres of the Devil's Gate Reservoir. Sediment removal activities are anticipated to continue through 2022 with habitat restoration activities occurring through 2023 (Los Angeles County Public Works 2018). Least Bell's vireo was documented within riparian habitat that will be removed during the sediment removal project. There were also significant impacts to sensitive vegetation communities, jurisdictional waters, and protected trees. To mitigate for the impacts, approximately 70 acres of habitat restoration would occur in the remaining portions of the Reservoir, including along the sloped areas between the Arroyo Seco and the spreading basins as well as within the southernmost Spreading Basin No. 17.

The Project's impacts on the downstream ecological and hydrological systems with the Devil's Gate Dam Sediment Removal Project and its subsequent habitat restoration is described in the long-term operational impacts to sensitive vegetation communities. Downstream reduced flows associated with Project diversions are not expected to result in any measurable effects on downstream riparian habitat. Section 4.5, Hydrology and Water Quality, which includes information presented in the Hydraulics, Sediment Transport, and Groundwater Analysis (see Appendix F) and summarizes potential changes in hydraulics, sediment transport, and groundwater coupled with ecological modeling and habitat requirements all provide support of this conclusion (Psomas 2018). Mitigation would therefore not be required because there would be no impacts to hydrology or biological resources in the context of the CEQA.

The previously approved components of the Arroyo Seco Canyon Project (Area 1), located approximately 630 feet upstream of Area 2, includes habitat restoration along the stream channel, a new nature trail, and a rest area/picnic area, along with demolition of the existing Headworks structure on the Arroyo Seco. Significant impacts associated with the Project were to sensitive vegetation communities, jurisdictional waters, and protected trees. To mitigate for the impacts, habitat restoration would occur that would create and enhance riparian habitat using protected trees.

Oak Grove Area Improvements Project is located approximately 2,200 feet southwest of the Project. It geographically includes the western portion of Hahamongna Watershed Park from the Flint Wash Bridge, north, to the southern edge of the Hahamongna Annex area. There are five projects in the current Capital Improvement Program (CIP) with funding and that are located within the OGAI project area, including (1) Oak Grove Area Improvements, (2) Trail Development, (3) Berkshire Creek Area Improvements, (4) Habitat Restoration, and (5) Oak Grove Disc Golf Course Improvements (City of Pasadena Department of Public Works 2020). The Oak Grove Area Improvements were adopted as part of the Hahamongna Watershed Park Master Plan approval. The Berkshire Creek Area Improvements project was substantially completed in March 2020. The remaining OGAI projects are currently funded for the planning and design phase. The projects will improve the area of the existing Oak Grove field, and may include a new restroom, improvements to vehicular and pedestrian circulation, assessment of the disc golf course layout and improvements to the outdoor amphitheater. The City has not budgeted for the project beyond FY 2020, but should funding become available construction could occur as early as 2021, concurrent with the proposed Project.

The Los Angeles Flood Control District's Pump Back /Intake at Devil's Gate (also known as the Devil's Gate Water Conservation Project) is located approximately 4,200 feet south of the Project. The project includes installing a pump and intake on the upstream face of Devil's Gate Dam. A 5-mile pipeline to be constructed from the pump easterly to transfer water to Eaton Wash is on hold; however, the feasibility of maximizing stormwater capture and groundwater replenishment through a pipeline to the Arroyo Seco spreading grounds is being assessed. It is assumed that if the LACFCD moves forward with the project, it would be after the Devil's Gate Sediment Removal Project has been completed at the end of 2022 and, consequently, after completion of the ASCP Areas 2 and 3 (proposed Project). Impacts to biological resources by the project have not been evaluated. However, it is stated in the Feasibility Study that no significant environmental impacts are anticipated for construction of the proposed pipeline alignments, as all construction would be within paved right-of-way. Each pipeline alignment alternative proposed would have temporary impacts related to noise, air quality, greenhouse gas emissions, traffic and public services during construction, and a more detailed environmental impact analysis would be required to develop mitigation measures to ensure these impacts are not significant, and in compliance with regulatory codes (County of Los Angeles 2017).

The Project's contribution to cumulative impacts would be reduced to less than significant or avoided through the mitigation measures identified in Section 4.2.6. Therefore, with implementation of MM-BIO-1 through MM-BIO-8, impacts would not be cumulatively considerable.

4.2.7 Mitigation Measures

Special-Status Wildlife Species

MM-BIO-1 Prior to commencement of any earthmoving activities or the pre-construction staging of equipment on the Project site, the City shall develop a Preconstruction Survey and Relocation Plan for terrestrial reptiles, including the California newt, two-striped gartersnake, Southern California legless lizard, and coastal whiptail. The Preconstruction Survey and Relocation Plan shall be submitted to the California Department of Fish and Wildlife (CDFW) for review prior to any ground-disturbing activities within potentially occupied habitat.

The Plan shall include at a minimum, the following: (1) protocols for pre-construction surveys to flush out and/or move identified special status wildlife within the study area, as feasible; (2) the timing, frequency, and locations where surveys should be conducted; (3) the habitat and conditions in the proposed relocation site(s); (4) the methods that would be used for trapping and relocating identified species; (5) protocols for documentation/recordation of the species and number of animals relocated; and (6) protocols for notifying CDFW in the event that identified species cannot be relocated.

The Plan shall require that a Biological Monitor be present during initial vegetation clearing activities within Areas 2 and 3, as well as twice weekly until ground disturbing activities are completed. The Biological Monitor shall also be familiar with least Bell's vireo and shall conduct pre-clearing non-protocol surveys for this species while onsite. If a least Bell's vireo or other State of federally listed species is detected, work activity within 200 feet of the detected occupied habitat will be temporarily halted and the City will consult with the appropriate wildlife agencies. With authorization from these agencies, which may include a 'take' permit, the project will proceed in accordance with conditions developed in the consultation. Conditions will include avoidance and minimization measures to prevent or minimize impacts on the listed species(s) occurring on or adjacent to the site.

The Plan shall require that any individual special-status terrestrial wildlife species observed within the study area during the pre-construction survey(s) shall be flushed out and/or moved out of harm's way to avoid direct impacts to these species, and if special-status species are detected, the Biological Monitor shall capture and relocate individuals to nearby undisturbed areas with suitable habitat outside of the construction area, but as close to their origin as possible. The final recordation/documentation of any wildlife relocated during Project activities shall be made available to CDFW for confirmation that construction activities were executed in compliance with the approved Preconstruction Survey and Relocation Plan.

MM-BIO-2 Project construction shall be conducted in compliance with the conditions set forth in the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code with methods approved by the California Department of Fish and Wildlife (CDFW) to protect active bird/raptor nests. To the maximum extent feasible, vegetation removal shall occur during the non-breeding season for nesting birds (generally late September to early March) and nesting raptors (generally early July to late January) to avoid impacts to nesting birds and raptors. If the Project requires that work be initiated during the breeding season for nesting birds (March 1–September 30) and nesting raptors (February 1–June 30), in order to avoid direct impacts on active nests, a pre-construction survey shall be conducted by a qualified Biologist for nesting birds and/or raptors within 3 days prior to clearing of any vegetation and/or any work near existing structures (i.e., within 300 feet for nesting birds and within 500 feet for nesting raptors). If the Biologist does not find any active nests within or immediately adjacent to the impact areas, the vegetation clearing/construction work shall be allowed to proceed.

If the Biologist finds an active nest within or immediately adjacent to the construction area and determines that the nest may be impacted or breeding activities substantially disrupted, the Biologist shall delineate an appropriate buffer zone around the nest depending on the sensitivity of the species and the nature of the construction activity. Any nest found during survey efforts shall be mapped on the construction plans. The active nest shall be protected until nesting activity has ended. To protect any nest site, the following restrictions to construction activities shall be required until nests are no longer active, as determined by a qualified Biologist: (1) clearing limits shall be established within a buffer around any occupied nest (the buffer shall be 100–300 feet for nesting birds and 300–500 feet for nesting raptors), unless otherwise determined by a qualified Biologist and (2) access and surveying shall be restricted within the buffer of any occupied nest, unless otherwise determined by a qualified Biologist. Encroachment into the buffer area around a known nest shall only be allowed if the Biologist determines that the proposed activity would not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest or the nest has failed.

MM-BIO-3 A Biological Monitor shall conduct a pre-construction bat habitat assessment of buildings and trees marked for potential removal. Potential for roosting shall be categorized by 1) potential for solitary roost sites, 2) potential for colonial roost sites (10 bats or more). If the potential for colonial roosting is determined, those trees shall not be removed during the bat maternity roost season (March 1 – July 31). Trees potentially supporting colonial roosts outside of maternity roost season, and trees potentially supporting solitary roosts may be removed via a two-step removal process, whereby some level of disturbance (such as trimming of lower branches) (at the direction of Biological Monitor) is applied to the tree on day one to allow bats to escape during the darker hours, and the roost tree shall be removed two days later (i.e., there shall be no less or more than two nights between initial disturbance and the grading or tree removal). When feasible, trees will be dropped slowly and a Biological Monitor will monitor the activity. If buildings are determined to be occupied, one-way exclusionary devices will be placed over bat access points and left in place for two nights prior to building removal.

Sensitive Vegetation Communities

MM-BIO-4 Direct impacts to sensitive vegetation communities (white alder–California sycamore woodland association and California sycamore woodlands alliance) shall be mitigated through a combination of on-site and/or off-site measures. Mitigation for impacts to sensitive vegetation communities shall consider and overlap with compensation for jurisdictional waters (MM-BIO-6) since the sensitive vegetation is associated with the jurisdictional limits of Arroyo Seco. Mitigation for direct impacts to sensitive vegetation communities shall be implemented through on-site creation/enhancement, program funding, mitigation bank credits, and/or creation/enhancement of native vegetation communities on City lands. Mitigation acreages shall be implemented as shown in the Table below.

Sensitive Vegetation Community	Direct Impacts (acres)	Mitigation Ratio	Mitigation (acres)
white alder–California sycamore woodland association	0.47	3:1	1.41
California sycamore woodlands alliance	0.04	3:1	0.12
Totals:	**0.51**	**—**	**1.53**

On-site Mitigation. Prior to the issuance of a grading permit or any earthwork on the Project site, PWP shall prepare a Habitat Mitigation and Monitoring Plan (HMMP) for habitat enhancement and creation activities. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. The HMMP shall include restoration of the following habitats:

Riparian Woodlands. Impacted areas of (white alder–California sycamore woodland association and California sycamore woodlands alliance) shall be created/restored within and adjacent to the same on-site areas that the woodland currently existed prior to Project implementation, as well as other areas deemed to have appropriate soils and topography for successful establishment. Understory areas shall be revegetated with a diversity of locally collected seeds. Temporary irrigation shall be established and maintained, with irrigation suspensions in times of rainfall. Successful establishment of the woodland shall be determined only after removal of irrigation system and confirmed ability of the woodland to survive in the absence of irrigation.

It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the City, CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the City and the three agencies.

Off-site Mitigation. If mitigation is implemented through mitigation program funding and/or mitigation bank credits, the Project Applicant shall work with the City, CDFW, USACE, and RWQCB to ensure the mitigation program funding and/or mitigation bank credits are appropriate to offset permanent impacts. Mitigation lands shall be comprised of similar or higher quality riparian woodland and preferably located in the vicinity of the site or watershed.

If mitigation is implemented through offsite enhancement of City-owned lands, PWP shall prepare a HMMP that details the location and existing conditions of the offsite lands. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the City, CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the City and the three agencies.

MM-BIO-5 To prevent inadvertent disturbance to sensitive vegetation communities outside the limits of work, the construction limits shall be clearly demarcated (e.g., installation of flagging or temporary high visibility construction fence) prior to ground disturbance activities. All construction activities including equipment staging and maintenance shall be conducted within the marked disturbance limits. A qualified biologist shall be present during initial ground-disturbing activities within the Project site to ensure that Project activities stay within the demarcated limits.

Jurisdictional Waters

Significant direct and indirect impacts to jurisdictional waters can be mitigated to less than significant with implementation of MM-BIO-5 and the following measures:

MM-BIO-6 Mitigation for direct impacts to jurisdictional waters shall be implemented through on-site enhancement of remaining jurisdictional waters and/or off-site acquisition, program funding, and/or mitigation bank credits. Mitigation ratios for each type of jurisdictional waters is shown in the Table below. Mitigation for temporary and permanent impacts to jurisdictional wetlands and waters shall consider and overlap with compensation for sensitive vegetation communities (MM-BIO-4).

Jurisdictional Waters Type	Direct Impacts (acres)	Mitigation Ratio	Mitigation (acres)[a]
USACE waters of the United States	0.20	1:1	0.20
RWQCB waters of the state	2.58	1:1	2.58
CDFW streambed and bank, with riparian vegetation[b]	0.49	3:1	1.47
CDFW streambed and bank, with non-riparian habitat[c]	2.41	1:1	2.41

Notes:

[a] Mitigation areas for each jurisdictional type may overlap

[b] white alder–California sycamore woodland (0.48 acres) and coast live oak woodland (<0.01 acres)

[c] California sagebrush–California buckwheat–laurel sumac scrub (<0.001 acres); urban/developed (0.03 acres); disturbed habitat (2.38 acres); laurel sumac scrub (<0.01 acres)

On-site Mitigation. Prior to the issuance of a grading permit or any earthwork on the Project site, PWP shall prepare a HMMP for habitat enhancement and creation activities. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. The HMMP shall include restoration of the following habitats:

Riparian Woodlands. Impacted areas of (white alder–California sycamore woodland association and coast live oak woodland) shall be created/restored within and adjacent to the same on-site areas that the woodland currently existed prior to Project implementation, as well as other areas deemed to have appropriate soils and topography for successful establishment. Understory areas shall be revegetated with a diversity of locally collected seeds. Temporary irrigation shall be established and maintained, with irrigation suspensions in times of rainfall. Successful establishment of the woodland shall be determined only after removal of irrigation system and confirmed ability of the woodland to survive in the absence of irrigation.

It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the three agencies.

Off-site Mitigation. If mitigation is implemented through mitigation program funding and/or mitigation bank credits, PWP shall work with the CDFW, USACE, and RWQCB to ensure the mitigation program funding and/or mitigation bank credits are appropriate to offset permanent impacts. Mitigation lands shall be comprised of similar or higher quality riparian woodland and preferably located in the vicinity of the site or watershed.

If mitigation is implemented through offsite enhancement of City-owned lands, PWP shall prepare a HMMP that details the location and existing conditions of the offsite lands. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the three agencies.

Habitat Linkages and Wildlife Corridors

MM-BIO-7 Prior to the commencement of earthmoving within Area 2 for the demolition of the existing diversion/weir structure, the City shall develop a Native Resident and Migratory Fish Monitoring Plan (Monitoring Plan), in consultation with CDFW. This Monitoring Plan shall set forth annual monitoring requirements to determine if native fish species or migratory fish populations are present within an approximate 3,500-foot section of the stream (about 1,500 feet upstream of the diversion/weir structure to the abandoned headworks (Area 1) and 2,000 feet downstream to the JPL Bridge at the mouth of the canyon). Annual survey protocols shall be established to the satisfaction of CDFW and set forth in the Monitoring Plan. If the results of the annual surveys reveal a positive presence of native fish, the Monitoring Plan shall set forth thresholds for determining the permanency of the population, and whether or not connectivity both upstream and downstream of the diversion structure is appropriate and in the best interest of the long-term survival of an established native or migratory fish population, given hazards associated with stranding downstream. Until passage for steelhead is restored to the Arroyo Seco, the City shall implement a program to rescue fish between the diversion structure and the JPL Bridge. If rescue is determined to be ineffective or impractical, then the City shall modify its operations to

accommodate passage. At such time as steelhead passage is restored, the City shall alter either the design of the diversion/weir structure, the operational methods of the diversion/weir structure, or both to satisfy Fish and Game Code Sections 5901 and 5937.

City of Pasadena Protected Trees

MM-BIO-8 A qualified biologist shall be present during initial ground-disturbing activities within the Project site to ensure that Project activities stay within the demarcated limits, as required in MM-BIO-5. This qualified biologist shall identify the number of City-protected trees that are removed as a result of Project construction activities, as well as trees that would be encroached upon. This inventory of trees shall be used to determine an appropriate tree replacement program that shall be, at a minimum, consistent with the administrative guideline tree replacement matrix of the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code), and the Ordinance's administrative guideline replacement matrix, as it relates to tree replacement of protected trees.

Trees within approximately 15 feet of proposed construction activity shall be temporarily fenced with chain-link fencing in accordance with the City's Tree Ordinance and Tree Protection Guidelines. The fencing shall be installed to the extent of the tree's dripline plus four (4) radial feet and be minimum six (6) feet high with an access gate of minimal width. The fenced area shall be considered the Tree Protection Zone (TPZ) unless proximate construction required temporary removal.

All trees that have been substantially root pruned (30% or more of their root zone) during construction within the TPZ shall be monitored by an International Society of Arboriculture Certified arborist for the first five years after construction completion. The arborist shall submit an annual report, photograph each tree and compare tree health and condition to the original, pre-construction baseline. For trees that do not survive the five-year monitoring period, such trees shall be replaced in accordance with the requirements of this measure.

4.2.8 Level of Significance After Mitigation

Implementation of MM-BIO-1 through MM-BIO-8 would reduce potentially significant impacts to biological resources a level less than significant.

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SOURCE: Bing 2019, Open Street Map 2019

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FIGURE 4.2-1 - SHEET 1

Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

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FIGURE 4.2-1 - SHEET 2

Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

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FIGURE 4.2-2 - SHEET 1

Potential Jurisdictional Waters

Biological Resources Technical Report for the Arroyo Seco Canyon Project

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SOURCE: Bing 2019, Open Street Map 2019

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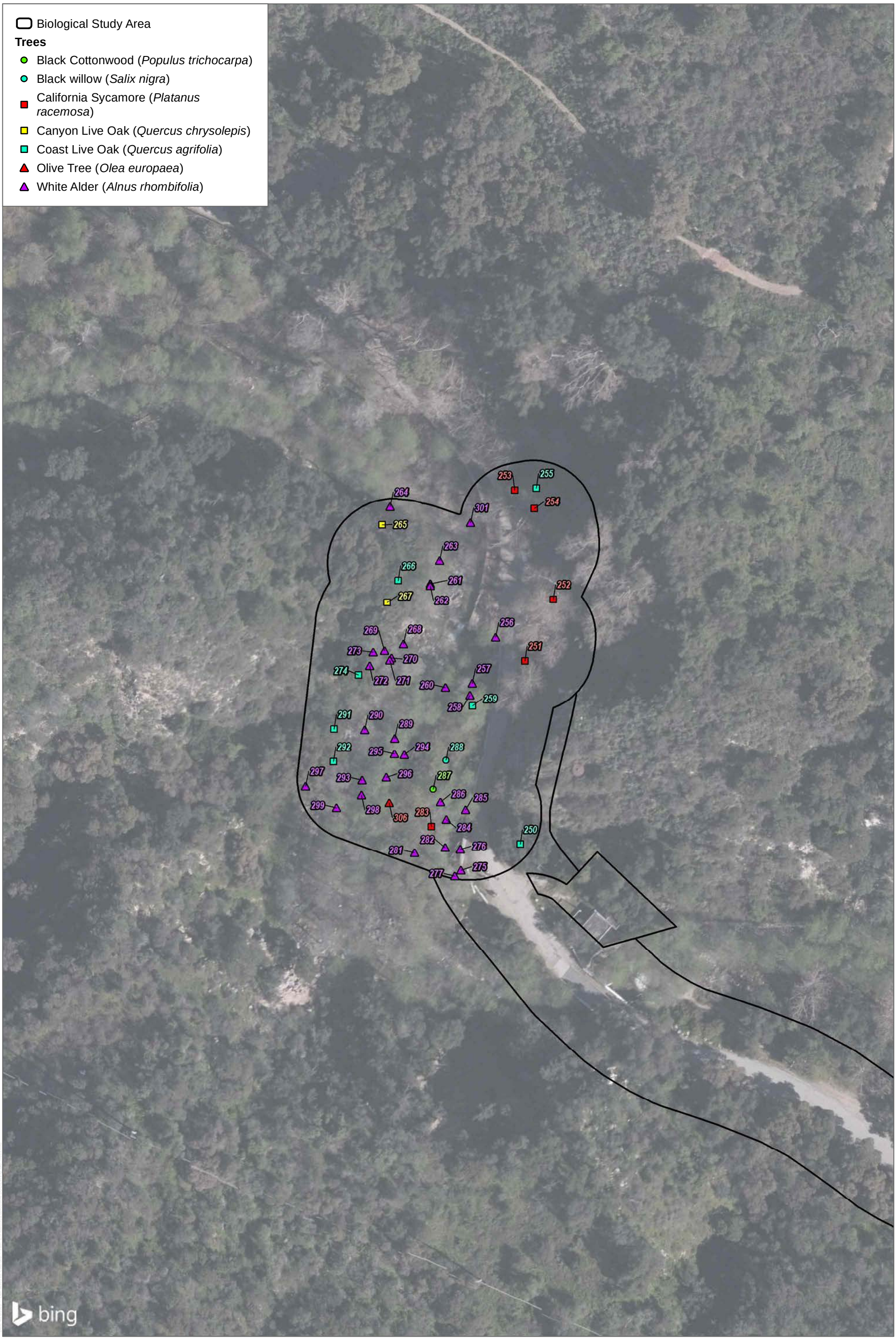
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FIGURE 4.2-2 - SHEET 2

Potential Jurisdictional Waters

Biological Resources Technical Report for the Arroyo Seco Canyon Project

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SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

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FIGURE 4.2-3 - SHEET 1

Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

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Biological Study Area

Trees

- American Elderberry (*Sambucus canadensis*)
- Bailey Acacia (*Acacia baileyana*)
- Black Cottonwood (*Populus trichocarpa*)
- Black willow (*Salix nigra*)
- Box Elder (*Acer negundo*)
- California Sycamore (*Platanus racemosa*)
- Coast Live Oak (*Quercus agrifolia*)
- Evergreen Ash (*Fraxinus uhdei*)
- Southern California Black Walnut (*Juglans californica*)
- Spotted Gum (*Corymbia maculata*)
- Sugar Gum (*Eucalyptus cladocalyx*)
- White Alder (*Alnus rhombifolia*)
- White Ironbark (*Eucalyptus leucoxylon*)



SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

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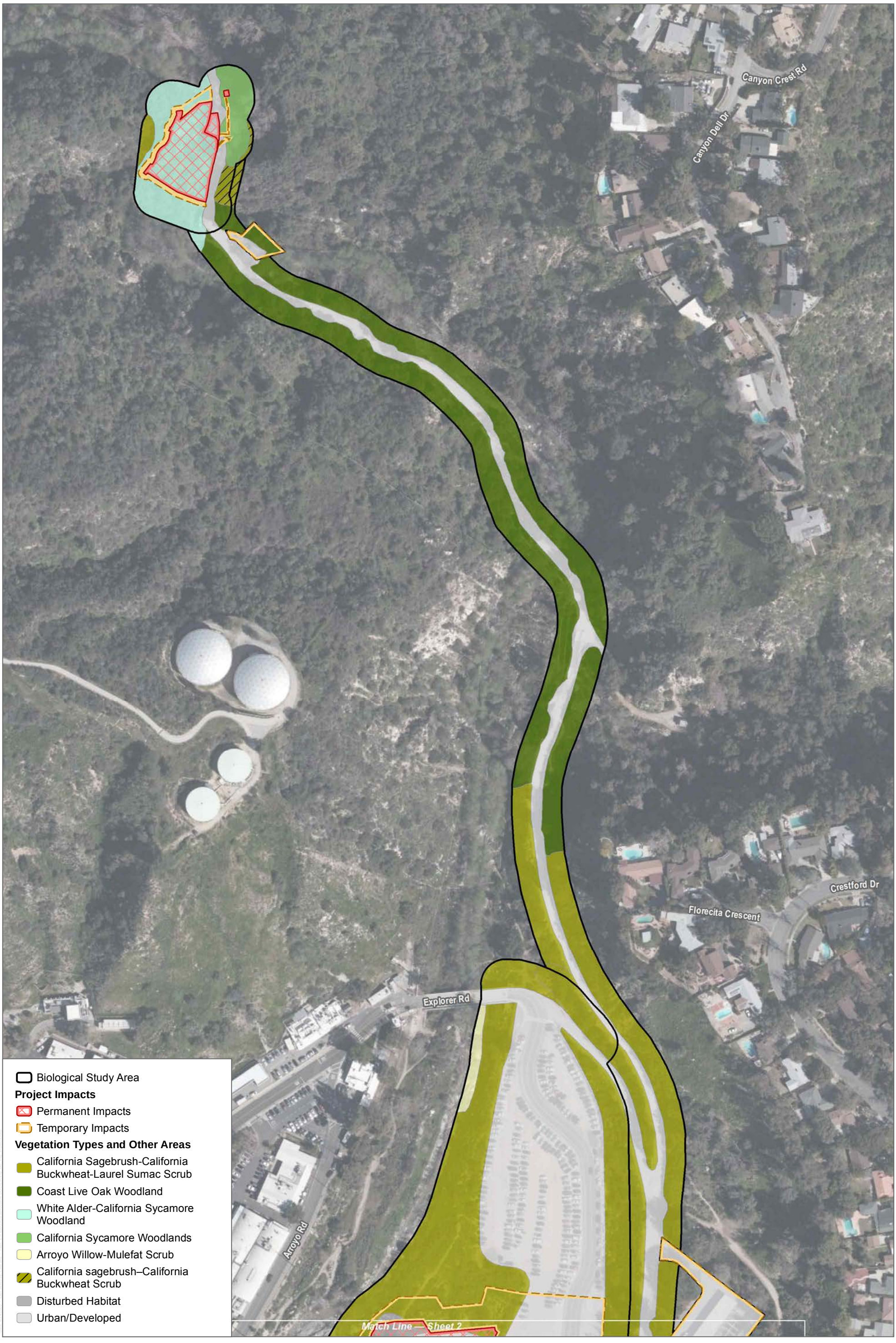
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FIGURE 4.2-3 - SHEET 2

Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

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FIGURE 4.2-4 - SHEET 1

Impacts to Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

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FIGURE 4.2-4 - SHEET 2

Impacts to Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

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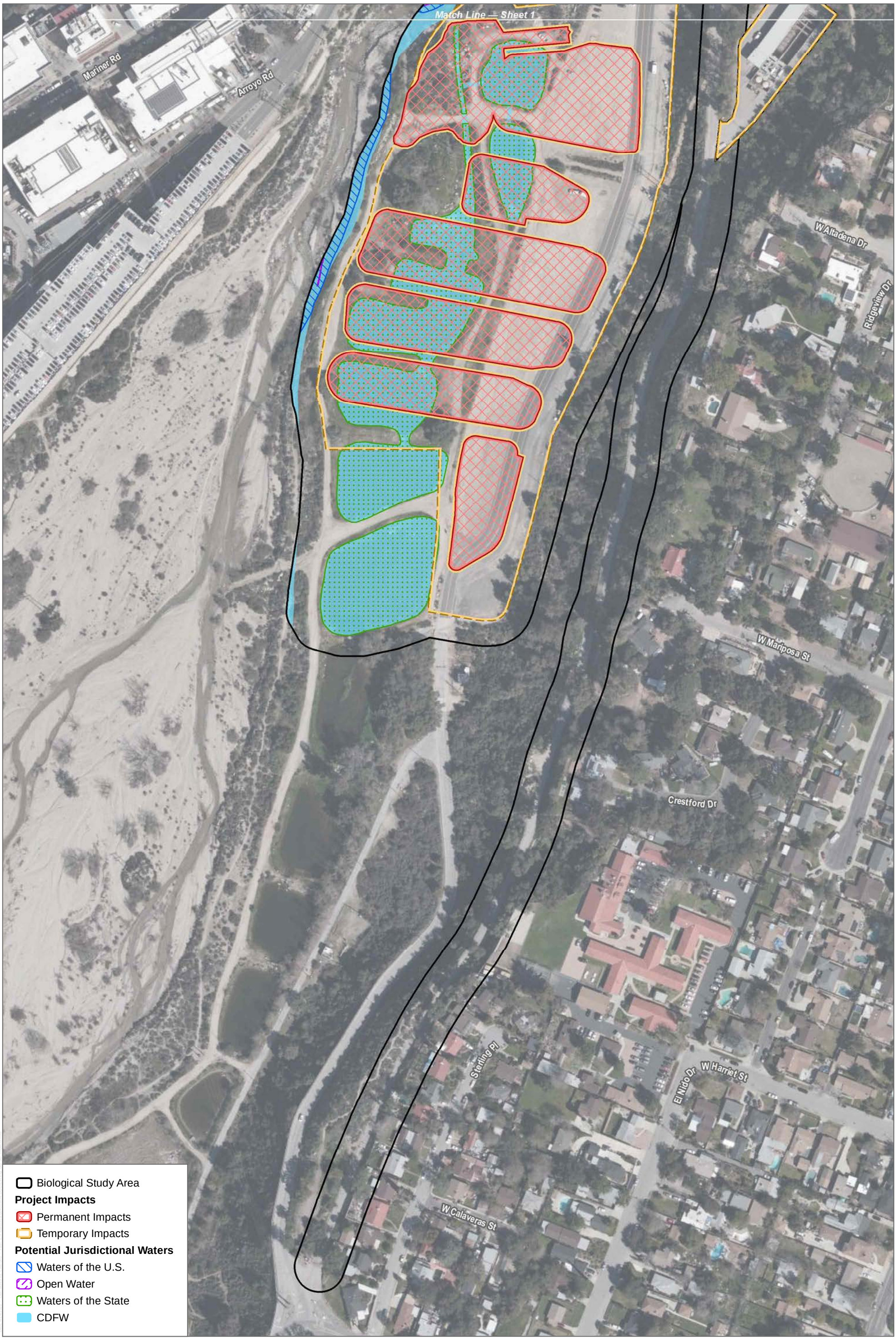
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FIGURE 4.2-5 - SHEET 1

Impacts to Potential Jurisdictional Waters

Biological ResourcesArroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

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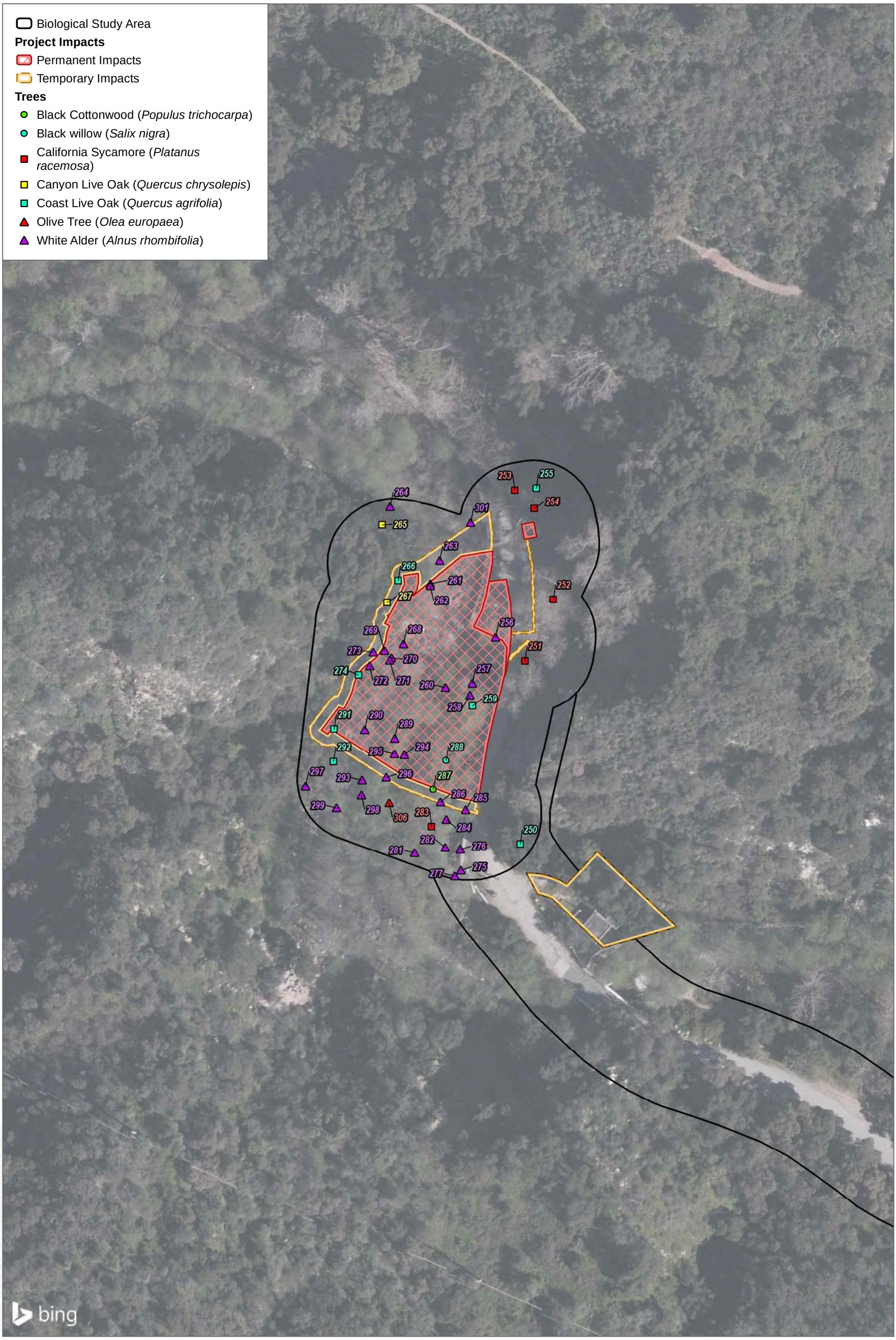
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FIGURE 4.2-5 - SHEET 2

Impacts to Potential Jurisdictional Waters

Biological ResourcesArroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

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FIGURE 4.2-6 - SHEET 1

Impacts to Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

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Biological Study Area

Project Impacts

Permanent Impacts

Temporary Impacts

Trees

- American Elderberry (*Sambucus canadensis*)
- Bailey Acacia (*Acacia baileyana*)
- Black Cottonwood (*Populus trichocarpa*)
- Black willow (*Salix nigra*)
- Box Elder (*Acer negundo*)
- California Sycamore (*Platanus racemosa*)
- Coast Live Oak (*Quercus agrifolia*)
- Evergreen Ash (*Fraxinus uhdei*)
- Southern California Black Walnut (*Juglans californica*)
- Spotted Gum (*Corymbia maculata*)
- Sugar Gum (*Eucalyptus cladocalyx*)
- White Alder (*Alnus rhombifolia*)
- White Ironbark (*Eucalyptus leucoxylon*)



SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

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FIGURE 4.2-6 - SHEET 2

Impacts to Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

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4.3 Cultural Resources

4.3.1 Methodology

This section describes the existing conditions of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential environmental impacts, and identifies mitigation measures related to implementation of the proposed Project. The analysis of the Project impacts related to cultural resources is based on a review of existing resources and applicable laws, regulations, and guidelines, as well as the following:

Appendix E-1 Cultural Resources Technical Report for the Arroyo Seco Canyon Project Areas 2 and 3, prepared by Dudek, dated June 2020.

Appendix E-2 Vertebrate Paleontology Records Check, prepared by the Natural History Museum of Los Angeles County, dated October 2020.

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

4.3.2 Existing Conditions

The Project site is located at 3420 to 3500 North Arroyo Boulevard within the Arroyo Seco Canyon adjacent to North Arroyo Boulevard and the Gabrielino Trail, located in Township 1 North, Range 12 West on the Pasadena, California 7.5′ USGS quadrangle map. Figure 4.3-1, Records Search Study Area, depicts the 0.5-mile records search radius overlaid on the USGS quadrangle map.

Project Site History

A complete discussion of the prehistory period, ethnographic period, and historical period may be found in Appendix E-1 of this Draft EIR. The Report includes a California Historical Resources Information System (CHRIS) records search; coordination with the California Native American Heritage Commission (NAHC) and tribal contacts; he results of a pedestrian survey of the Project site by a qualified architectural historian; building development and archival research, development of an appropriate historic context for the Project site; and recordation and evaluation of five commercial properties over 45 years old for historical significance and integrity in consideration of National Register of Historic Places (NRHP), California Register of Historical Resources (CRHR), and City of Pasadena designation criteria and integrity requirements.

Building development and archival research were conducted for the Project site in an effort to establish a thorough and accurate historic context for the significance evaluations, and to confirm the building development history of the Project site and associated parcels. Archival research included historic aerial photographs, historical newspapers, reviewing Los Angeles County Assessor records, Pasadena Digital History Collection, and the City of Pasadena's California Historical Resources Inventory Database (CHRID).

Arroyo Seco Canyon Developments (1887-present)

The Project site is located within the Hahamongna Watershed Master Plan Area, within the larger Arroyo Seco which also includes the Central and Lower Arroyo Seco Master Plan Areas. The Arroyo Seco Canyon was used as a prehistoric through-route for the Hahamong'nas (a band of native Tongva people), connecting the area that is now Hahamongna Watershed Park to trade partners to the north. The canyon continued to be a source of water, recreation, and travel route well into the nineteenth century. As early as 1887, the City of Pasadena and citizens were recognizing the Arroyo Seco as a whole for its benefits as a park. At the turn of the twentieth century, Arroyo Seco enjoyed a long period of recreational development, such as at Camp Oakwilde, a rustic resort constructed in 1911, and several private and public cabins throughout the canyon. In 1911, the City of Pasadena annexed the lower and middle sections of the Arroyo Seco, and in 1919, the area now known as Hahamongna Watershed Park was annexed to the city (City of Pasadena 2019).

With the recreation movement taking hold in the Arroyo Seco, and the Arts and Crafts Movement (1895-1920) influencing building and landscape architecture at large in southern California, the area within and around the Arroyo Seco developed several unifying features that were consistently used throughout the Arroyo Seco canyon area, including parks, trails, landscaping features, neighborhoods, and civic structures. These included the emphasis on the natural environment and use of native cobblestone in walls, gates, and fences, especially as accents to pedestrian walkways and roads that might otherwise have a utilitarian appearance. Native rock cobblestone walls also complemented the larger Arts and Crafts-style residential architecture of Pasadena (Bricker et al. 1992; City of Pasadena 2003a).

A road through Arroyo Seco Canyon has been visible on maps since the 1894 "Los Angeles, Calif." topographical map of the area. This earliest topographical map of the area shows the road extending between the Los Angeles Terminal Railroad Line and a mountain hamlet called Las Casitas before looping back west and south to La Cañada, following an older trail forged by the native Gabrielinos. Arroyo Seco Canyon Road, also known as Arroyo Boulevard, was paved for use as a county highway c. 1920, during which time Bridge No. 2 was constructed as a necessary improvement along the Arroyo Boulevard/Gabrielino Trail. Bridge No. 2 appears on the very first available aerial map from 1927, as well as other smaller bridges along the road and at the mouth of the canyon. A secondary spur road, leading east from the Bridge No. 1 crossing location, is also present on aerial photos as early as 1927. At the end of this spur road was a square-plan, river cobble-clad building on a concrete platform and a small, concrete diversion dam. Both of these structures are located outside of the Project site (LAT 1919; USGS 2019).

The Arroyo Seco road appears improved by bridges in the earliest available aerial photograph from 1927; however, subsequent floods in 1934 and 1938 appear to obliterate the road and bridges in the canyon, with the exception of Bridge No. 2. The road between Devil's Gate Dam and Oak Wilde, a forest community some 4 miles up Arroyo Seco Road, remained closed until 1939, the same year local Civilian Conservation Corps (CCC) Company 903 constructed Bridge No. 3. Despite the CCC improvements, the City of Pasadena road section outside of U. S. Forest Service lands was not officially repaired until 1941 (LAT 1938, 1940a, 1940b; Pasadena Star News 1939).

Local CCC Company 903 was assigned to the USFS in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great

Depression. By June 1, 1933, over 1,400 working camps were established, employing more than 300,000 men, representing the most rapid peace-time mobilization in U.S history. Working on projects for the U.S. Forest Service, the National Park Service, and the Departments of Agriculture and Interior, CCC workers fought forest fires, planted trees, cleaned and maintained access roads, re-seeded grazing lands, implemented soil erosion controls, and built wildlife refuges, fish-rearing facilities, animal shelters, and water storage basins. Roosevelt also authorized the CCC to build bridges and campground facilities in an effort to encourage people to go enjoy America's natural resources.

The CCC planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems (History.com 2010). In 1941, the Arroyo Seco Project, part of a Los Angeles River watershed upstream work project, began with the Millard Canyon channel and road improvement project. A joint effort between USFS and the City of Pasadena engineers, the improvements in Millard Canyon entailed channel improvements and creating a new road cut above the channel bed with a "seven foot wall of native rock" (Pasadena Post 1941a:17). The stretch of road to be improved by the retaining walls and barriers was described as above Devil's Gate Dam, and below the Brown Mountain truck trail turn off. The road improvements were in support of the larger goal of the watershed upstream work project: to build the Brown Mountain Dam near Arroyo Seco headwaters as a means of flood control. When the upstream project was completed, the City entered into a contract with the USFS to share costs of maintenance and patrols for the sections of Arroyo Seco and Millard Canyon that were in City of Pasadena Land, but adjacent to USFS land. Improvements are also visible in aerial photographs between 1938 and 1944, such as the construction of Bridge No. 1, road pavement, and the construction of native rock retaining walls and barriers (Pasadena Post, 1941a, 1941b; Pasadena Star News 1941, 1944; UCSB 2019).

Screen Building Complex (c. 1932-1944)

The Screen Building Complex consists of the screen building (formerly known as the Chlorine Plant, per as-built drawings), intake structure, and a flashboard dam/weir. The screen building is identified on 1932 as-built plans for the Arroyo Seco Headworks (Work Order 2802, Pasadena Water Department 1932), indicating that it was constructed around this time. As such, it is likely that these components were constructed by the CCC during their Arroyo Seco improvements campaign in the 1930s. A flashboard dam/weir was also part of this as-built drawing set, and was constructed at this location in 1932. It is possible that an earlier weir, dam, or pipeline preceded its construction, but this could not be verified in archival research, including aerial photographs or historical maps. An image of the weir from March 5, 1937, shows that there was a modest concrete structure with angled buttresses and a paved horizontal surface downstream, leading to a short drop off to the natural streambed. The drop off aligns with retaining walls on either end. A concrete wing wall lines the cut bank side of the stream where the weir meets it, and a small concrete platform (the top deck of the intake structure) rests adjacent to the wing wall on mounded soil. The 1938 historic aerial image shows the devastation wrought by flooding that year; the screen building is visible, but the c. 1932 weir appears to have been destroyed. In the next 1944 historic aerial image clearly shows the screen building, intake structure, and a new weir. The new weir, visible in the 1944 aerial photograph, is of a different design than the 1932 weir, and a cobblestone wall is visible rising from the original retaining wall on the right (east or cutbank) side of the weir. The cobblestone wall supports a concrete platform, of which the original rectangular concrete platform is incorporated, indicating extensive repairs and/or additional damage during later flood events.

Debris Basins and Flood Control Infrastructure (1948)

Flood control in Arroyo Seco began after the especially costly 1914 and 1916 floods damaged large portions of Los Angeles County farmland and urban areas. In 1915, the LACFCD was established in response to the in 1914 flood, and would protect an area of 2,760 square miles. Investment was initially delayed by the onset of World War I, but the first flood control feature built in the Arroyo Seco was the Devil's Gate Dam: designed in 1916, funded by bonds in 1917, and erected by Los Angeles County Department of Public Works by 1920 (Brick 2011; Pasadena Star News 1916; SB&C 1919; Van Wormer 1991).

The City of Pasadena, which had water rights to Arroyo Seco, began a spreading program in Arroyo Seco in 1914 to replenish the Raymond Basin aquifer; however, the program was abandoned in 1924 due to drought. The remnants of the 1914 spreading basins were washed out in 1936 when the Arroyo Seco stream changed its course to the east side of the Arroyo. Historic aerial photographs and maps indicate that the LACFCD-owned spreading grounds were installed in 1948, as a result of a 1940 push to build upstream flood control features in the Angeles National Forest. $1.17 million was used towards the establishment of silt and debris check dams on the upstream side of the Devil's Gate reservoir and the Brown Mountain Dam. The first funding installment was approved in 1941 and another in 1944, resulting from the 1944 storm and subsequent flood. Federal funds also went to the channelization of Arroyo Seco Canyon further downstream of Devil's Gate Dam By 1952, the Los Angeles County-owned Altadena Storm Drain and sheds were completed as well. The PWP-owned sludge basins were added in the 1970s, after the construction of the Behner Water Treatment Plant (Brown and Taylor 1982; City of Pasadena 2003b; ETA 1941; LAT 1940c, 1946; SCPR 2016; UCSB 2019; Van Wormer 1991).

John L. Behner Water Treatment Plant (1971)

The John L. Behner Water Treatment Plant (Behner WTP) was named after the first General Manager of the consolidated Pasadena Water and Power Department (PWP). Located in the Arroyo Seco Canyon east of JPL, the plant had a capacity of 5 million gallons per day. The project, which began as the result of a PWP feasibility study in 1967 decided on the current location. Originally, the Metropolitan Water District (MWD) identified the Upper Arroyo Seco as a location for their new MWD water treatment plant; however, they received backlash from Pasadena citizens using the area as a park. As a result, the City of Pasadena moved forward with their plan for a smaller water treatment plant facility, and a county regional park at the same time. The push was successful, and the PWP's plant was designed by Pasadena-based engineering firm James M. Montgomery, Consulting Engineers Inc. and constructed by the Margate Construction Company in 1970 and dedicated in 1971. However, new water treatment regulations imposed as a result of the Surface Water Treatment Rule meant that the treatment plant was shut down in June 1993. Another feasibility study on the potential for upgrading the facility was conducted in 1995, but the Behner WTP remains offline to this day (City of Pasadena 2010, 2012; LAT 1968; PI 1971).

Architectural Style- Brutalism

Only one resource within the Project site was designed in a clear architectural style: the Behner WTP, which exhibits numerous character-defining features of the Brutalist style.

The term "Brutalism" derives from the French *béton brut*, which translates as raw concrete, and describes concrete that displays the patterns, seams, and bug holes caused by formwork and concrete emplacement. The Brutalist architectural style is characterized by its use of raw building materials in a very direct and imposing way, emphasizing bulky forms and sharp angles with limited visible glass surfaces. A popular style between the 1950s and 1970s, Brutalism favored heavy, solid shapes cast with highly detailed and textured reinforced concrete. Often associated with High Modernism, a style emphasizing austere and abstract forms rooted in science and technology, the bold, unapologetic design and monumentality of Brutalism makes it an easy target for criticism, and it is thought to be one of the most divisive styles of architecture to emerge since the beginning of the twentieth century (Lowder 2013; McAlester 2015; Mindel 2016).

Brutalism was a popular style of architecture for educational buildings, particularly university buildings, but was relatively rare for corporate and single-family residential projects. It was also favored for civic projects, high-rise apartments, and shopping centers, as the style emulated strength, functionality, and an appreciation for material simplicity (Brutalism Online 2016). Character-defining features of Brutalism include (City of San Diego 2007; HRG & PH 2007):

- Exposed, expressive structural system
- Rough, unadorned concrete construction
- Monumental massing
- Heavy blockish shapes
- Angular and rectilinear forms
- Prefabricated concrete panels with exposed joinery
- Windows as voids in an otherwise solid volume
- Repetitive patterns
- Avoidance of traditional elements or ornament
- Raised plazas and base articulation

Engineer: James M. Montgomery, Consulting Engineers, Inc. (1945-1990)

The Behner WTP was designed by engineer James M. Montgomery (1896-1969). Montgomery was born in Ohio in 1896, and moved to Los Angeles California by 1910. He briefly served in the military during World War I, and was honorably discharged in October 1918. Montgomery returned to Newark, Ohio for a few years, but eventually moved back to Los Angeles Between 1935 and 1940. Montgomery launched his engineering firm in 1941, after having some success in helping design the F.E. Weymouth Memorial Water Softening and Filtration Plant in 1936 with MWD. This early connection with water infrastructure led to a career of consulting, studies, reports, and designing water infrastructure systems for Southern California and the greater West Coast of the United States for the next five decades. The firm was based in Pasadena for the first few decades. James Montgomery himself passed away in 1969, but his firm continued consulting work focused on water infrastructure. In 1990, the James M. Montgomery, Consulting Engineers, Inc. firm merged with Watson Hawksley, Ltd of the United Kingdom to become Montgomery-Watson. In 2001, Montgomery Watson merged with Harza Engineering and became Montgomery Watson Harza. This name was shortened to MWH Global in 2003. In 2016, MWH was acquired by Stantec Consulting, Inc. (Ancestry 2019).

Built Environment Resources Identified in the Project Site

Dudek Architectural Historian Kate Kaiser, MSHP and Nicole Frank, MSHP, conducted a pedestrian survey of the Project site for historic built environment resources on October 23, 2019. The survey entailed walking to each affected property in the Project area: the PWP spreading basins, the LACFCD flood control infrastructure, Southern California Edison (SCE) transmission line route, Behner WTP, the Arroyo Seco Road bed within and between all proposed Project areas, the three bridge sites, the screen building, and the intake structure and weir. Below is a discussion of the identified historic-age resources.

John L. Behner Water Treatment Plant

The Behner WTP is a one-story Brutalist-style civic building, rectangular in shape, with a flat roof, designed by James M. Montgomery, Consulting Engineer, Inc. of Pasadena, and built in 1971. Exterior walls are exposed concrete with limited fenestration. The design emphasizes horizontality in form, but with strong vertical accents: simple, unadorned, rectangular concrete pilasters flank each narrow window/panel; broad concrete pilasters flank the entry door; and repetitive patterns of vertically-oriented rectilinear forms. A tall, monolithic concrete wall, with a broad band of vertically-oriented rectilinear forms creating a repetitive pattern, blocks view of the southern portion of external water treatment facilities to the east of and adjacent to the building. The external water treatment facilities comprise a series of open concrete tanks, with water flow controlled by a pair of wood flood gates, and a pair of moderately-sized, cylindrical above-ground tanks.

Screen Building Complex

The Screen Building Complex (formerly known as the Chlorination Plant) consists of the screen building built c. 1932, a weir built c. 1938, and an intake structure built c. 1938. The screen building is an L-shaped, flat-roofed concrete building of utilitarian design. A narrow drip edge runs along the walls below what appears to be a short parapet wall. Fenestration includes two flush single-leaf entry doors, a roll-up garage door, and five windows obscured by metal screens. A vertical metal ladder attached near one of the entry doors provides access to the roof. An elevated rectangular concrete open-air tank structure, with a large piece of mechanical equipment bolted over half of the structure and accessed by three metal steps, sits to the left of and slightly in front of the screen building. A rectangular arch constructed from metal I-beams, with the two uprights supported with angled I-beams on the front and back of the arch, is located in front of the garage door. The weir is a combination of mortared stone and poured-in-place concrete with at least one wood sluice gate, although access was limited during survey due to vegetation and debris. A cobblestone wall rises from the original retaining wall on the right (east or cutbank) side of the weir and supports a concrete platform, the top deck of the intake structure, into which the original rectangular concrete platform is incorporated and expanded.

Bridge No. 1

Bridge No. 1 is depicted in Figure 2-4B, Gabrielino Trail/Access Road Existing Conditions Photographs in Section 2, Environmental Setting of this Draft EIR. Bridge No. 1 appears to be a two-span box culvert bridge, with the bridge supported on either end by a cobblestone abutment wall and in the middle by a cobblestone wall. The abutments and center wall may be concrete clad with mortared cobblestones, or built as load-bearing cobblestone masonry walls. The bridge deck appears to be supported by a metal plate(s) that rests upon the cobblestone walls. An approximately 18-inches-tall band of mortared cobblestone rests on the upstream and

downstream edges of the metal plate(s), with the bridge deck coated in tarmac. A new temporary bridge with concrete access ramps passes across the deck of Bridge No.1. Aerial images indicate a bridge crossing over Millard Canyon existed at the same location prior to 1927. Archival research indicates that the original bridge was either damaged or destroyed by the 1938 floods, and replaced with the existing two-span box culvert bridge either during a CCC repair campaign in 1939 or as part of the 1941 Arroyo Seco Program. A previous report identified the bridge deck as being replaced with a "similar reinforced concrete span" in 1979, and that river rock was applied to both sides of the deck at the time to "visually integrate it with the existing river rock-clad bridge components" (Daly 2014). Comparison of photographs taken in 2019 during the site visit with those included in a 2015 report indicate that the bridge deck was coated with a layer of tarmac c. 2017, prior to installing the temporary bridge (TJC & Associates 2015).

Bridge No. 2

Bridge No. 2 is depicted in Figure 2-4B and is a board-formed concrete arch bridge, with board-formed concrete abutments and a subtle four-point arch, spanning the Arroyo Seco, constructed circa 1920. Rectangular concrete railings border the upstream and downstream edges of the bridge deck, with openings between upper and lower rails sporting a row of classically shaped single balusters resembling the form of a flower bud from a pomegranate tree. The bridge deck is covered with tarmac.

Bridge No. 3

Bridge No. 3 is depicted in Figure 2-4B and is a wooden kingpost truss bridge, with heavy timber supports braced by a vertical metal rod and angled wood beam braced on a cantilevered timber girder. Timber railings line both side of the bridge deck, and board-formed concrete retaining walls support either end of the bridge. A metal plaque attached to one end of the southern retaining wall indicates the wood bridge was erected in 1939 by "C.C.C. Company 903 – U.S.F.S. in cooperation with Pasadena Water Department." A temporary bridge deck is positioned directly above the original wood bridge. The temporary bridge was initially installed to accommodate the loading from heavy equipment needed during construction of the Arroyo Seco Canyon Project that would be beyond the capacity of the original Bridge No. 3. However, as the condition of the original bridge has continued to deteriorate and is no longer safe for use, the temporary structure allows for continued passage into the canyon and access to the USFS compound by isolating traffic weight and movement from affecting the older wood bridge. The temporary bridge deck is built with anti-skid steel decking supported by steel I-beam girders, and is bolted through wood sill plates into the top of the original bridge's concrete retaining walls. Sloped, poured-in-place concrete ramps provide access to the temporary bridge deck at either end. Tubular metal railings line each side of the temporary bridge deck and concrete access ramps.

Flood Control Infrastructure

Flood control infrastructure at the upstream end of the spreading basins consists of two LACFCD-owned sheds to either side of a County-owned concrete storm drain box structure, called the Altadena Storm Drain, with pulley operated components and a concrete and metal check dam. Each shed is a square plan gable fronted building, with horizontal wood board cladding, and rolled composition roofing, on a concrete slab foundation. The doors are both located on the south elevations and consist of vertical wood board doors, braced on the interior. Other fenestration consists of screened window openings and a louvered vent in the gable end. The two sheds are to either side of the storm drain box structure with three openings on the top side, and letting out via culvert into the Arroyo Seco.

The PWP spreading basins consist of, two spreading basins (Pasadena Ponds 1 and 2) formerly used as sludge ponds during operation of the Behner WTP, and 14 additional spreading basins (originally developed by

LACFCD) separated by check dams completed between 1948 and 1952. Spreading basin features are engineered earthen ponds separated by soil embankments and small wood and concrete flow control dams. Each basin varies in total size and depth (Figure 34). The Pasadena Ponds 1 and 2 also have buried concrete culverts between them and the Parshall Flume, as well as chain link fence surrounding them.

A flow control dam is located west of the westernmost shed. Situated in a naturalized channel, west of the Altadena Storm Drain, the flow control dam consists of two walls of wood cribbing, and a wood board dam in the center, with removable boards in a metal track in order to control flow in the narrow channel. The downstream side of the channel has had a gunite mixture applied to the channel walls. On the east side of the dam, is a concrete platform, stair and metal handrail. On the west side of the dam, are two corrugated metal canisters, one lidded with flat metal and the other with conical metal.

Finally, downstream of the flow control dam, there is a culvert and vehicle bridge through which water is measured (via a Parshall Flume) before it flows into the spreading basins. The culvert has two 18-inch openings in the channel basin. The roadbed is filled with gravel, but the culvert is constructed of board-formed concrete, with metal lining, and metal guard rails on top for safety. There is also a corrugated galvanized steel tank with a conical lid placed on a concrete platform on the upstream side of the culvert. The tank is currently used to house the controls for the Parshall Flume's metering device.

CHRIS Records Search

A CHRIS records search was conducted for the Project site and surrounding 0.5-mile records search area at the South Central Coastal Information Center (SCCIC), located on the campus of California State University, Fullerton on October 3, 2019. This search included their collections of mapped prehistoric, historic, and built environment resources, Department of Parks and Recreation Site Records, technical reports, and ethnographic references. Additional consulted sources include historical maps of the study area, the NRHP, the CRHR, the California Historic Property Data File, the lists of California State Historical Landmarks, California Points of Historical Interest, and the Archaeological Determinations of Eligibility.

Previously Conducted Cultural Resources Studies

The SCCIC records indicate that 35 cultural resources investigations have been conducted within 0.5-mile of the Project site. Of these, six studies were conducted within a portion of the Project site, (LA-01903, LA-06948, LA-08927, LA-11042, LA-11193, and LA-11194), and one study (LA-01312) was adjacent to the Project site. Table 4.3-1, below, summarizes the six previous cultural resources studies that overlap or were adjacent to the Project site, followed by a brief summary of each study that overlaps or is adjacent to the Project.

Table 4.3-1. Previous Cultural Resources Investigations Within 0.5-Mile of the Project site

SCCIC Report Number	Title	Author	Year	Proximity to Project site
LA-01312	Archaeological Reconnaissance Report: Fuel Break System for the Crest-Millard Fuel Management Unit	Bridgewater, John W.	1976	Adjacent
LA-01903	Preliminary Assessment of the Prehistoric Cultural Resources of the Devil's Gate Reservoir, Pasadena, California	Blodgett, Leslie M	1987	Overlaps

Table 4.3-1. Previous Cultural Resources Investigations Within 0.5-Mile of the Project site

SCCIC Report Number	Title	Author	Year	Proximity to Project site
LA-06948	Archaeological Survey Report Southern California Edison Seco 16 Kv Circuit Deteriorated Pole Replacement Project	Romani, John F.	2002	Overlaps
LA-08927	A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Sunset Overlook Trailhead Area of the Hahamongna Watershed Park in the City of Pasadena, Los Angeles County, California	McKenna, Jeanette A.	2007	Overlaps
LA-11042	A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Eastside Neighborhood and JPL Connector Trail Improvements Project Area in the Hahamongna Watershed Park, City of Pasadena, Los Angeles County, California	McKenna, Jeanette A.	2009	Overlaps
LA-11193	Sunset Overlook Trailhead Area in Hahamongna Watershed Park, Master EIR Initial Study Environmental Checklist	Bellas, John	2007	Overlaps
LA-11194	Hahamongna Watershed Park Master Plan, A Component of the Arroyo Seco Master Plan	Unknown	2002	Overlaps

Source: Appendix E-1

LA-01312

In 1976, John Bridgewater of the Saugus Ranger District conducted an Archaeological Reconnaissance Report (ARR) for Crest-Millard Fuel Management Unit on locations in Arroyo Seco and Tujunga Districts. The resulting report, *Fuel Break System for the Crest-Millard Fuel Management System*, studied dispersed sections of the Angeles National Forest potentially affected by the maintenance and expansion of a fuel break system. The study area included an Area of Potential Effect (APE) that extended to the first major ridge in the San Gabriel Mountain north of the area between the foothill cities of Tujunga and Pasadena, roughly adjacent to the current Project site. One prehistoric site was identified within the vicinity of the APE (P-19-000342) as a result of the records search and field survey, however, it was determined that it would only be impacted if future plans pushed construction north of the Vasquez Break. A site survey record from 1965 for P-19-000342 was attached to Mr. Bridgewater's report which included surface survey of a general village site, identification of a cogstone, milling stones, and interviews of the property owners who attested to a purported village having existed according to the local cultural memory.

LA-01903

In 1987, Leslie Blodgett was contracted by Cotton/Beland and Associates to prepare an Archaeological Survey Report in support of repair and reuse of the Devil's Gate Reservoir, in the City of Pasadena. The study area consisted of the reservoir property located directly north of the I-210 Foothill Freeway and directly south of the Cal Tech Jet Propulsion Laboratory. The study area overlapped a portion of the current Project site at Area 3. The resulting report, *Preliminary Assessment of the Prehistoric Cultural Resources of the Devil's Gate Reservoir, Pasadena, California* (Blodgett 1987), consisted of a records search and pedestrian survey. No prehistoric cultural resources were identified within the study area as a result of the archival review and field

inspection. However, the records search identified two prehistoric sites within 1-mile of the study area: the aforementioned P-19-000342 purported village site, and P-19-000026, known as the Sheldon Reservoir site, which consists of a multi-level prehistoric graveyard. As a result of these findings, the study area was determined archaeologically sensitive given the close proximity of these sites to the study area.

LA-06948

In 2002, Southern California Edison Company (SCE) retained Compass Rose Archaeological, Inc. to conduct a Phase I Inventory in support of the proposed replacement and relocation of two deteriorated H-frame structures on the Seco 16 kV circuit. One structure location is within the current Project site. The study impact areas consisted of individual structure locations and a 30-meter diameter surrounding each structure. No prehistoric or historic-age cultural resources were identified within the impact areas as a result of the CHRIS records search and pedestrian survey. The resulting letter report, *Southern California Edison Seco 16 kV Circuit Edison Company Circuit Deteriorated Pole Replacement Project*, stated that no further cultural resources considerations were warranted for the project aside from standard management recommendations for the unanticipated discovery of cultural resources uncovered during construction activities.

LA-08927

In 2007, Willdan retained McKenna et. al. to conduct a cultural resources study in support of the Arroyo Seco Master Plan Project with improvements to the Sunset Overlook Trailhead area located at Windsor Avenue within the Hahamongna Watershed Park in the City of Pasadena. The project consisted of improvements to the parking lot, as well as the widening of the trailhead, extending to where the Gabrieleno Trail meets the Sunset Overlook, overlapping the southern portion of the current Project site. The study consisted of a CHRIS records search, Native American coordination, and a pedestrian survey. No cultural resources were identified within the study area as a result of the records search and pedestrian survey. However, based on communications with the Gabrielino/Tongva Tribe, the Tribe considers the area of Arroyo Seco sensitive for the presence of cultural resources of Native American origin. The resulting letter report, *A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Sunset Overlook Trailhead Area of the Hahamongna Watershed Park in the City of Pasadena, Los Angeles County, California*, stated that the study area should be considered moderately sensitive for the presence of prehistoric archaeological resources and provided recommendations for archaeological monitoring during construction.

LA-11042

In 2009, Willdan retained McKenna et. al. to conduct a cultural resources study in support of the Eastside Neighborhood and JPL Connector Trail Project with improvements to all trail-ways north of Devil's Gate Reservoir in the Arroyo Seco area west of the City of Pasadena. Specifically, the study area included approximately 1619 linear feet of trail improvements between the City of Altadena (from the terminus of Altadena Drive) and Hahamongna Watershed Park, overlapping a portion of Area 3 within the current Project site. The study consisted of a CHRIS records search, Native American coordination, and a pedestrian survey. No cultural resources were identified within the study area as a result of the records search and pedestrian survey. However, based on communications with the Gabrielino/Tongva Tribe, the Tribe considers the area of Arroyo Seco sensitive for the presence of cultural resources of Native American origin. The resulting letter report, *A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Eastside Neighborhood and JPL Connector Trail Improvements Project Area in the*

Hahamongna Watershed Park, City of Pasadena, Los Angeles County, California, stated that the study area should be considered moderately sensitive for the presence of prehistoric archaeological resources and provided recommendations for archaeological monitoring during construction.

LA-11193

In 2007, the City of Pasadena, Parks and Natural Resources Division prepared a Master EIR Initial Study in support of the Sunset Overlook Trailhead Area in Hahamongna Watershed Park. Details of this project were discussed above in SCCIC report LA-08927. The Initial Study published the results of the McKenna et.al. 2007 study, which determined that the study area is sensitive for the presence of Native American cultural resources, and provided mitigations for archaeological monitoring.

LA-11194

In 2002, the City of Pasadena, Parks and Natural Resources Division prepared the Hahamongna Watershed Park Master Plan. The Hahamongna Watershed Park overlaps the southern portion of the current Project site. The document referenced the Blodgett (1987) study discussed above in SCCIC report LA-01903, which stated that although no prehistoric cultural resources were identified within the Hahamongna Watershed Park as a result of a records search and pedestrian survey, the presence of two known prehistoric sites within the vicinity of the park suggests that the area is sensitive for the presence of prehistoric cultural resources.

Previously Recorded Cultural Resources

The CHRIS records indicate that one previously recorded resource (P-19-189942) overlaps the Project site, and one resource (P-19-186535) is adjacent to the Project site. Resource P-19-189942 consists of the Hahamongna Watershed Park and associated recreational facilities. The resource was previously determined ineligible for the CRHR, and is therefore not considered an historical resource. Resource P-19-186535 consists of the Angeles National Forest, a registered California Historical Landmark. The Project is not anticipated to impact this resource.

Thirteen additional previously recorded cultural resources are within 0.5-mile of the Project site. Of these, two consist of prehistoric archaeological resources, including P-19-000342, the purported village site discussed above in SCCIC report LA-01312, and an isolated granitic discoidal recovered from fill material. There is one multi-component resource consisting of multiple loci of sparse prehistoric lithic scatters, as well as a historic-era domestic refuse scatter and purported historic-era burial from the late 1800s. There are two historic-era archaeological resources consisting of a granite headstone fragment from 1865, which is associated with the multi-component site, and the remnants of an early twentieth century campground known as Teddy's Outpost. None of these prehistoric or historic-era archaeological resources have been evaluated for the NRHP or CRHR.

Additionally, there are eight built environment resources within 0.5-mile of the Project site. These resources include the Jet Propulsion Laboratory campus, the registered National Historic Landmark Space Flight Operations Facility and the NRHP eligible Space Simulator, which are both within the Jet Propulsion Laboratory campus; the USDA Forest Service Oak Grove administrative site; two individual buildings within the Arroyo Seco Ranger Station administration site; a USDA Forest Service Road; and the CRHR listed single-family property built in 1924 known as the Buffum House.

Native American Coordination

Dudek contacted the NAHC on September 16, 2019 to request a search of the SLF. Results of the SLF (received October 7, 2019) were positive. The NAHC recommended contacting the Gabrieleño Band of Mission Indians – Kizh Nation for specific information regarding the positive findings. The NAHC also provided contact information for an additional four Native American individuals and/or tribal organizations who may have direct knowledge of cultural resources in or near the Project site; however, the additional four Native American individuals and/or tribal organizations have not, as of the submission of this Draft EIR, contacted the City requesting that the lead agency (City) provide notification to the tribe of projects in the tribe's area of traditional and cultural affiliation. In compliance with Assembly Bill (AB) 52, the City has contacted tribal representatives that have requested to be notified of projects in Pasadena. These efforts are summarized in Section 4.9, Tribal Cultural Resources of this Draft EIR.

Paleontological Resources Setting

The proposed Project site lies within the Transverse Ranges Geomorphic Province (Norris and Webb 1990; California Geological Survey 2002). This geomorphic province structure is east-west trending and is oblique to the normal northwest trend of coastal California. Regionally, the Transverse Ranges extend offshore in the west to include the continental shelf and offshore islands (Santa Cruz, Santa Rosa, and San Miguel) (Norris and Webb 1990; California Geological Survey 2002). Regional mountain ranges in the Transverse Ranges geomorphic province include the San Bernardino Mountains in the east, which have been displaced to the south along the San Andreas Fault. Geologically, these mountains are dominated by Cenozoic sedimentary and Mesozoic igneous rocks that have been folded and faulted by north-south compression that is squeezing the Transverse Ranges (Norris and Webb 1990; CGS 2002).

Dudek requested a paleontological records search though the Natural History Museum of Los Angeles County (LACM) of the proposed Project site and a one-half mile radius buffer on September 17, 2019, and the results were received on October 1, 2019. According to the LACM records search (Appendix E-2; McLeod 2019) and surficial geological mapping by Dibblee and Ehrenspeck (1989) at a scale of 1:24,000, Area 2 of the proposed Project site is underlain by Cretaceous (~ 145 – 65 million years ago) plutonic igneous rocks and Holocene gravel deposits (map unit Qg), and Area 3 is underlain by Pleistocene (~ 2.58 million years ago – 11,700 years ago) alluvial fan deposits (map unit Qof) and Holocene gravel deposits (map unit Qg). The Pleistocene alluvial fan deposits crop out within the eastern extension of Area 3.

The records search results indicated that the LACM has no vertebrate fossil localities from within the proposed Project site boundaries or within the one-half mile radius buffer; however, they do have localities nearby from the same geological units underlying the proposed Project (Appendix E-2; McLeod 2019). LACM 2027, which is the closest vertebrate locality, situated near the Washington Boulevard and Allen Avenue intersection southeast of the proposed Project, yielded a fossil mastodon (*Mammut*) from an unknown depth below the surface. Further southeast, LACM (CIT) 342 produced fossil specimens of turkey (*Parapavo californicus*) and mammoth (*Mammuthus*) from a depth of 14 feet below the ground surface (Appendix E-2; McLeod 2019). Both specimens were documented in the scientific literature: the turkey by Miller (1942) and the rare, nearly complete mammoth by Roth (1984).

4.3.3 Relevant Plans, Policies, and Ordinances

Federal

The National Historic Preservation Act

The NHPA established the National Register of Historic Places (NRHP) and the President's Advisory Council on Historic Preservation (ACHP), and provided that states may establish State Historic Preservation Officers (SHPOs) to carry out some of the functions of the NHPA. Most significantly for federal agencies responsible for managing cultural resources, Section 106 of the NHPA directs that

> [t]he head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP.

Section 106 also affords the ACHP a reasonable opportunity to comment on the undertaking (16 U.S.C. 470f).

36 Code of Federal Regulations, Part 800 (36 CFR 800) implements Section 106 of the NHPA. It defines the steps necessary to identify historic properties (those cultural resources listed in or eligible for listing in the NRHP), including consultation with federally recognized Native American tribes to identify resources with important cultural values; to determine whether or not they may be adversely affected by a proposed undertaking; and the process for eliminating, reducing, or mitigating the adverse effects.

The content of 36 CFR 60.4 defines criteria for determining eligibility for listing in the NRHP. The significance of cultural resources identified during an inventory must be formally evaluated for historic significance in consultation with the ACHP and the California SHPO to determine if the resources are eligible for inclusion in the NRHP. Cultural resources may be considered eligible for listing if they possess integrity of location, design, setting, materials, workmanship, feeling, and association.

Regarding criteria A through D of Section 106, the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, cultural resources, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that:

A. Are associated with events that have made a significant contribution to the broad patterns of our history; or
B. Are associated with the lives of persons significant in our past; or
C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
D. Have yielded or may be likely to yield, information important in prehistory or history [36 CFR 60.4].

The 1992 amendments to the NHPA enhance the recognition of tribal governments' roles in the national historic preservation program, including adding a member of an Indian tribe or Native Hawaiian organization to the ACHP.

The NHPA amendments:

- Clarify that properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined eligible for inclusion in the National Register
- Reinforce the provisions of the Council's regulations that require the federal agency to consult on properties of religious and cultural importance.

The 1992 amendments also specify that the ACHP can enter into agreement with tribes that permit undertakings on tribal land and that are reviewed under tribal regulations governing Section 106. Regulations implementing the NHPA state that a federal agency must consult with any Indian tribe that attaches religious and cultural significance to historic properties that may be affected by an undertaking.

State/Regional

California Register of Historical Resources

In California, the term "historical resource" includes but is not limited to "any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California" (California Public Resources Code Section 5020.1(j)). In 1992, the California legislature established the CRHR "to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (California Public Resources Code Section 5024.1(a)). The criteria for listing resources on the CRHR were expressly developed to be in accordance with previously established criteria developed for listing in the NRHP, enumerated below. According to California Public Resources Code Section 5024.1(c)(1–4), a resource is considered historically significant if it (i) retains "substantial integrity," and (ii) meets at least one of the following criteria:

(1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
(2) Is associated with the lives of persons important in our past.
(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
(4) Has yielded, or may be likely to yield, information important in prehistory or history.

In order to understand the historic importance of a resource, sufficient time must have passed to obtain a scholarly perspective on the events or individuals associated with the resource. A resource less than 50 years old may be considered for listing in the CRHR if it can be demonstrated that sufficient time has passed to understand its historical importance (see 14 CCR 4852(d)(2)).

The CRHR protects cultural resources by requiring evaluations of the significance of prehistoric and historical resources. The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing in the NRHP are automatically listed in the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys.

California Environmental Quality Act

Cultural Resources

As described further below, the following CEQA statutes and CEQA Guidelines are of relevance to the analysis of archaeological, historic, and tribal cultural resources:

- California Public Resources Code Section 21083.2(g) defines "unique archaeological resource."
- California Public Resources Code Section 21084.1 and CEQA Guidelines Section 15064.5(a) define "historical resources." In addition, CEQA Guidelines Section 15064.5(b) defines the phrase "substantial adverse change in the significance of an historical resource." It also defines the circumstances when a project would materially impair the significance of an historical resource.
- California Public Resources Code Section 21074(a) defines "tribal cultural resources."
- California Public Resources Code Section 5097.98 and CEQA Guidelines Section 15064.5(e) set forth standards and steps to be employed following the accidental discovery of human remains in any location other than a dedicated ceremony.
- California Public Resources Code Sections 21083.2(b)-(c) and CEQA Guidelines Section 15126.4 provide information regarding the mitigation framework for archaeological and historical resources, including examples of preservation-in-place mitigation measures; preservation-in-place is the preferred manner of mitigating impacts to significant archaeological sites because it maintains the relationship between artifacts and the archaeological context and may also help avoid conflict with religious or cultural values of groups associated with the archaeological site(s).

More specifically, under CEQA, a project may have a significant effect on the environment if it may cause "a substantial adverse change in the significance of an historical resource" (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(b).) If a site is either listed or eligible for listing in the CRHR, or if it is included in a local register of historical resources or identified as significant in an historical resources survey (meeting the requirements of California Public Resources Code Section 5024.1(q)), it is a "historical resource" and is presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)). The lead agency is not precluded from determining that a resource is an historical resource even if it does not fall within this presumption (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)).

A "substantial adverse change in the significance of an historical resource" reflecting a significant effect under CEQA means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines Section 15064.5(b)(1); California Public Resources Code Section 5020.1(q)). In turn, CEQA Guidelines section 15064.5(b)(2) states the significance of an historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or
2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
3. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

Pursuant to these sections, the CEQA inquiry begins with evaluating whether a Project site contains any "historical resources," then evaluates whether that project will cause a substantial adverse change in the significance of an historical resource such that the resource's historical significance is materially impaired.

If it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (California Public Resources Code Section 21083.2[a], [b], and [c]).

California Public Resources Code Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

Impacts to non-unique archaeological resources are generally not considered a significant environmental impact (California Public Resources Code section 21083.2(a); CEQA Guidelines Section 15064.5(c)(4)). However, if a non-unique archaeological resource qualifies as tribal cultural resource (California Public Resources Code Section 21074(c), 21083.2(h)), further consideration of significant impacts is required. CEQA Guidelines Section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. As described below, these procedures are detailed in California Public Resources Code Section 5097.98.

Paleontological Resources

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under state laws and regulations (CEQA). This report satisfies project requirements in accordance with CEQA (PRC Section 21000 et seq.) and PRC Section 5097.5. This analysis also complies with guidelines and significance criteria specified by the Society of Vertebrate Paleontology (SVP 2010).

Paleontological resources are explicitly afforded protection by CEQA, specifically in Section VII(f) of CEQA Guidelines Appendix G, the Environmental Checklist Form, which addresses the potential for adverse impacts to "unique paleontological resource[s] or site[s] or … unique geological feature[s]" (14 CCR 15000 et seq.). This provision covers fossils of signal importance—remains of species or genera new to science, for example, or fossils exhibiting features not previously recognized for a given animal group—as well as localities that yield fossils significant in their abundance, diversity, preservation, and so forth. Further, CEQA provides that, generally, a resource shall be considered "historically significant" if it has yielded or may be likely to yield information important in prehistory (14 CCR 15064.5 [a][3][D]). Paleontological resources would fall within this category. The California Public Resources Code, Chapter 1.7, Sections 5097.5 and 30244, also regulates removal of paleontological resources from state lands, defines unauthorized removal of fossil resources as a misdemeanor, and requires mitigation of disturbed sites.

California Health and Safety Code Section 7050.5

California law protects Native American burials, skeletal remains, and associated grave goods, regardless of their antiquity, and provides for the sensitive treatment and disposition of those remains. California Health and Safety Code Section 7050.5 requires that if human remains are discovered in any place other than a dedicated cemetery, no further disturbance or excavation of the site or nearby area reasonably suspected to contain human remains can occur until the county coroner has examined the remains (Health and Safety Code Section 7050.5(b)). PRC Section 5097.98 also outlines the process to be followed in the event that remains are discovered. If the coroner determines or has reason to believe the remains are those of a Native American, the coroner must contact the NAHC within 24 hours (Health and Safety Code Section 7050.5(c)). The NAHC will notify the "most likely descendant." With the permission of the landowner, the most likely descendant may inspect the site of discovery. The inspection must be completed within 48 hours of notification of the most likely descendant by the NAHC. The most likely descendant may recommend means of treating or disposing of, with appropriate dignity, the human remains and items associated with Native Americans.

Local

City of Pasadena Historic Preservation Ordinance (Chapter 17.62)

This study was completed in consideration of all sections of the Pasadena Historic Preservation Ordinance (Chapter 17.62). Sections most relevant to this study are provided below.

17.62.010 - Purpose of Chapter

The purpose of this Chapter is to specify significance criteria for the designation of historical resources, procedures for designation, and review procedures to:

A. Encourage and promote the adaptive reuse of the City's historical resources;
B. Enhance, perpetuate, and preserve architecturally and historically significant structures and promote revitalization of historic neighborhoods and commercial areas;
C. Ensure that the rights of the owners of historical resources and owners of properties adjacent to historical resources are safeguarded;
D. Foster civic pride in the beauty and noble accomplishments of the past by promoting private stewardship of historical resources that represent these accomplishments;
E. Fulfill the City's responsibilities:
    1. As a Certified Local Government under Federal preservation laws; and
    2. For Federal Section 106 reviews and for the California Environmental Quality Act regarding historical resources.
F. Promote the identification, documentation, and evaluation of the significance of individual historical resources and districts;
G. Implement the historic preservation goals, policies, and programs of the General Plan;
H. Promote the City as a destination for tourists and as a desirable location for business;
I. Promote public awareness of the value of rehabilitation, restoration, and maintenance of the existing building stock as a means to conserve reusable material and energy resources;
J. Recognize the City's historical resources as economic assets; and
K. Stabilize and improve property values, and enhance the aesthetic and visual character and environmental amenities of the City's historic properties and areas.

17.62.040 - Criteria for Designation of Historic Resources

Evaluation of Historic Resources

When considering applications to designate a historic monument, landmark, historic sign, landmark tree or landmark district, the Historic Preservation Commission shall apply the criteria below according to applicable National Register of Historic Places Bulletins for evaluating historic properties, including the seven aspects of integrity: location, design, setting, materials, workmanship, feeling and association (National Register of Historic Places Bulletin #15: "How to Apply the National Register Criteria for Evaluation").

Historic Monuments

1. A historic monument shall include all historical resources previously designated as historic treasures before adoption of this Chapter, historical resources that are listed in the National Register at the State-wide or Federal level of significance (including National Historic Landmarks) and any historical resource that is significant at a regional, State, or Federal level, and is an exemplary representation of a particular type of historical resource and meets one or more of the following criteria:
   a. It is associated with events that have made a significant contribution to the broad patterns of the history of the region, State, or nation.
   b. It is associated with the lives of persons who are significant in the history of the region, State, or nation.
   c. It is exceptional in the embodiment of the distinctive characteristics of an historical resource property type, period, architectural style, or method of construction, or that is an exceptional representation of the work of an architect, designer, engineer, or builder whose work is significant to the region, State, or nation, or that possesses high artistic values that are of regional, State-wide or national significance.
   d. It has yielded, or may be likely to yield, information important in prehistory or history of the region, State, or nation.
2. A historic monument designation may include significant public or semi-public interior spaces and features.

Landmarks

1. A landmark shall include all properties previously designated a landmark before adoption of this Chapter and any historical resource that is of a local level of significance and meets one or more of the criteria listed in Subparagraph 2., below.
2. A landmark may be the best representation in the City of a type of historical resource or it may be one of several historical resources in the City that have common architectural attributes that represent a particular type of historical resource. A landmark shall meet one or more of the following criteria:
   a. It is associated with events that have made a significant contribution to the broad patterns of the history of the City, region, or State.
   b. It is associated with the lives of persons who are significant in the history of the City, region, or State.
   c. It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the City or, to the region or possesses artistic values of significance to the City or to the region.
   d. It has yielded, or may be likely to yield, information important locally in prehistory or history.

Historic Signs

1. A historic sign shall include all signs in the sign inventory as of the date of adoption of this Zoning Code and any sign subsequently designated historically significant by the Historic Preservation Commission that possesses high artistic values. A historic sign shall meet one or more or the following criteria:
   a. The sign is exemplary of technology, craftsmanship or design of the period when it was constructed, uses historic sign materials and means of illumination, and is not significantly altered from its historic period. Historic sign materials shall include metal or wood facings, or paint directly on the façade of a building. Historic

means of illumination shall include incandescent light fixtures or neon tubing on the exterior of the sign. If the sign has been altered, it must be restorable to its historic function and appearance.

b. The sign is integrated with the architecture of the building.

c. A sign not meeting criteria a or b above may be considered for inclusion in the inventory if it demonstrates extraordinary aesthetic quality, creativity, or innovation.

2. All other regulations relating to signs shall comply with Chapter 17.48 (Signs).

Landmark Trees

A tree shall qualify to be of historic or cultural significance and of importance to the community if it meets any one of the following criteria:

1. It is one of the largest or oldest trees of the species located in the City;
2. It has historical significance due to an association with a historic event, person, site, street, or structure; or
3. It is a defining landmark or significant outstanding feature of a neighborhood.

Landmark Districts

1. A landmark district shall include all landmark districts previously designated before adoption of this Chapter and any grouping of contiguous properties that also meet the following criteria:
   a. Within its boundaries, a minimum of 60 percent of the properties qualify as contributing; and
   b. The grouping represents a significant and distinguishable entity of Citywide importance and one or more of a defined historic, cultural, development and/or architectural context(s) (e.g., 1991 Citywide historic context, as amended, historic context prepared in an intensive-level survey or historic context prepared specifically for the nominated landmark district).
2. When determining the boundaries of a landmark district, the Historic Preservation Commission shall use the National Register of Historic Places Bulletin #21: "Defining Boundaries for National Register Properties".

Arroyo Seco Master Plan

The Arroyo Seco Master Plans are a set of documents defining the community vision for the Arroyo Seco Natural Park. The set is comprised of four separate planning documents: the Lower Arroyo Master plan, Central Arroyo Master Plan, Hahamongna Watershed Park Master Plan, and Design Guidelines. The Hahamongna Watershed Park Master Plan and Design Guidelines are both relevant to this report.

The Hahamongna Watershed Park Master Plan (City of Pasadena 2003b) illustrates a vision for the 300-acres of open space that extends from Devil's Gate Dam north and into the Arroyo Seco Canyon, on the northwestern edge of the city. The Hahamongna Watershed Park Master Plan was adopted to establish a framework for recreation, water resources, flood management, habitat restoration, and cultural resources in this area. The Hahamongna Watershed Park Master Plan promotes the use of decorative Arroyo stone walls, gates, and fences, reflecting the historic heritage of the Arroyo Seco in Pasadena. They are established in this Master Plan as major enhancing and contributing to the unique setting of the natural habitats that are focal areas throughout the park.

Arroyo Seco Design Guidelines

The Arroyo Seco Design Guidelines (City of Pasadena 2003a) provide a unifying set of criteria for the site development improvements set forth in the Arroyo Seco Master Plan for on-going, long-range improvements for the Arroyo Seco. These guidelines will lead to a unified park design that reflects the heritage of the Arroyo Seco and its relationship to the tradition of the City of Pasadena. The Arroyo Seco Design Guidelines provide specific site design solutions that are consistent with the existing Arroyo Seco Ordinance and a vehicle by which practical inputs for ongoing improvements can take place. The Design Guidelines document gives more specific instances dictating how decorative cobblestone walls, gates, and fences should be utilized.

In the Architectural Design Concepts section guidelines, the "use of natural materials" and "arroyo stone" should be incorporated whenever appropriate. The guidelines also call for the preservation of stone walls in the Arroyo, when culturally significant. The arroyo stone walls and steps throughout the City of Pasadena and especially in the Arroyo Seco are considered an historical resource because many of them were built during the WPA years and in some locations designed by notable architects (City of Pasadena 2003a). See below:

7.2 General Guidelines

7.2.1 Walls

1. Where appropriate, vines and/or shrubs can be located against walls in areas where vandalism (graffiti) is a problem.
2. The stone walls in the Arroyo are culturally significant and shall be preserved.
3. Wall improvements in the Arroyo Seco shall primarily consist of walls that are faced in arroyo stone.
4. Walls constructed of split-faced block may be allowed in appropriate situations as determined by the Design Commission.
5. Wall improvements shall use the historic masonry style of the Arroyo by using a variety of sizes of stone, with large stones and boulders at the base of the wall including dry-stack techniques.
6. See the Wall Restoration Standards in Appendix E for improvements being considered to an existing stone wall or the construction of a new arroyo stone wall.
7. Where an existing stone retaining wall is in need of repair and posing a threat to the further degradation of the wall or to the public, the wall will be improved to ensure structural stability. See Appendix E, Wall Restoration Standards.
8. Wall improvements will consider drainage patterns immediate to the wall and provide weep holes at regular intervals and/or the appropriate drainage solution to protect the longevity of the wall.
9. Improvements to arroyo stone walls will be made by a qualified craftsman in the masonry trade with demonstrable experience with similar work.
10. Low stone walls will be finished so that the top of the wall is smooth, flat, and comfortable enough to be used as seating.

11. A well-crafted and proportionately sized cantilevered concrete cap atop an arroyo stone wall or pilaster is an acceptable design.
12. All construction and repair of the arroyo stone walls and steps shall be done in accordance with the current City of Pasadena's "Standard Specifications for Public Works Construction" (popularly known as the "Greenbook").
13. Arroyo stone walls along neighborhood trails shall be restored.

4.3.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to cultural resources are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to cultural resources would occur if the project would:

a) Cause a substantial adverse change in the significance of an historical resource pursuant to §15064.5.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5.

Through the analysis in the Initial Study (see Appendix A-1), it was determined that the proposed Project would not disturb any human remains, including those interred outside of dedicated cemeteries. (i.e., Threshold c).

c) Disturb any human remains, including those interred outside of dedicated cemeteries.

Accordingly, this issue is not further analyzed in this Draft EIR and the pertinent impact analysis can be reviewed in the Initial Study

Additionally, because Project-related impacts to Geology and Soils were found to be less than significant in the Initial Study (see Appendix A-1), with the exception of potential impacts to paleontological resources, this cultural resources section of this Draft EIR also includes an analysis of the proposed Project's potential impacts to paleontological resources. According to Appendix G of the CEQA Guidelines, a significant impact related to paleontological resources would occur if the Project would:

d) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

4.3.5 Environmental Impacts Analysis

Threshold 4.3a. Would the project cause a substantial adverse change in the significance of an historical resource pursuant to §15064.5.?

Table 4.3-2 provides a summary of all resources evaluated for historical significance within the Project site. Six built environment resources were identified as a result of the background research and pedestrian survey. Of these, three resources (the Behner WTP, Bridge No. 2, and Bridge No. 3) were found eligible for NRHP, CRHR and local designation. The remaining three resources (the Screen Building Complex, Bridge No. 1, and the flood control infrastructure) were found not eligible under all designation criteria due to a lack of historical associations and integrity. Below the table is a significance evaluation for each resource.

Table 4.3-2. Summary of Resource Evaluation Findings

Resource Name	Description	Built Date	Evaluation Findings
John L. Behner WTP	Brutalist-style water treatment plant building and related infrastructure	1971	Appears eligible under NRHP/CRHR Criteria C/3 at local level, and City Criterion 2c (3S/3CS/5S3)
Screen Building Complex	Complex consisting of screen building, a weir, and two pipelines	c. 1932	Appears not eligible under all designation criteria (6Z)
Bridge No. 1	Two-span box culvert bridge spanning Millard Canyon tributary stream	c. 1938-1941	Appears not eligible under all designation criteria (6Z)
Bridge No. 2	Concrete arch bridge spanning the Arroyo Seco	c. 1920	Appears eligible under NRHP/CRHR Criteria C/3 at local level, and City Criterion 2c (3S/3CS/5S3)
Bridge No. 3	King truss bridge spanning the Arroyo Seco erected by the CCC	1939	Appears eligible under NRHP/CRHR Criteria A/1 and C/3, and City Criteria 2a and 2c (3S/3CS/5S3)
Flood Control Structures (PWP/LACFCD)	Complex of utilitarian sheds, Altadena Storm Drain, culvert, flow control dam, Pasadena Ponds 1 and 2, and 14 spreading basins	c. 1948-1952	Appears not eligible under all designation criteria (6Z)

John L. Behner Water Treatment Plant

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The subject property was completed in 1971, during a period of economic downturn that that began in the late 1960s, and taken offline in 1993 after passage of the Surface Water Treatment Rule. Although the property is generally representative of the City's mid-century growth, it has no direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this

property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The Behner WTP is a good example of Brutalist civic architecture as expressed in the context of a utilitarian building designed for practicality. Designed by local Pasadena engineering firm James M. Montgomery, Consulting Engineer Inc. and built in 1971, the building displays several character-defining features of the Brutalist architectural style, including an exposed, expressive structural system; rough, unadorned concrete construction; monumental massing; heavy blockish shapes; angular and rectilinear forms; prefabricated concrete panels with exposed joinery; windows as voids in an otherwise solid volume; repetitive patterns; and avoidance of traditional elements or ornament. While smaller in scale than the more monumental, hulking Brutalist buildings often seen in civic centers and on college campuses, the building still conveys the essential character-defining features of the Brutalist design aesthetic and exhibits a high level of integrity. The designing engineering firm, James M. Montgomery, Consulting Engineer, Inc., is a local, Pasadena-based firm that regularly constructed water infrastructure projects for local cities and water districts, such as MWD, Santa Monica, and Huntington Beach. There are no known alterations to the exterior of the building. Although the engineer does not rise to the level of a "master," the building embodies the distinctive characteristics of the Brutalist architectural style and possesses artistic values of significance to the City or to the region. Consideration was also given to the fact that Brutalism is a relatively rare architectural style in Pasadena, with few noteworthy examples. The Pasadena CHRID lists only two eligible Brutalist properties: a public library and a private residence. According to the Los Angeles Conservancy, "The Lamanda Park Branch of the Pasadena Public Library is a rare Brutalist building in an area of modest suburban homes in east Pasadena" (LAC 2019). The same may be said of the Behner WTP, as it remains relatively hidden from view, tucked away behind a suburban neighborhood. As such, the property appears eligible for the NRHP under Criterion C and CRHR under Criterion 3 at the local level of significance.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements. Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property appears eligible as a landmark under local designation criteria 2c.

Integrity Discussion

The Behner WTP maintains integrity of location, as it remains in its original location. The building retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The building retains integrity of setting, as upon its construction, the Arroyo Seco Canyon area had already attained the majority of JPL-related development, residential suburban development, and undeveloped Forest Service and parkland observed today. The building maintains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The windows sport metal security screens, but the majority of the building's original materials are extant. The building retains integrity of feeling and association, as the property retains the ability to express itself as a water treatment plant. In summary, the building retains the requisite integrity for designation, and appears eligible for listing under NRHP Criterion C, CRHR Criterion 3, and City of Pasadena Landmark criterion 2c at the local level of significance.

Screen Building Complex

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The complex was completed c. 1932, most likely by the CCC during their improvements campaign in the Arroyo Seco Canyon. The extant weir was replaced after a major flooding event in the 1940s, and a newer cobblestone wall rises from the original retaining wall on the right (east or cutbank) side of the weir. The cobblestone wall supports a concrete platform, into which the original rectangular concrete platform is incorporated. indicating extensive repairs and/or additional damage during later flood events. The Screen Building Complex is no longer visibly recognizable as dating to its original c. 1932 construction date due to the extensive damage and subsequent repairs. Further, it does not have a direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The Screen Building Complex comprises a screen building, a weir, an intake structure, and two pipelines. The individual components are modest utilitarian structures built with common materials using common techniques and with no artistic value. They do not embody the distinctive characteristics of a type, period, or method of construction, nor do they represent the work of a master, nor does the complex represent a significant and distinguishable entity whose components may lack individual distinction. Furthermore, the Screen Building Complex is no longer visibly recognizable as dating to its original c. 1932 construction date due to the extensive damage and subsequent repairs. For these reasons, the Screen Building Complex does not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property does not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

The Screen Building Complex retains integrity of location, as it remains in its original location. The Complex lacks integrity of design as it was subjected to large-scale exterior alterations since its original construction in 1932 and no longer maintains the essential features of form, plan, space, structure, and style. The Complex retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The Complex lacks integrity of materials and workmanship due to the extensive damage and subsequent repairs to the physical elements that date from its construction. The Complex retains integrity of feeling, as it is still nestled within the Arroyo Seco surrounded by a mixture of natural environment and water infrastructure. Finally, while the screen building still reads as a grouping of structures related to water infrastructure in Pasadena, this association is not significant. In summary, the Screen Building Complex does not retain the requisite integrity for designation, nor does it rise to the level of significance required for designation at the national, state or local levels.

Bridge No. 1

NRHP/CRHR Statement of Significance

Bridge No. 1 does not meet any of the criteria for listing in the NRHP or CRHR, either individually or as part of an existing historic district.

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. Archival research indicates that the original bridge was either damaged or destroyed by the 1938 floods, and replaced with the existing two-span box culvert bridge either during a CCC repair campaign in 1939 or as part of the 1941 Arroyo Seco Program. Bridge No. 1 was completed c. 1940, replacing the original bridge, and is a simple utilitarian design. Even if the bridge was constructed as part of the CCC repair campaign in 1939, it does not maintain any significant physical features that convey this association. Further, evidence suggests that the bridge deck was replaced in 1979 (Daly 2014). It has no direct association with events that have made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Bridge No. 1 is a two-span box culvert bridge of simple utilitarian design completed c. 1940, replacing an older bridge damaged or destroyed by the 1938 floods. Although parts of it are cobblestone, the material was popular during the early 20th C. due to the influence of Greene and Greene and the Arts & Crafts style, and it was inexpensive and readily available from the Arroyo Seco stream bed. Additionally, a previous evaluation of the bridge (Daly 2014) indicates that the bridge deck was replaced in 1979 with reinforced concrete, and subsequently topped with at least one layer of tarmac (c. 2017). The bridge itself is not characteristic of a type, period, or method of construction, nor does it represent the work of a master, nor does it possess high artistic values, and it is not part of a significant and distinguishable entity whose components may lack individual distinction. For these reasons, Bridge No. 1 does not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property does not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

Bridge No. 1 maintains integrity of location, as it remains in its original location. The bridge does not retain integrity of design as its deck was replaced in 1979. The bridge retains diminished integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge also lacks integrity of materials and workmanship due to replacement of the bridge deck and other features. The bridge's simple design does not convey the feeling or association with a CCC-built bridge as it lacks major visible character-defining features and associated materials. In summary, Bridge No. 1 does not retain the requisite integrity for designation, nor does it rise to the level of significance required for designation at the national, state or local levels..

Bridge No. 2

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. Bridge No. 2 was constructed c. 1920 as a necessary improvement along the Arroyo Boulevard/Gabrielino Trail, around the time Arroyo Boulevard was paved for use as a county highway. However, the road no longer functions as a county highway or a major thoroughfare, and has no direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, Bridge No.2 does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Built c. 1920, around the time Arroyo Boulevard was paved for use as a county highway, Bridge No. 2 exhibits classical design elements in the rows of classically shaped single balusters resembling the form of a flower bud from a pomegranate tree, as well as the subtle four-point shape of the arch. The bridge also displays the pattern of board-formed concrete, a method of construction popular for civil works during the early 20th Century. The designed structure successfully relied on massed reinforced concrete with a broad arched opening to withstand the destructive forces of periodic floods down Arroyo Seco. As such, the bridge embodies distinctive characteristics of a type, period, and method of construction. Therefore, Bridge No. 2 appears eligible for listing under Criterion C of the NRHP and Criterion 3 of the CRHR at the local level of significance.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property appears eligible as a landmark under local designation criterion 2c.

Integrity Discussion

Bridge No. 2 maintains integrity of location, as it remains in its original location. The bridge retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The bridge retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge retains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The bridge no longer retains integrity of feeling and association, since Arroyo Boulevard/Gabrielino Trail no longer serves as an important thoroughfare. In summary, Bridge No. 2 retains the requisite integrity for designation, and appears eligible for listing under NRHP Criterion C, CRHR Criterion 3, and City of Pasadena Landmark criterion 2c.

Bridge No. 3

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research indicates that Bridge No. 3 was constructed in 1939 by the CCC, after the 1938 flood destroyed the original bridge. Local CCC Company 903 was assigned to the USFS in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal

programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great Depression. They planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems. As such, Bridge No. 3 was constructed by a group associated with events that made a significant contribution to the broad patterns of our history. Therefore, Bridge No. 3 appears eligible under Criterion A of the NRHP and Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Bridge No. 3 is a wooden kingpost truss bridge, with heavy timber supports braced by a vertical metal rod and angled wood beam braced on a cantilevered timber girder. Timber railings line both side of the bridge deck, and board-formed concrete retaining walls support either end of the bridge. The kingpost design harkens back to timber-framed roof construction in Roman buildings, and was common in medieval architecture. The kingpost made its way into timber bridge design via Palladio, the first known personage to promote timber trusses for bridge design, and is the oldest timber truss design used for bridges. The kingpost truss is comprised of a stringer, a kingpost (vertical beam), and two diagonal beams designed primarily for short spans of approximately 20 to 30 feet. As such, the bridge embodies the distinctive characteristics of a type and method of construction. Therefore, Bridge No. 3 appears eligible under Criterion C of the NRHP and Criterion 3 of the CRHR.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property appears eligible as a landmark under local designation criteria 2a and 2c.

Integrity Discussion

Bridge No. 3 maintains integrity of location, as it remains in its original location. The bridge retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The bridge retains integrity of setting, as it still

rests within a natural environment along the Arroyo Seco. The bridge retains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. Finally, the bridge retains the feeling of an early 20th century timber bridge constructed by the CCC and it maintains its essential character-defining features to convey its association with the CCC building campaign in the 1930s. In summary, Bridge No. 3 retains the requisite integrity for designation, and appears eligible for listing under NRHP Criteria A and C, CRHR Criteria 1 and 3, and City of Pasadena Landmark Criteria 2a and 2c.

Flood Control Infrastructure

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The spreading basins were completed in 1948, and the Altadena Storm Drain, sheds, culverts, and check dams completed between 1948 and 1952. These date have no bearing on the industrial, commercial, and institutional growth of Pasadena nor is it directly related to a historical natural disaster such as a specific flood. The flood control infrastructure appears to have no direct association with events that have made a significant contribution to the history of the City of Pasadena, or Los Angeles County, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked on these structures are known to be historically significant figures at the national, state, or local level. The structures have been owned by PWP or LACFCD since construction, and as such is not associated with the life of a specific person significant to the past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. The structures do not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The flood control structures, including spreading basins completed in 1948, and the Altadena Storm Drain, sheds, culverts and checkdams completed between 1948 and 1952, are utilitarian in construction and lack association to a specific architectural style or method of construction. They have no specific character-defining features, do not represent the work of a master engineer, do not possess high artistic value and are not significant as contributing features of an entity whose components may lack individual distinction. Therefore the structures do not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The structures are not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the flood control structures do not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

The spreading basins, Altadena Storm Drain, checkdams, culverts, and sheds, as a collective engineered structure retain integrity of location and have not been moved since their construction in 1948. They maintain integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, structure, and function. The structures retain integrity of setting, as they remain in the Arroyo Seco floodplain north of the Devil's Gate Dam, structures retain between a steep hillside and the campus of JPL. The structures retain integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The structures retain integrity of feeling and association, as they can still express their purpose as water and flood related infrastructure. In summary, while the structures retain the requisite integrity, it does not rise to the level of significance required for designation at the national, state or local levels.

Historic Resources Impacts Summary

The following historical resources/historic properties were identified within the Project APE as a result of the property significance evaluations:

- John L. Behner Water Treatment Plant (3S/3CS/5S3)
- Bridge No. 2 (3S/3CS/5S3)
- Bridge No. 3 (3S/3CS/5S3)

Additionally, five features were identified within the APE that are considered character-defining features of the larger Arroyo Seco and should be avoided/protected as part of the current Project. The Arroyo Seco is considered "a unique environmental, recreational and cultural resource of the city surrounded by residential neighborhoods" and "must be preserved, protected and properly maintained." (Arroyo Seco Public Lands Ordinance 3.32.020). The arroyo stone walls and steps throughout the City of Pasadena and especially in the Arroyo Seco are considered an historical resource because many of them were built during the WPA years and in some locations designed by notable architects. Rehabilitation, including maintenance and repair, shall be focused on conservation of this historical resource (City of Pasadena 2003a). Contributing design features of the Arroyo Seco identified in the Project APE include cobblestone and concrete retaining walls that date between 1938 and 1940:

- rock retaining wall for on northeast side of Arroyo Seco Canyon roadbed;

- rock retaining wall supporting the east-most canyon wall;
- rock retaining wall near screen building;
- rock wall barrier on side of road near intake/weir structure;
- rock wall barrier on south side of Bridge No. 2.

These walls vary in length and height, but are typically constructed of smooth, round river cobbles, in semi-coursed layers, with a thick Portland cement mortar. The use of semi-coursed, smooth river cobble in concrete mortar is a common feature seen throughout Pasadena and the Arroyo Seco. The Arroyo Seco Design Guidelines (City of Pasadena 2003a) document is one of four separate planning documents produced as part of The Arroyo Seco Master Plans. The design guidelines provide a unifying set of criteria for the site development improvements set forth in the Arroyo Seco Master Plan for on-going, long-range improvements for the Arroyo Seco. The purpose of these guidelines is to maintain a unified park design that reflects the heritage of the Arroyo Seco and its relationship to the tradition of the City of Pasadena. The Arroyo Seco Design Guidelines provide specific site design solutions that are consistent with the existing Arroyo Seco Ordinance and a vehicle by which practical inputs for ongoing improvements can take place ((City of Pasadena 2003).

Area 2 Impacts

No historical resources were identified in Area 2. As previously described, the Screen Building Complex and related infrastructure (including the weir and intake structure) were found ineligible and are not an historical resource. Additionally, construction and operation of a new diversion structure would not directly impact or indirectly alter the setting or character of any adjacent resources. All proposed Project activities associated with the Area 2 Diversion and Intake Replacement would be less than significant and no mitigation is required.

Area 3 Impacts

No historical resources were identified in Area 3. Although the proposed Project's construction activities would intersect the existing SCE Easement, all associated SCE infrastructure (i.e., poles and wires) would be avoided by the Project and protected in coordination with SCE. As previously described, all PWP/LACFCD flood control infrastructure, including the spreading basins, were found ineligible and are not historical resources. The proposed Project includes placement of rock boulders along the western edge of Explorer Road to separate the roadway from the adjacent basins. There are no historical resources that would be impacted by the placement of rock boulders along the western edge of Explorer Road; further, the use of natural materials as a barrier is in conformance with the existing Arroyo Seco Design Guidelines:

> "Boulders are preferred in establishing perimeter barriers. Typically, they are placed to keep motorized vehicles out of an area." (City of Pasadena 2003a)

All proposed Project activities associated with the Area 3 Spreading Basin Improvements would be less than significant and no mitigation is required.

Gabrielino Trail and Bridges Nos. 1, 2 and 3

During construction, the Gabrielino Trail/Access Road would provide for vehicular access to and from Area 2, and sometimes Area 3. Activity along the Gabrielino Trail/Access Road has the potential to impact the concrete railings of Bridge No. 2 and the adjacent Arroyo Seco stone wall features. These are design features of the larger Arroyo Seco and should be protected from inadvertent damage during construction activities. Therefore,

MM-CUL-1 is required. MM-CUL-1 recommends protection from construction and vehicle damage measures for Bridge No. 2 during construction and pre-construction/post-construction surveys by a qualified historic preservation consultant to ensure that adverse effects or significant impacts have not occurred due to short-term construction activities at Bridge No. 2. With incorporation of MM-CUL-1, short-term impacts to Bridge No. 2 would be less than significant.

The structural overlay bridges spanning the entire length of Bridge Nos. 1 and 3 would remain in place throughout the construction activities for the proposed Project. These structural overlays are already in-place and have been determined essential to safely support vehicles during construction. No new construction is required to keep the bridge overlay structures in place. The structural overlay for Bridge No. 1 would be removed after completion of construction activities for the ASCP. Bridge No. 1 is not an historical resource under CEQA and continued use of the overlay structure would not result in a significant impact to an historical resource. Therefore, impacts to Bridge No. 1 would be less than significant and no mitigation is required.

With regard to short-term use of the overlay on Bridge No. 3 during construction, an historical resources impact assessment was prepared for the temporary bridge overlays in conformance with the required 2015 IS/MND mitigation requirements. The analysis states that "although temporary protective measures would be installed for 1-2 years, these protective measures are removable and reversible" (Jerabek 2015). Therefore, short-term construction activities would not result in a significant impact due to the presence of the overlay and no mitigation would be required.

The structural overlay bridge installed in 2017 that spans the entire length of Bridge No. 3 is not in conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties in consideration of its proposed permanency. The overlay structure, characterized by a steel deck supported by steel I-beam girders, poured-in-place concrete ramps, and tubular metal railings, does not conform to the Secretary of the Interior's Standards for Rehabilitation of a 1930s timber bridge built by the CCC. Nor does the current bridge overlay conform to the City's Arroyo Seco Design Guidelines for Open Structures and Bridges. Now that the overlay is proposed to remain on Bridge No. 3 into the foreseeable future, the existing bridge overlay should be reviewed for conformance with the Arroyo Seco Design Guidelines. As a potentially permanent design feature, the continued presence of the overlay structure on Bridge No. 3 is considered a significant impact to historical resources, as the overlay detracts from nearly all of its important character-defining features and introduces incompatible, highly visible, modern materials. It is anticipated that Bridge No. 3 will continue to deteriorate, and as a result, PWP will need to remove dangerous elements of the bridge (damaged joists, for example) and even partially or fully demolish the bridge to protect public safety as it continues to deteriorate. Whether and when reconstruction/replacement of Bridge No. 3 will take place is unknown, and it is unknown whether the new bridge would be constructed in such a manner that would allow for its preservation as a historical resource.

Therefore, MM-CUL-2 is required. MM-CUL-2, which requires preparation of Historic American Engineering Record (HAER) documentation for Bridge No. 3 in accordance with the Secretary of the Interior's Standards, and sharing documentation with the City of Pasadena, the SCCIC, and the Angeles National Forest, as well as implementing adjustments to bring the bridge overlay components into compliance with the Arroyo Seco Design Guidelines, to the extent feasible. Implementation of MM-CUL-2 would lessen impacts but would not reduce impacts to Bridge No. 3 below a level of significance. Therefore, impacts would remain significant and unavoidable, even after incorporation of MM-CUL-2.

Construction Staging Areas

During construction activities, the Screen Building adjacent to Area 2 would be used for temporary construction materials and equipment staging. The Screen Building Complex and related infrastructure is not an historical resource and impacts would be less than significant.

During construction activities, the Behner WTP adjacent to Area 3 would be used for temporary construction materials and equipment staging. The Behner WTP appears eligible under NRHP/CRHR Criteria C/3 at local level, and City Criterion 2c (3S/3CS/5S3) and is considered an historical resource under CEQA/historic property under Section 106 of the NHPA. Short-term construction activities have the potential to inadvertently damage the Behner WTP by construction equipment and materials staging in proximity to the building. Therefore, MM-CUL-3 is required. MM-CUL-3 requires protection from equipment staging activities, vehicle staging activities, and fence placement for the exterior of the Behner WTP. With incorporation of MM-CUL-3, potential short-term impacts to Behner WTP would be less than significant.

Threshold 4.3b Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

Short-Term Construction Impacts

As previously discussed, Dudek conducted a CHRIS records search at the SCCIC on October 3, 2019. The records search identified 35 previously conducted cultural resources technical investigations within the records search area. Of these, six overlap and one is adjacent to the Project site.

Additionally, the SCCIC records indicate that 14 previously recorded cultural resources exist within the surrounding 0.5-mile search radius. The CHRIS records indicate that one previously recorded cultural resource (P-19-189942) overlaps the Project site, and one resource (P-19-186535) is adjacent to the Project site. Resource P-19-189942 consists of the Hahamongna Watershed Park and associated recreational facilities. The resource was previously determined ineligible for the CRHR, and is therefore not considered an historical resource. Resource P-19-186535 consists of the Angeles National Forest, a registered California Historical Landmark.

Thirteen additional previously recorded cultural resources are within 0.5-mile of the Project site. Of these, two consist of prehistoric archaeological resources, including P-19-000342, the purported village site discussed in SCCIC report LA-01312, and an isolated granitic discoidal recovered from fill material. There is one multi-component resource consisting of multiple loci of sparse prehistoric lithic scatters, as well as a historic-era domestic refuse scatter and purported historic-era burial from the late 1800s. There are two historic-era archaeological resources consisting of a granite headstone fragment from 1865, which is associated with the multi-component site, and the remnants of an early twentieth century campground known as Teddy's Outpost. Resource (P-19-001599) is a multi-component site – meaning it consists of both prehistoric and historic-era resources and includes a possible historic-era burial. This site is located 0.5-miles northeast of the Project site. None of these prehistoric or historic-era archaeological resources have been evaluated for the NRHP or CRHR. The remaining eight resources are built environment resources that are within 0.5-mile of the Project site.

No archaeological resources were identified within the Project site as a result of the CHRIS records search or Native American outreach and three previously recorded prehistoric or historic-era archaeological resources

were identified within 0.5-mile of the Project. In compliance with Assembly Bill (AB) 52, the City has contacted tribal representatives that have requested to be notified of projects in Pasadena. These efforts are summarized in Section 4.9, Tribal Cultural Resources of this Draft EIR.

Based on the results provided above, the potential of encountering and impacting unknown archaeological resources during Project implementation is low; however, it is always possible that unanticipated discoveries could be encountered during ground-disturbing activities associated with the proposed Project. If such unanticipated discoveries were encountered, impacts to encountered resources could be potentially significant. However, with implementation of MM-CUL-4, which requires that all construction work occurring within 100 feet of the find shall immediately stop until a qualified archaeologist, meeting the Secretary of the Interior's Professional Qualification Standards for Archaeology, can evaluate the significance of the find, potentially significant impacts to archaeological resources would be reduced to less-than-significant levels. With incorporation of MM-CUL-4, the Project's potential to cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5 would be reduced to a level less than significant.

Long-Term Operational Impacts

Earthmoving activities would cease at the completion of construction activities. No long-term operational earthwork would occur that could disturb or cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5. Therefore, long-term operation of the Project would result in no impacts associated with archaeological resources, and no mitigation is required.

Threshold 4.3d Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Short-Term Construction Impacts

No paleontological resources were identified within the proposed Project site as a result of the institutional records search or desktop geological review. Based on surficial geological mapping reviewed for the proposed Project, the Project site does not contain exposed unique geologic features and is not anticipated to be underlain by unique geologic features. Areas of the proposed Project underlain by plutonic igneous rocks (portions of Area 2) have no paleontological sensitivity. The portions of Areas 2 and 3 underlain by Holocene gravel deposits (within the Arroyo Seco Drainage) have low paleontological sensitivity increasing to moderate or high sensitivity with depth, and the Pleistocene alluvial fan deposits within the northeastern portion of the Area 3 have moderate to high paleontological sensitivity. If intact paleontological resources are located onsite, ground-disturbing activities associated with construction of the proposed Project, such as earthwork/excavation and trenching for pipeline connections, have the potential to destroy a unique paleontological resource on site. As such, the proposed Project site is considered to be potentially sensitive for paleontological resources, and without mitigation, the potential damage to paleontological resources during construction associated with the proposed Project is considered a significant impact. Given the proximity of past fossil discoveries in the surrounding area within Pleistocene alluvial deposits, the proposed Project site is highly sensitive for supporting paleontological resources below the depth of fill and weathered, Pleistocene alluvial deposits. With implementation of MM-PALEO-1, which requires preparation of a Paleontological Resources Impact Mitigation Program (PRIMP) for the Project, the proposed Project's potential to directly or indirectly destroy a unique paleontological resource or site or unique geologic feature would be reduced to less than significant.

Long-Term Operational Impacts

Earthmoving activities would cease at the completion of construction. No long-term operational earthwork would occur that could directly or indirectly destroy a unique paleontological resource or site or unique geologic feature. Therefore, long-term operation of the Project would result in no impacts to paleontological resources, and no mitigation is required.

4.3.6 Cumulative Impacts

Cumulative impacts on cultural resources consider whether impacts of the proposed Project together with other related projects, when taken as a whole, substantially diminish the number of historical or archeological resources within the same or similar context or property type. However, impacts to cultural resources, if any exist, tend to be site-specific. The cumulative projects below were chosen based on direction from the City. A map depicting the locations of all cumulative projects can be found in Section 4, Environmental Impacts Analysis (refer to Section 3.5 Cumulative Impacts, Figure 3-5, Cumulative Projects).

- Previously Approved Components of Arroyo Seco Canyon Project (ASCP)
- Devil's Gate Reservoir Sediment Removal and Management Project
- Oak Grove Area Improvements (OGAI) Project
- LACFCD Pump back/Intake at Devil's Gate to Eaton Canyon
- Explorer Groundwater Well

Historic Resources

Previously Approved Components of Arroyo Seco Canyon Project (ASCP)

As described above, the proposed Project would have one impact that cannot be mitigated to a less than significant level: the impacts to Bridge No. 3. The APE of this cumulative project directly overlaps that of the proposed Project, with an additional "Area 1" in the Angeles National Forest (ANF) lands. Expected impacts from this project include earthmoving, vehicle and equipment staging, and vehicle use of the road and bridges. The Previously Approved Components of ASCP originally provided mitigation measures, including a bridge overlay for Bridge No. 3, as long as the bridge overlay placed on Bridge No. 3 would be temporary and reversible. For the cumulative project, it would only involve the use of Bridge No. 3 during short-term construction activities, likely at the same time as the proposed Project. Temporary placement of the bridge overlay was not determined to result in a significant impact, as described above. Therefore, the potential for both the proposed Project and this cumulative project to use the Bridge No. 3 at the same time would not result in cumulatively considerable impacts.

The proposed Project's mitigation for Bridge No. 2, which is also an historical resource for the purposes of CEQA, requires placement of temporary k-rails, or other feasible protections, along the balustrade section of the bridge to protect it from vehicle and equipment damage. As long as these protective rails are removed at the end of the proposed Project, there would not be cumulative impacts to Bridge No. 2.

Since the bridge overlay on historic Bridge No. 3 is assumed to remain into the foreseeable future, implementation of MM-CUL-2, recommends preparation of Historic American Engineering Record (HAER) documentation for Bridge No. 3 in accordance with the Secretary of the Interior's Standards to address long-term impacts to the bridge. However, this mitigation would not reduce impacts below a level of significance. While the proposed Project would significantly impact Bridge No. 3, no cumulative impacts to historical resources pursuant to §15064.5 are expected from this proposed Project.

Devil's Gate Reservoir Sediment Removal and Management Project

Records search results for the proposed Project indicate that the Hahamongna Watershed Park was found ineligible for designation and is not considered an historical resource for the purposes of CEQA. The Devil's Gate Dam was outside of the proposed Project's record search radius, so the status of the dam as an historical resource was not reviewed or considered as part of the proposed Project. This cumulative project proposed to remove sediment and restore habitat at the Devil's Gate Reservoir and not upstream where historical resources pursuant to §15064.5 have been identified by the proposed Project, and no upstream issues were identified. Therefore, no cumulative impacts to historical resources pursuant to §15064.5 are expected from this cumulative project.

Oak Grove Area Improvements (OGAI) Project

The OGAI project is located west of the proposed Project area, in the Hahamongna Watershed Park, Oak Grove Disc Golf Course, Oak Grove Area, and Berkshire Creek Area. This area does not overlap the proposed Project site, but does overlap an historical resource identified in this cumulative project's record search: the Oak Grove Administrative Site constructed in 1941. This building has been identified but not formally evaluated in consideration of federal, state, or local designation criteria. This site would need to be formally evaluated to determine if it is an historical resource under CEQA that would be affected by the cumulative impacts of all ongoing projects in its vicinity. Therefore, potential impacts from the OGAI Project to any evaluated historical resources identified in this EIR (i.e. Bridge No. 2, Bridge No. 3, Behner WTP) would only potentially affect their integrity of setting. Because this cumulative project would be visually removed and physically distant from all historical resource pursuant to §15064.5 identified for the proposed Project, there would be no impacts to the settings of these identified historical resources. Therefore, no cumulative impacts to historical resources pursuant to §15064.5 are expected from this cumulative project.

LACFCD Pump back/Intake at Devil's Gate to Eaton Canyon

This cumulative project is also located at the Devil's Gate Dam and involves the installation of a pump and intake structure at the upstream face of the Dam, with the objective to conserve stormwater by holding a reservoir pool behind Devil's Gate Dam and pumping the water into the Arroyo Seco Spreading Grounds for groundwater recharge. This area overlaps a portion of proposed Project Area 3, but does not overlap any of the historical resources identified as part of this project. Therefore, potential impacts to historical resources would only potentially affect their integrity of setting. If the cumulative project were to be implemented, having these water features filled and fully operational would not impact the settings of any nearby historical resources. Therefore, no cumulative impacts to historical resources pursuant to §15064.5 are expected from this project.

Explorer Groundwater Well

PWP plans to construct a groundwater well that would augment the existing municipal production wells. Project activities would include drilling and completion of a new groundwater well located just east of the spreading basins in Area 3, near the SCE Easement. Additionally, the Explorer Groundwater Well Project includes the potential renovation of the Behner WTP to augment the water treatment capacity. The proposed Project activity would have a temporary impact to the integrity setting of the Behner WTP during construction. The result of the significance evaluation included as part of the proposed Project indicate that Behner WTP, constructed in 1971, appears eligible under NRHP/CRHR Criteria C/3 at local level, and City of Pasadena Criterion 2c for being an excellent, rare, and unaltered example of Brutalist architecture applied to a municipal utility building and retains a high level of integrity. Because the building appears eligible, it is considered an historical resource pursuant to §15064.5. Cumulative impacts could be mitigated provided that the renovation of Behner WTP under this cumulative project adheres to Secretary of Interior Standards for Rehabilitation. However, if the proposed changes would occur on the building's interior and would not impact any of the building's exterior character-defining features, the cumulative project would likely result in a less than significant impacts to historical resources. Therefore, this cumulative project has the potential to result in impacts to the Behner WTP historical resource pursuant to §15064.5 if not adequately mitigated. However, since the proposed Project would not result in long-term impacts to Behner WTP, and mitigation would adequately address any short-term impacts from staging, the proposed Project would not result in cumulatively considerable impacts to Behner WTP.

Cumulative Impacts for Archaeology and Paleontological

Direct impacts to cultural resources are generally site specific. As defined in Section 15130 of the CEQA Guidelines, a cumulative impact consists of an impact that is created as a result of the incremental effects of a proposed Project, together with the effects of other projects, causing related impacts. Although a project, in conjunction with the effects of past, current, and reasonably foreseeable future projects may result in the disturbance of archaeological resource sites throughout the region, the City requires the mitigation of impacts to these resources. Therefore, despite the site-specific nature of the resources, in the event that unknown or undocumented archaeological resources are discovered, implementation of MM-CUL-1 would reduce the potential for cumulative impacts. Additionally, it is anticipated that cultural resources that are potentially affected by related projects would also be subject to the same requirements of CEQA as the proposed Project and any impacts would be mitigated, as applicable. These determinations would be made on a case-by-case basis, and the effects of cumulative development on cultural resources would be mitigated to the extent feasible in accordance with CEQA and other applicable legal requirements.

Cumulative paleontological impacts related to nearby development projects in the area that involve ground disturbance. The paleontological impacts on each project site are specific to that site and its users and would not be in common or contribute to (or shared with, in an additive sense) the paleontological impacts on other project sites. In addition, development on nearby project sites is subject to uniform site development and construction standards, including impacts to paleontological and unique geological resources analyzed in CEQA documents required for each project. Each paleontological analysis would include recommendations that would mitigate any potential effects related to paleontological resources, in accordance with CEQA. Therefore, the Project's contribution to paleontological impacts would not be cumulatively significant Therefore, cumulative impacts are considered to be less than significant.

4.3.7 Mitigation Measures

MM-CUL-1 Prior to the commencement of construction vehicle and truck traffic along the Gabrielino Trail/Access Road north of the JPL Bridge, the City shall ensure that Bridge No. 2 and all identified arroyo stone wall features along the affected portions of the Gabrielino Trail/Access Road are properly protected for the duration of construction activities. The City shall install temporary protective barriers in the form of concrete k-rails along the decorative railings of Bridge No. 2 on both sides of the road to protect the railings from further deterioration and damage from vehicles. The concrete k-rails shall be removed once the Project is completed leaving Bridge No. 2 intact. The concrete k-rails shall be installed parallel to the Bridge's existing baluster railings, with approximately 2 feet of separation between the k-rail and the resource. The k-rails shall be positioned to ensure that the Bridge railings are protected from daily construction traffic. The k-rails shall not be permanently attached to the bridge. All arroyo stone wall features adjacent to the Gabrielino Trail/Access Road shall be protected by concrete k-rails wherever feasible; however, in areas where k-rails would create an impassable or bottleneck situation for vehicles, the City shall utilize other reasonable protections, including cones and flagging, to ensure that the arroyo stone walls are not inadvertently damaged during construction vehicle movement and equipment transport. The plans for the temporary barriers shall be reviewed by a qualified architectural historian prior to Project implementation. In order to ensure that the bridge and stone walls are adequately protected during Project activities, the City shall ensure completion of pre-construction and post-construction surveys by a qualified historic preservation consultant to ensure that adverse effects or significant impacts have not occurred to Bridge No. 2. If the pre-construction survey identifies deficiencies in the protections for Bridge No. 2 or the stone walls, recommendations for additional physical barriers or visual warnings shall be provided and implemented prior to initiation of construction activities. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning – Historic Preservation for review and approval.

MM-CUL-2 Prior to construction completion, the City shall ensure preparation of Historic American Engineering Record (HAER) documentation for Bridge No. 3 in accordance with the *Secretary of the Interior's Standards for Architectural and Engineering Documentation*. Documentation shall be completed by a qualified historic preservation professional who meets the Secretary of the Interior's Professional Qualifications Standards for architectural history. The documentation shall capture the physical description of the existing bridge with: 1) existing as-builts/drawings (where/if available); 2) a written narrative that includes a detailed history and architectural description of the bridge and a discussion of its historical significance; 3) photographs of the bridge with large format negatives to demonstrate its current condition; and 4) provide other photographs of the bridge prior to installation of the current overlay. Upon approval of the final HAER package, the City shall offer one original copy of the final HAER package to the City of Pasadena Historic Preservation Program, the South Central Coastal Information Center at California State University, Fullerton, and the Angeles National Forest Administrative Office.

Prior to project construction completion, the City shall conduct a review of the bridge overlay design on Bridge No. 3 and construction materials used in the bridge overlay to determine improvements that can be made to conform with the City's Arroyo Seco Design Guidelines. Examples of potential improvements include, but are not limited to, evaluation of appropriate paint colors that reflect the natural character of the Arroyo Seco, and replacement of components with more natural materials (e.g. wood, concrete, brick, arroyo stone piers, unpainted weathering steel or other natural materials, such as copper and wrought iron). The proposed design improvements shall be submitted to the City of Pasadena Department of Planning – Historic Preservation for review and approval.

MM-CUL-3 Prior to commencement of Project construction activities that would require equipment staging at the Behner Water Treatment Plant (WTP), the City shall ensure that the exterior of the WTP building is adequately protected from equipment and vehicle staging activities. The northwest and southwest exterior elevations of the WTP shall, at a minimum, be protected by construction fencing and signage to ensure that none of the major exterior character-defining features of the building are inadvertently damaged. Fencing shall be placed at a minimum distance of five (5) feet from the exterior of the building, and crews working in the immediate vicinity should be alerted to the presence of an historical resource and instructed to avoid it. The City shall ensure that Project-related equipment and materials are not in contact with the exterior or the building, including absolute avoidance of leaning materials and equipment against exterior walls. The temporary fencing, signage, and barriers shall be removed at the conclusion of construction activities.

MM CUL-4 Prior to commencement of earthmoving activities, the City shall retain a qualified Archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for Archaeology. The Archaeologist shall be present at the pre-grade conference; shall establish procedures for archaeological resource surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts, as appropriate. At a minimum, in the event archaeological resources are exposed during construction activities, all construction work occurring within 100 feet of the find shall immediately stop until a qualified archaeologist can evaluate the significance of the find and determine whether or not additional study is warranted. The Archaeologist shall first determine whether it is a "unique archaeological resource" pursuant to the California Environmental Quality Act (CEQA, i.e., Section 21083.2[g] of the California Public Resources Code) or a "historical resource" pursuant to Section 15064.5(a) of the State CEQA Guidelines. If the archaeological resource is determined to be a "unique archaeological resource" or a "historical resource", the Archaeologist shall formulate a mitigation plan in consultation with the City of Pasadena that satisfies the requirements of the above-referenced sections. The Archaeologist shall prepare a report of the results of any study prepared as part of a testing or mitigation plan, following guidelines of the California Office of Historic Preservation, and s/he shall record the site and submit the recordation form to the City of Pasadena and the California Historic Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton. Work may proceed in other areas of the site, subject to the direction of the Archaeologist.

MM-PALEO-1 Prior to commencement of any grading activity on-site, the City shall retain a qualified Paleontologist per the Society of Vertebrate Paleontology (SVP) (2010) guidelines. The paleontologist shall prepare a Paleontological Resources Impact Mitigation Program (PRIMP) for the Project. The PRIMP shall be consistent with the SVP (2010) guidelines. Minimum requirements to be set forth in the PRIMP include: (1) attendance at the preconstruction meeting and worker environmental awareness training, where monitoring is required within the proposed Project site based on construction plans and/or geotechnical reports; (2) procedures for adequate paleontological monitoring and discoveries treatment, and paleontological methods, including sediment sampling for microvertebrate fossils, reporting, and collections management; (3) mandatory monitoring on-site during all rough grading and other significant ground-disturbing activities, including augering in previously undisturbed, fine-grained Pleistocene alluvial deposits; (4) mandatory actions in the event that paleontological resources (e.g., fossils) are unearthed during grading, including the requirement for the paleontological monitor to temporarily halt and/or divert grading activity to allow recovery of paleontological resources, and roping/fencing off of the discovery with a 50-foot radius buffer; and (5) if resources are discovered, methods for coordination between the qualified paleontologist and the City for appropriate exploration and/or salvage, as well as final disposition of the resources in an accredited institution or museum, such as the Natural History Museum of Los Angeles County.

4.3.8 Level of Significance After Mitigation

Implementation of MM-CUL-1 and MM-CUL-3 would reduce the short-term construction impacts to two historical resources (the Behner WTP and Bridge No. 2) to a less than significant level.

Implementation of MM-CUL-2 would lessen impacts but would not reduce impacts to Bridge No. 3 below a level of significance. Therefore, impacts to cultural resources under CEQA are considered significant and unavoidable, even with implementation of MM-CUL-2.

Implementation of MM-CUL-4 and MM-PALEO-1 would reduce impacts to archaeological resources and paleontological resources to less than significant.

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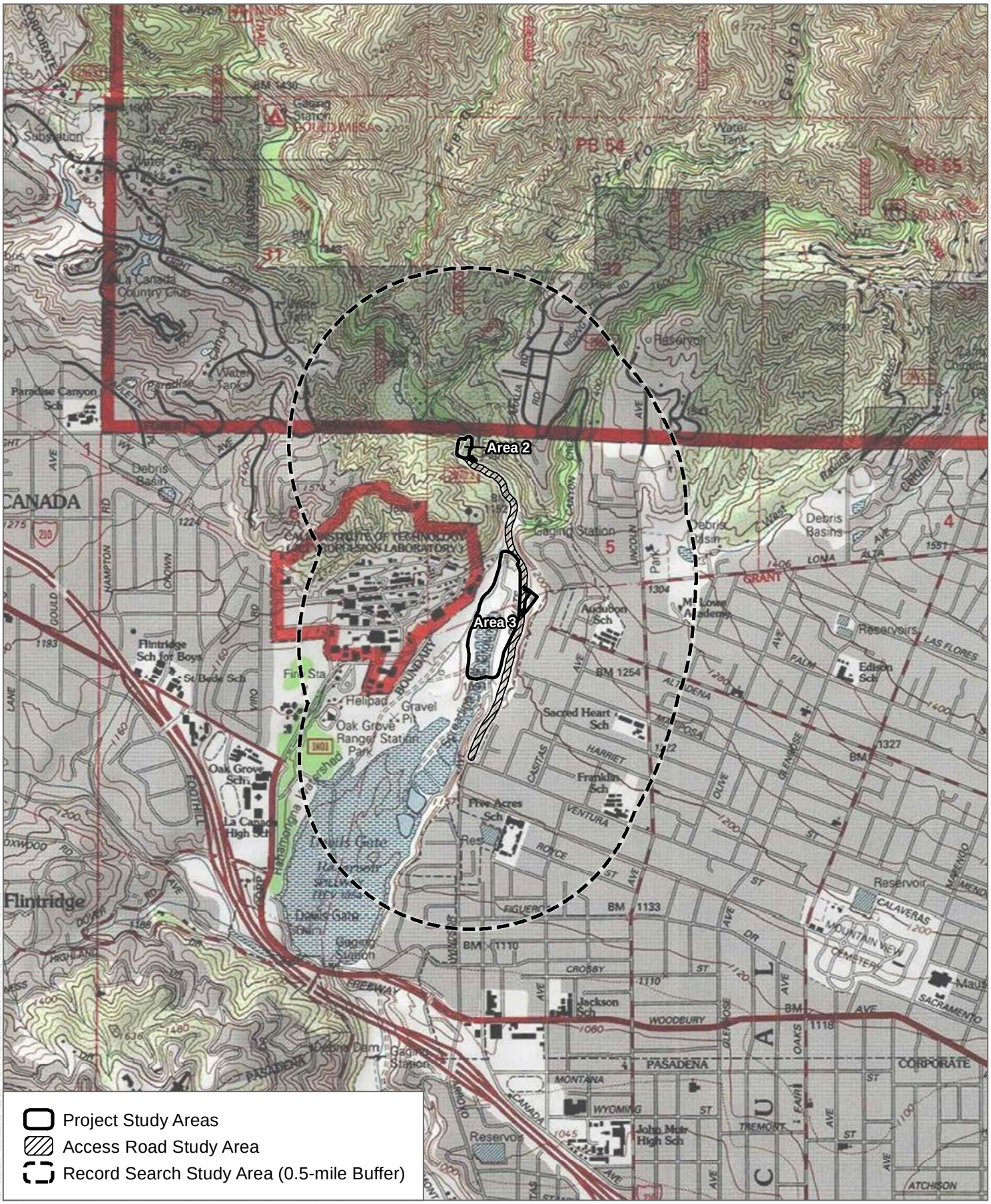
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SOURCE: USGS Topo 7.5 Minute Series Pasadena Quadrangle
Township 1N / Range 12W / Section 05

DUDEK

0 1,000 2,000 Feet
0 285 570 Meters
1:24,000

FIGURE 4.3-1
Records Search Study Area
Arroyo Seco Canyon Project

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4.4 Greenhouse Gas Emissions

4.4.1 Methodology

This section describes the existing conditions of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential environmental impacts, and identifies mitigation measures related to implementation of the proposed Project. The analysis of the Project impacts related to greenhouse gases (GHGs) is based on:

Appendix C CalEEMod Data, dated February 2020.

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

Although not a part of the proposed Project, there are specific components in Area 2 that are approved to move forward without additional environmental review that are included in this EIR section and in the California Emissions Estimator Model (CalEEMod) construction assumptions. The improvements to be conducted in Area 2, which have been previously approved to proceed in accordance with the 2015 ASCP MND, include:

1. Removal of existing K-rails along an approximate 150-foot-long segment of the Gabrielino Trail/Access Road between Bridge No. 3 and the intake structure;
2. Stabilization and repaving of the Gabrielino Trail/Access Road with asphalt and would be sloped to direct surface runoff away from the stream towards the hillside; and,

These non-Project improvements are included in the CalEEMod assumptions because their construction is anticipated to occur simultaneously with the proposed Project improvements, likely using the same equipment. As such, it was determined to be unrealistic to parse out the short-term construction activities of the various Project components; therefore, the GHG impacts of constructing all improvements within Area 2 are considered in this section.

Similarly, although not a part of the proposed Project, there are specific components in Area 3 that are approved to move forward without additional environmental review that are included in this EIR section and in the CalEEMod construction assumptions. The improvements to be conducted in Area 3, which have been previously approved to proceed in accordance with the 2015 ASCP MND, include:

1. Demolition of various facilities, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chainlink fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins;
2. Construction and operation of new pre-fabricated restroom, new sewer lift station, and associated pipelines, including a new 12-inch-diameter potable water pipeline and a new sewer line within the JPL Bridge;

3. Construction and operation of new pipelines, including a 12-inch-diameter well line, 16-inch-diameter utility service line, and 12-inch-diameter booster line;
4. Removal of the Behner WTP's influent and effluent lines and removal of the 8-inch-diameter sludge line from the Behner WTP;
5. Construction and operation of the recreational parking lot at the northern end of Area 3;
6. Construction/realignment and operation of Explorer Road; and
7. Construction of new fencing, gates, a roundabout, a guard station, a trail pathway, and signs at the northern end of the parking lot.

Additional details related to these non-Project components are included in Appendix A-4, 2015 ASCP Initial Study/Mitigated Negative Declaration.

The non-Project components within Areas 2 and 3 listed above were previously approved for both short-term construction and long-term operations. Only the short-term construction activities for these non-Project components are modeled in the CalEEMod analysis, as all operational aspects were approved through the 2015 IS/MND and there would be no changes associated with the long-term operations of the proposed Project when compared to the 2015 IS/MND, as further described in Section 3, Project Description, of this Draft EIR.

4.4.2 Existing Conditions

Climate Change Overview

Climate change refers to any significant change in measures of climate, such as temperature, precipitation, or wind patterns, lasting for an extended period of time (decades or longer). The Earth's temperature depends on the balance between energy entering and leaving the planet's system. Many factors, both natural and human, can cause changes in Earth's energy balance, including variations in the sun's energy reaching Earth, changes in the reflectivity of Earth's atmosphere and surface, and changes in the greenhouse effect, which affects the amount of heat retained by Earth's atmosphere (EPA 2017a).

The greenhouse effect is the trapping and build-up of heat in the atmosphere (troposphere) near the Earth's surface. The greenhouse effect traps heat in the troposphere through a threefold process as follows: Short-wave radiation emitted by the Sun is absorbed by the Earth, the Earth emits a portion of this energy in the form of long-wave radiation, and GHGs in the upper atmosphere absorb this long-wave radiation and emit it into space and toward the Earth. The greenhouse effect is a natural process that contributes to regulating the Earth's temperature and creates a pleasant, livable environment on the Earth. Human activities that emit additional GHGs to the atmosphere increase the amount of infrared radiation that gets absorbed before escaping into space, thus enhancing the greenhouse effect and causing the Earth's surface temperature to rise.

The scientific record of the Earth's climate shows that the climate system varies naturally over a wide range of time scales and that, in general, climate changes prior to the Industrial Revolution in the 1700s can be explained by natural causes, such as changes in solar energy, volcanic eruptions, and natural changes in GHG concentrations. Recent climate changes, in particular the warming observed over the past century, however, cannot be explained by natural causes alone. Rather, it is extremely likely that human activities have been the dominant cause of that warming since the mid-twentieth century and is the most significant driver of observed

climate change (EPA 2017a; IPCC 2013). Human influence on the climate system is evident from the increasing GHG concentrations in the atmosphere, positive radiative forcing, observed warming, and improved understanding of the climate system (IPCC 2013). The atmospheric concentrations of GHGs have increased to levels unprecedented in the last 800,000 years, primarily from fossil fuel emissions and secondarily from emissions associated with land use changes (IPCC 2013).

Greenhouse Gases

A GHG is any gas that absorbs infrared radiation in the atmosphere; in other words, GHGs trap heat in the atmosphere. As defined in California Health and Safety Code Section 38505(g), for purposes of administering many of the state's primary GHG emissions reduction programs, GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3). (See also California Environmental Quality Act (CEQA) Guidelines Section 15364.5.)[1] Some GHGs, such as CO_2, CH_4, and N_2O, occur naturally and are emitted into the atmosphere through natural processes and human activities. Of these gases, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Manufactured GHGs, which have a much greater heat-absorption potential than CO_2, include fluorinated gases, such as HFCs, PFCs, and SF_6, which are associated with certain industrial products and processes. The following paragraphs provide a summary of the most common GHGs and their sources.[2]

Carbon Dioxide

CO_2 is a naturally occurring gas and a by-product of human activities and is the principal anthropogenic GHG that affects the Earth's radiative balance. Natural sources of CO_2 include respiration of bacteria, plants, animals, and fungus; evaporation from oceans; volcanic out-gassing; and decomposition of dead organic matter. Human activities that generate CO_2 are from the combustion of fuels such as coal, oil, natural gas, and wood and changes in land use.

Methane

CH_4 is produced through both natural and human activities. CH_4 is a flammable gas and is the main component of natural gas. Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, flooded rice fields, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion.

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1 Climate-forcing substances include GHGs and other substances such as black carbon and aerosols. This discussion focuses on the seven GHGs identified in California Health and Safety Code Section 38505 as impacts associated with other climate-forcing substances are not evaluated herein.

2 The descriptions of GHGs are summarized from the Intergovernmental Panel on Climate Change's (IPCC) Second Assessment Report (1995), IPCC's Fourth Assessment Report (2007), CARB's "Glossary of Climate Change Terms" (2016), and EPA's "Glossary of Climate Change Terms" (2016).

Nitrous Oxide

N_2O is produced through natural and human activities, mainly through agricultural activities and natural biological processes, although fuel burning and other processes also create N_2O. Sources of N_2O include soil cultivation practices (microbial processes in soil and water), especially the use of commercial and organic fertilizers, manure management, industrial processes (such as in nitric acid production, nylon production, and fossil-fuel-fired power plants), vehicle emissions, and using N_2O as a propellant (e.g., rockets, racecars, and aerosol sprays).

Fluorinated Gases

Fluorinated gases (also referred to as F-gases) are synthetic powerful GHGs emitted from many industrial processes. Fluorinated gases are commonly used as substitutes for stratospheric ozone-depleting substances (e.g., chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and halons). The most prevalent fluorinated gases include the following:

- **Hydrofluorocarbons:** HFCs are compounds containing only hydrogen, fluorine, and carbon atoms. HFCs are synthetic chemicals used as alternatives to ozone-depleting substances in serving many industrial, commercial, and personal needs. HFCs are emitted as by-products of industrial processes and are used in manufacturing.
- **Perfluorocarbons:** PFCs are a group of human-made chemicals composed of carbon and fluorine only. These chemicals were introduced as alternatives, with HFCs, to the ozone depleting substances. The two main sources of PFCs are primary aluminum production and semiconductor manufacturing. Since PFCs have stable molecular structures and do not break down through the chemical processes in the lower atmosphere, these chemicals have long lifetimes, ranging between 10,000 and 50,000 years.
- **Sulfur Hexafluoride:** SF_6 is a colorless gas soluble in alcohol and ether and slightly soluble in water. SF_6 is used for insulation in electric power transmission and distribution equipment, semiconductor manufacturing, the magnesium industry, and as a tracer gas for leak detection.
- **Nitrogen Trifluoride:** NF_3 is used in the manufacture of a variety of electronics, including semiconductors and flat panel displays.

Global Warming Potential

Gases in the atmosphere can contribute to climate change both directly and indirectly. Direct effects occur when the gas itself absorbs radiation. Indirect radiative forcing occurs when chemical transformations of the substance produce other GHGs, when a gas influences the atmospheric lifetimes of other gases, and/or when a gas affects atmospheric processes that alter the radiative balance of the Earth (e.g., affect cloud formation or albedo) (EPA 2016). The Intergovernmental Panel on Climate Change developed the global warming potential (GWP) concept to compare the ability of each GHG to trap heat in the atmosphere relative to another gas. The GWP of a GHG is defined as the ratio of the time-integrated radiative forcing from the instantaneous release of 1 kilogram of a trace substance relative to that of 1 kilogram of a reference gas (IPCC 2014). The reference gas used is CO_2; therefore, GWP-weighted emissions are measured in metric tons (MT) of CO_2 equivalent (CO_2e).

The current version of the California Emissions Estimator Model (CalEEMod) (Version 2016.3.2) assumes that the GWP for CH_4 is 25 (so emissions of 1 MT of CH_4 are equivalent to emissions of 25 MT of CO_2), and the GWP for N_2O is 298, based on the Intergovernmental Panel on Climate Change's Fourth Assessment Report (IPCC 2007). The GWP values identified in CalEEMod were applied to the proposed Project.

Sources of Greenhouse Gas Emissions

Per the U.S. Environmental Protection Agency's (EPA) Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2016 (EPA 2018), total United States GHG emissions were approximately 6,511.3 million metric tons (MMT) CO_2e in 2016. The primary GHG emitted by human activities in the United States was CO_2, which represented approximately 81.6% of total GHG emissions (5,310.9 MMT CO_2e). The largest source of CO_2, and of overall GHG emissions, was fossil-fuel combustion, which accounted for approximately 93.5% of CO_2 emissions in 2016 (4,966.0 MMT CO_2e). Relative to 1990, gross United States GHG emissions in 2016 are higher by 2.4%; down from a high of 15.7% above 1990 levels in 2007. GHG emissions decreased from 2015 to 2016 by 1.9% (126.8 MMT CO_2e) and overall, net emissions in 2016 were 11.1% below 2005 levels (EPA 2018).

According to California's 2000–2016 GHG emissions inventory (2018 edition), California emitted 429.4 MMT CO_2e in 2016, including emissions resulting from out-of-state electrical generation (CARB 2018a). The sources of GHG emissions in California include transportation, industrial uses, electric power production from both in-state and out-of-state sources, commercial and residential uses, agriculture, high GWP substances, and recycling and waste. The California GHG emission source categories (as defined in California Air Resources Board's (CARB) 2018 GHG emissions inventory) and their relative contributions in 2016 are presented in Table 4.4-1.

Table 4.4-1. Greenhouse Gas Emissions Sources in California

Source Category	Annual GHG Emissions (MMT CO_2e)	Percent of Total[a]
Transportation	169.38	41%
Industrial	89.61	23%
Electricity generation[b]	68.58	16%
Residential and commercial uses	39.36	12%
Agriculture	33.84	8%
High GWP substances	19.78	4%
Recycling and waste	8.81	2%
Totals	**429.40**	**100%**

Source: CARB 2018a.

Notes: GHG = greenhouse gas; MMT CO_2e = million metric tons of carbon dioxide equivalent; GWP = global warming potential. Emissions reflect 2016 California GHG inventory.

[a] Percentage of total has been rounded and total may not sum due to rounding.

[b] Includes emissions associated with imported electricity, which account for 26.28 MMT CO_2e.

Between 2000 and 2016, per-capita GHG emissions in California have dropped from a peak of 14.0 MT per person in 2001 to 10.8 MT per person in 2016, representing a 23% decrease. In addition, total GHG emissions in 2016 were approximately 12 MMT CO_2e less than 2015 emissions. The declining trend in GHG emissions,

coupled with programs that will continue to provide additional GHG reductions going forward, demonstrates that California will continue to reduce emissions below the 2020 target of 431 MT CO_2e (CARB 2018).

Potential Effects of Climate Change

Globally, climate change has the potential to affect numerous environmental resources through uncertain impacts related to future air temperatures and precipitation patterns. The 2014 Intergovernmental Panel on Climate Change Synthesis Report (IPCC 2014) indicated that warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. Signs that global climate change has occurred include warming of the atmosphere and ocean, diminished amounts of snow and ice, and rising sea levels (IPCC 2014).

In California, climate change impacts have the potential to affect sea-level rise, agriculture, snowpack and water supply, forestry, wildfire risk, public health, and electricity demand and supply (CCCC 2012). The primary effect of global climate change has been a 0.2 degrees Celsius (°C) (0.36 degrees Fahrenheit (°F)) rise in average global tropospheric temperature per decade, determined from meteorological measurements worldwide between 1990 and 2005. Scientific modeling predicts that continued emissions of GHGs at or above current rates would induce more extreme climate changes during the twenty-first century than were observed during the twentieth century. A warming of about 0.2°C (0.36°F) per decade is projected, and there are identifiable signs that global warming could be taking place.

Although climate change is driven by global atmospheric conditions, climate change impacts are felt locally. A scientific consensus confirms that climate change is already affecting California. The average temperatures in California have increased, leading to more extreme hot days and fewer cold nights. Shifts in the water cycle have been observed, with less winter precipitation falling as snow, and both snowmelt and rainwater running off earlier in the year. Sea levels have risen, and wildland fires are becoming more frequent and intense due to dry seasons that start earlier and end later (CAT 2010).

An increase in annual average temperature is a reasonably foreseeable effect of climate change. Observed changes over the last several decades across the western United States reveal clear signals of climate change. Statewide average temperatures increased by about 1.7°F from 1895 to 2011, and warming has been greatest in the Sierra Nevada (CCCC 2012). By 2050, California is projected to warm by approximately 2.7°F above 2000 averages, a threefold increase in the rate of warming over the last century. By 2100, average temperatures could increase by 4.1°F to 8.6°F, depending on emissions levels. Springtime warming—a critical influence on snowmelt—will be particularly pronounced. Summer temperatures will rise more than winter temperatures, and the increases will be greater in inland California, compared to the coast. Heat waves will be more frequent, hotter, and longer. There will be fewer extremely cold nights (CCCC 2012). A decline of Sierra Nevada snowpack, which accounts for approximately half of the surface water storage in California, by 30% to as much as 90% is predicted over the next 100 years (CAT 2006).

Model projections for precipitation over California continue to show the Mediterranean pattern of wet winters and dry summers with seasonal, year-to-year, and decade-to-decade variability. For the first time, however, several of the improved climate models shift toward drier conditions by the mid-to-late twenty-first century in central, and most notably, Southern California. By the late century, all projections show

drying, and half of them suggest 30-year average precipitation will decline by more than 10% below the historical average (CCCC 2012).

A summary of current and future climate change impacts to resource areas in California, as discussed in the Safeguarding California: Reducing Climate Risk (CNRA 2014), is provided below.

Agriculture. Some of the specific challenges faced by the agricultural sector and farmers include more drastic and unpredictable precipitation and weather patterns; extreme weather events that range from severe flooding to extreme drought, to destructive storm events; significant shifts in water availably and water quality; changes in pollinator lifecycles; temperature fluctuations, including extreme heat stress and decreased chill hours; increased risks from invasive species and weeds, agricultural pests and plant diseases; and disruptions to the transportation and energy infrastructure supporting agricultural production.

Biodiversity and Habitat. Specific climate change challenges to biodiversity and habitat include species migration in response to climatic changes, range shift and novel combinations of species; pathogens, parasites and disease; invasive species; extinction risks; changes in the timing of seasonal life-cycle events; food web disruptions; threshold effects (i.e., a change in the ecosystem that results in a "tipping point" beyond which irreversible damage or loss has occurred).

Energy. Specific climate change challenges for the energy sector include temperature, fluctuating precipitation patterns, increasing extreme weather events, and sea-level rise.

Forestry. The most significant climate change related risk to forests is accelerated risk of wildfire and more frequent and severe droughts. Droughts have resulted in more large-scale mortalities and combined with increasing temperatures have led to an overall increase in wildfire risks. Increased wildfire intensity subsequently increases public safety risks, property damage, fire suppression and emergency response costs, watershed and water quality impacts, and vegetation conversions.

Ocean and Coastal Ecosystems and Resources. Sea-level rise, changing ocean conditions, and other climate change stressors are likely to exacerbate long-standing challenges related to ocean and coastal ecosystems in addition to threatening people and infrastructure located along the California coastline and in coastal communities. Sea-level rise, in addition to more frequent and severe coastal storms and erosion, are threatening vital infrastructure such as roads, bridges, power plants, ports and airports, gasoline pipes, and emergency facilities, as well as negatively impacting the coastal recreational assets such as beaches and tidal wetlands.

Public Health. Climate change can impact public health through various environmental changes and is the largest threat to human health in the twenty-first century. Changes in precipitation patterns affect public health primarily through potential for altered water supplies, and extreme events such as heat, floods, droughts, and wildfires. Increased frequency, intensity, and duration of extreme heat and heat waves are likely to increase the risk of mortality due to heat-related illness, as well as exacerbate existing chronic health conditions. Other extreme weather events are likely to negatively impact air quality and increase or intensify respiratory illness, such as asthma and allergies.

Transportation. Although the transportation industry is a source of GHG emissions, it is also vulnerable to climate change risks. Increasing temperatures and extended periods of extreme heat threaten the integrity of the roadways and rail lines. High temperatures cause the road surfaces to expand, which leads to increased pressure and pavement buckling. High temperatures can also cause rail breakages, which could lead to train derailment. Other forms of extreme weather events, such as extreme storm events, can negatively impact infrastructure, which can impair movement of peoples and goods, or potentially block evacuation routes and emergency access roads. Increased wildfires, flooding, erosion risks, landslides, mudslides, and rockslides can all profoundly impact the transportation system and pose a serious risk to public safety.

Water. Climate change could seriously impact the timing, form, amount of precipitation, runoff patterns, and frequency and severity of precipitation events. Higher temperatures reduce the amount of snowpack and lead to earlier snowmelt, which can impact water supply availability, natural ecosystems, and winter recreation. Water supply availability during the intense dry summer months is heavily dependent on the snowpack accumulated during the winter time. Increased risk of flooding has a variety of public health concerns, including water quality, public safety, property damage, displacement, and post-disaster mental health problems. Prolonged and intensified droughts can also negatively groundwater reserves and result in increased overdraft and subsidence. The higher risk of wildfires can lead to increased erosion, which can negatively impact watersheds and result in poor water quality.

In March 2016, the California Natural Resources Agency (CNRA) released Safeguarding California: Implementation Action Plans, a document that shows how California is acting to convert the recommendations contained in the 2014 Safeguarding California plan into action (CNRA 2016). Additionally, in May 2017, the CNRA released the draft Safeguarding California Plan: 2017 Update, which is a survey of current programmatic responses for climate change and contains recommendations for further actions (CNRA 2017).

The CNRA released Safeguarding California Plan: 2018 Update in January 2018, which provides a roadmap for state agencies to protect communities, infrastructure, services, and the natural environment from climate change impacts. The 2018 Safeguarding California Plan includes 69 recommendations across 11 sectors and more than 1,000 ongoing actions and next steps developed by scientific and policy experts across 38 state agencies (CNRA 2018). As with previous state adaptation plans, the 2018 Update addresses acceleration of warming across the state; more intense and frequent heat waves; greater riverine flows; accelerating sea-level rise; more intense and frequent drought; more severe and frequent wildfires; more severe storms and extreme weather events; shrinking snowpack and less overall precipitation; and ocean acidification, hypoxia, and warming.

4.4.3 Relevant Plans, Policies, and Ordinances

Federal

Massachusetts v. EPA

In *Massachusetts v. EPA* (April 2007), the U.S. Supreme Court directed the EPA administrator to determine whether GHG emissions from new motor vehicles cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. In December 2009, the administrator signed a final rule with the following two distinct findings regarding GHGs under Section 202(a) of the federal Clean Air Act:

- The Administrator found that elevated concentrations of GHGs—CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6—in the atmosphere threaten the public health and welfare of current and future generations. This is the "endangerment finding."
- The Administrator further found the combined emissions of GHGs—CO_2, CH_4, N_2O, and HFCs—from new motor vehicles and new motor vehicle engines contribute to the GHG air pollution that endangers public health and welfare. This is the "cause or contribute finding."

These two findings were necessary to establish the foundation for regulation of GHGs from new motor vehicles as air pollutants under the Clean Air Act.

Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 (December 2007), among other key measures, would do the following, which would aid in the reduction of national GHG emissions (EPA 2007):

- Increase the supply of alternative fuel sources by setting a mandatory Renewable Fuel Standard requiring fuel producers to use at least 36 billion gallons of biofuel in 2022.
- Set a target of 35 miles per gallon for the combined fleet of cars and light trucks by model year 2020 and directs National Highway Traffic Safety Administration (NHTSA) to establish a fuel economy program for medium- and heavy-duty trucks and create a separate fuel economy standard for work trucks.
- Prescribe or revise standards affecting regional efficiency for heating and cooling products and procedures for new or amended standards, energy conservation, energy-efficiency labeling for consumer electronic products, residential boiler efficiency, electric motor efficiency, and home appliances.

Federal Vehicle Standards

In response to the U.S. Supreme Court ruling previously discussed, the Bush Administration issued Executive Order (EO) 13432 in 2007 directing the EPA, the Department of Transportation, and the Department of Energy to establish regulations that reduce GHG emissions from motor vehicles, non-road vehicles, and non-road engines by 2008. In 2009, the NHTSA issued a final rule regulating fuel efficiency and GHG emissions from cars and light-duty trucks for model year 2011, and in 2010, the EPA and NHTSA issued a final rule regulating cars and light-duty trucks for model years 2012–2016 (75 FR 25324–25728).

In 2010, President Barack Obama issued a memorandum directing the Department of Transportation, Department of Energy, EPA, and NHTSA to establish additional standards regarding fuel efficiency and GHG reduction, clean fuels, and advanced vehicle infrastructure. In response to this directive, EPA and NHTSA proposed stringent, coordinated federal GHG and fuel economy standards for model years 2017–2025 light-duty vehicles. The proposed standards projected to achieve 163 grams per mile of CO_2 in model year 2025, on an average industry fleet-wide basis, which is equivalent to 54.5 miles per gallon if this level were achieved solely through fuel efficiency. The final rule was adopted in 2012 for model years 2017–2021 (77 FR 62624–63200). On January 12, 2017, the EPA finalized its decision to maintain the current GHG emissions standards for model years 2022–2025 cars and light trucks (EPA 2017b).

In addition to the regulations applicable to cars and light-duty trucks described above, in 2011, the EPA and NHTSA announced fuel economy and GHG standards for medium- and heavy-duty trucks for model years 2014–2018 (76 FR 57106–57513). The standards for CO_2 emissions and fuel consumption are tailored to three main vehicle categories: combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. According to the EPA, this regulatory program will reduce GHG emissions and fuel consumption for the affected vehicles by 6%–23% over the 2010 baselines.

In August 2016, the EPA and NHTSA announced the adoption of the phase two program related to the fuel economy and GHG standards for medium- and heavy-duty trucks. The phase two program will apply to vehicles with model year 2018 through 2027 for certain trailers, and model years 2021 through 2027 for semi-trucks, large pickup trucks, vans, and all types and sizes of buses and work trucks. The final standards are expected to lower CO_2 emissions by approximately 1.1 billion MT and reduce oil consumption by up to 2 billion barrels over the lifetime of the vehicles sold under the program (EPA and NHTSA 2016).

Clean Power Plan and New Source Performance Standards for Electric Generating Units.

On October 23, 2015, the EPA published a final rule (effective December 22, 2015) establishing the Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (80 FR 64510–64660), also known as the Clean Power Plan. These guidelines prescribe how states must develop plans to reduce GHG emissions from existing fossil-fuel-fired electric generating units. The guidelines establish CO_2 emission performance rates representing the best system of emission reduction for two subcategories of existing fossil-fuel-fired electric generating units: (1) fossil-fuel-fired electric utility steam-generating units, and (2) stationary combustion turbines. Concurrently, the EPA published a final rule (effective October 23, 2015) establishing Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units (80 FR 64661–65120). The rule prescribes CO_2 emission standards for newly constructed, modified, and reconstructed affected fossil-fuel-fired electric utility generating units. The U.S. Supreme Court stayed implementation of the Clean Power Plan pending resolution of several lawsuits.

State/Regional

The statewide GHG emissions regulatory framework is summarized below by category: state climate change targets, building energy, renewable energy and energy procurement, mobile sources, solid waste, water, and other state regulations and goals. The following text describes EOs, legislation, regulations, and other plans and policies that would directly or indirectly reduce GHG emissions and/or address climate change issues

State Climate Change Targets

EO S-3-05

EO S-3-05 (June 2005) established California's GHG emissions reduction targets and laid out responsibilities among the state agencies for implementing the EO and for reporting on progress toward the targets. This EO established the following targets:

- By 2010, reduce GHG emissions to 2000 levels
- By 2020, reduce GHG emissions to 1990 levels
- By 2050, reduce GHG emissions to 80% below 1990 levels

EO S-3-05 also directed the California Environmental Protection Agency to report biannually on progress made toward meeting the GHG targets and the impacts to California due to global warming, including impacts to water supply, public health, agriculture, the coastline, and forestry. The Climate Action Team was formed, which subsequently issued reports from 2006 to 2010 (CAT 2016).

Assembly Bill 32

In furtherance of the goals established in EO S-3-05, the Legislature enacted Assembly Bill (AB) 32 (Núñez and Pavley). The bill is referred to as the California Global Warming Solutions Act of 2006 (September 27, 2006). AB 32 provided initial direction on creating a comprehensive multiyear program to limit California's GHG emissions at 1990 levels by 2020 and initiate the transformations required to achieve the state's long-range climate objectives.

Senate Bill 32 and AB 197.

Senate Bill (SB) 32 and AB 197 (enacted in 2016) are companion bills. SB 32 codified the 2030 emissions reduction goal of EO B-30-15 by requiring CARB to ensure that statewide GHG emissions are reduced to 40% below 1990 levels by 2030. AB 197 established the Joint Legislative Committee on Climate Change Policies, consisting of at least three members of the Senate and three members of the Assembly, to provide ongoing oversight over implementation of the state's climate policies. AB 197 also added two members of the Legislature to CARB as nonvoting members; requires CARB to make available and update (at least annually via its website) emissions data for GHGs, criteria air pollutants, and TACs from reporting facilities; and requires CARB to identify specific information for GHG emissions reduction measures when updating the Scoping Plan.

CARB's 2007 Statewide Limit.

In 2007, in accordance with California Health and Safety Code Section 38550, CARB approved a statewide limit on the GHG emissions level for 2020, consistent with the determined 1990 baseline (427 MMT CO_2e).

CARB's Climate Change Scoping Plan

One specific requirement of AB 32 is for CARB to prepare a "scoping plan" for achieving the maximum technologically feasible and cost-effective GHG emission reductions by 2020 (Health and Safety Code Section 38561(a)), and to update the plan at least once every 5 years. In 2008, CARB approved the first Scoping Plan. The Climate Change Scoping Plan: A Framework for Change (Scoping Plan) included a mix of recommended

strategies that combined direct regulations, market-based approaches, voluntary measures, policies, and other emission reduction programs calculated to meet the 2020 statewide GHG emission limit and initiate the transformations needed to achieve the state's long-range climate objectives. The key elements of the Scoping Plan include the following (CARB 2008):

1. Expanding and strengthening existing energy efficiency programs as well as building and appliance standards
2. Achieving a statewide renewable energy mix of 33%
3. Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system and caps sources contributing 85% of California's GHG emissions
4. Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets
5. Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard (LCFS) (17 CCR, Section 95480 et seq.)
6. Creating targeted fees, including a public goods charge on water use, fees on high GWP gases, and a fee to fund the administrative costs of the State of California's long-term commitment to AB 32 implementation

The Scoping Plan also identified local governments as essential partners in achieving California's goals to reduce GHG emissions because they have broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations. Specifically, the Scoping Plan encouraged local governments to adopt a reduction goal for municipal operations and for community emissions to reduce GHGs by approximately 15% from then levels (2008) by 2020. Many local governments developed community-scale local GHG reduction plans based on this Scoping Plan recommendation.

In 2014, CARB approved the first update to the Scoping Plan. The First Update to the Climate Change Scoping Plan: Building on the Framework (First Update) defined the state's GHG emission reduction priorities for the next 5 years and laid the groundwork to start the transition to the post-2020 goals set forth in EOs S-3-05 and B-16-2012. The First Update concluded that California is on track to meet the 2020 target, but recommended a 2030 mid-term GHG reduction target be established to ensure a continuum of action to reduce emissions. The First Update recommended a mix of technologies in key economic sectors to reduce emissions through 2050, including energy demand reduction through efficiency and activity changes; large-scale electrification of on-road vehicles, buildings, and industrial machinery; decarbonizing electricity and fuel supplies; and the rapid market penetration of efficient and clean energy technologies. As part of the First Update, CARB recalculated the state's 1990 emissions level using more recent GWPs identified by the Intergovernmental Panel on Climate Change, from 427 MMT CO_2e to 431 MMT CO_2e (CARB 2014).

In 2015, as directed by EO B-30-15, CARB began working on an update to the Scoping Plan to incorporate the 2030 target of 40% below 1990 levels by 2030 to keep California on its trajectory toward meeting or exceeding the long-term goal of reducing GHG emissions to 80% below 1990 levels by 2050 as set forth in S-3-05. The Governor called on California to pursue a new and ambitious set of strategies, in line with the five climate

change pillars from his inaugural address, to reduce GHG emissions and prepare for the unavoidable impacts of climate change. In the summer of 2016, the Legislature affirmed the importance of addressing climate change through passage of SB 32 (Pavley, Chapter 249, Statutes of 2016).

In January 2017, CARB released the 2017 Climate Change Scoping Plan Update (2030 Scoping Plan) for public review and comment (CARB 2017). The 2030 Scoping Plan builds on the successful framework established in the initial Scoping Plan and First Update while identifying new, technologically feasible and cost-effective strategies that will serve as the framework to achieve the 2030 GHG target and define the state's climate change priorities to 2030 and beyond. The strategies' "known commitments" include implementing renewable energy and energy efficiency (including the mandates of SB 350), increased stringency of the LCFS, measures identified in the Mobile Source and Freight Strategies, measures identified in the proposed Short-Lived Climate Pollutant Plan, and increased stringency of SB 375 targets. To fill the gap in additional reductions needed to achieve the 2030 target, it recommends continuing the Cap-and-Trade Program and a measure to reduce GHGs from refineries by 20%.

For local governments, the 2030 Scoping Plan replaced the initial Scoping Plan's 15% reduction goal with a recommendation to aim for a community-wide goal of no more than 6 MT CO_2e per capita by 2030 and no more than 2 MT CO_2e per capita by 2050, which are consistent with the state's long-term goals. These goals are also consistent with the Global Climate Leadership Memorandum of Understanding (Under 2 MOU) (Under 2 2016) and the Paris Agreement, which were developed around the scientifically based levels necessary to limit global warming below 2°C. The 2030 Scoping Plan recognized the benefits of local government GHG planning (e.g., through Climate Action Plans (CAPs)) and provide more information regarding tools CARB is working on to support those efforts. It also recognizes the CEQA streamlining provisions for project-level review where there is a legally adequate CAP.[3] The Second Update was approved by CARB's Governing Board on December 14, 2017.

The Scoping Plan recommends strategies for implementation at the statewide level to meet the goals of AB 32, SB 32, and the EOs, and establishes an overall framework for the measures that will be adopted to reduce California's GHG emissions. A project is considered consistent with the statutes and EOs if it meets the general policies in reducing GHG emissions to facilitate the achievement of the state's goals and does not impede attainment of those goals. As discussed in several cases, a given project need not be in perfect conformity with each and every planning policy or goals to be consistent. A project would be consistent if it will further the objectives and not obstruct their attainment.

CARB's Regulations for the Mandatory Reporting of Greenhouse Gas Emissions.

CARB's Regulation for the Mandatory Reporting of Greenhouse Gas Emissions (17 CCR 95100–95157) incorporated by reference certain requirements that the EPA promulgated in its Final Rule on Mandatory Reporting of Greenhouse Gases (Title 40, CFR, Part 98). Specifically, Section 95100(c) of the Mandatory

[3] *Sierra Club v. County of Napa* (2004) 121 Cal.App.4th 1490; *San Francisco Tomorrow et al. v. City and County of San Francisco* (2015) 229 Cal.App.4th 498; *San Franciscans Upholding the Downtown Specific Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656; *Sequoyah Hills Homeowners Assn. V. City of Oakland* (1993) 23 Cal.App.4th 704, 719.

Reporting Regulation incorporated those requirements that the EPA promulgated in the Federal Register on October 30, 2009; July 12, 2010; September 22, 2010; October 28, 2010; November 30, 2010; December 17, 2010; and April 25, 2011. In general, entities subject to the Mandatory Reporting Regulation that emit more than 10,000 MT CO_2e per year are required to report annual GHGs through the California Electronic GHG Reporting Tool. Certain sectors, such as refineries and cement plants, are required to report regardless of emission levels. Entities that emit more than the 25,000 MT CO_2e per year threshold are required to have their GHG emissions report verified by a CARB-accredited third party.

Executive Order B-18-12

EO B-18-12 (April 2012) directed state agencies, departments, and other entities under the governor's executive authority to take action to reduce entity-wide GHG emissions by at least 10% by 2015 and 20% by 2020, as measured against a 2010 baseline. EO B-18-12 also established goals for existing state buildings for reducing grid-based energy purchases and water use.

Executive Order B-30-15

EO B-30-15 (April 2015) identified an interim GHG reduction target in support of targets previously identified under S-3-05 and AB 32. EO B-30-15 set an interim target goal of reducing GHG emissions to 40% below 1990 levels by 2030 to keep California on its trajectory toward meeting or exceeding the long-term goal of reducing GHG emissions to 80% below 1990 levels by 2050 as set forth in S-3-05. To facilitate achieving this goal, EO B-30-15 called for CARB to update the Scoping Plan to express the 2030 target in terms of MMT CO_2e. The EO also called for state agencies to continue to develop and implement GHG emission reduction programs in support of the reduction targets.

Senate Bill (SB) 605 and SB 1383

SB 605 (2014) requires CARB to complete a comprehensive strategy to reduce emissions of short-lived climate pollutants in the state, and SB 1383 (2016) requires CARB to approve and implement that strategy by January 1, 2018. SB 1383 also establishes specific targets for the reduction of short-lived climate pollutants (40% below 2013 levels by 2030 for methane and HFCs, and 50% below 2013 levels by 2030 for anthropogenic black carbon), and provides direction for reductions from dairy and livestock operations and landfills. Accordingly, and as mentioned above, CARB adopted its Short-Lived Climate Pollutant Reduction Strategy in March 2017. The Short-Lived Climate Pollutant Reduction Strategy establishes a framework for the statewide reduction of emissions of black carbon, methane, and fluorinated gases.

Executive Order B-55-18

EO B-55-18 (September 2018) establishes a statewide policy for the state to achieve carbon neutrality no later than 2045 and achieve and maintain net negative emissions thereafter. The goal is an addition to the existing statewide targets of reducing the state's GHG emissions. CARB will work with relevant state agencies to ensure that future Scoping Plans identify and recommend measures to achieve the carbon neutrality goal.

Mobile Sources

Assembly Bill 1493

AB 1493 (Pavley) (July 2002) was enacted in a response to the transportation sector accounting for more than half of California's CO_2 emissions. AB 1493 required CARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles determined by the state board to be vehicles that are primarily used for noncommercial personal transportation in the state. The bill required that CARB set GHG emission standards for motor vehicles manufactured in 2009 and all subsequent model years. CARB adopted the standards in September 2004. The near-term (2009–2012) standards resulted in a reduction of approximately 22% in GHG emissions compared to the emissions from the 2002 fleet, and the mid-term (2013–2016) standards resulted in a reduction of approximately 30%.

Heavy Duty Diesel

CARB adopted the final Heavy Duty Truck and Bus Regulation, Title 13, Division 3, Chapter 1, Section 2025, on December 31, 2014, to reduce particulate matter and nitrogen oxides emissions from heavy-duty diesel vehicles. The rule requires particulate matter filters be applied to newer heavier trucks and buses by January 1, 2012, with older vehicles required to comply by January 1, 2015. The rule will require nearly all diesel trucks and buses to be compliant with the 2010 model year engine requirement by January 1, 2023. CARB also adopted an Airborne Toxic Control Measure to limit idling of diesel-fueled commercial vehicles on December 12, 2013. This rule requires diesel-fueled vehicles with gross vehicle weights greater than 10,000 pounds to idle no more than 5 minutes at any location (13 CCR 2485).

Executive Order S-1-07

EO S-1-07 (January 2007, implementing regulation adopted in April 2009) sets a declining LCFS for GHG emissions measured in CO2e grams per unit of fuel energy sold in California. The target of the LCFS is to reduce the carbon intensity of California passenger vehicle fuels by at least 10% by 2020 (17 CCR 95480 et seq.). The carbon intensity measures the amount of GHG emissions in the lifecycle of a fuel, including extraction/ feedstock production, processing, transportation, and final consumption, per unit of energy delivered.

Senate Bill 375

SB 375 (Steinberg) (September 2008) addresses GHG emissions associated with the transportation sector through regional transportation and sustainability plans. SB 375 requires CARB to adopt regional GHG reduction targets for the automobile and light-truck sector for 2020 and 2035 and to update those targets every 8 years. SB 375 requires the state's 18 regional metropolitan planning organizations to prepare a Sustainable Communities Strategy (SCS) as part of their Regional Transportation Plan (RTP) that will achieve the GHG reduction targets set by CARB. If a metropolitan planning organization is unable to devise an SCS to achieve the GHG reduction target, the metropolitan planning organization must prepare an Alternative Planning Strategy demonstrating how the GHG reduction target would be achieved through alternative development patterns, infrastructure, or additional transportation measures or policies.

Pursuant to Government Code, Section 65080(b)(2)(K), an SCS does not (i) regulate the use of land; (ii) supersede the land use authority of cities and counties; or (iii) require that a city's or county's land use policies and regulations, including those in a general plan, be consistent with it. Nonetheless, SB 375 makes regional and local planning agencies responsible for developing those strategies as part of the federally required metropolitan transportation planning process and the state-mandated housing element process.

In September 2010, CARB adopted the first SB 375 targets for the regional metropolitan planning organizations. The targets for the Southern California Association of Governments (SCAG) are an 8% reduction in emissions per capita by 2020 and a 13% reduction by 2035. Achieving these goals through adoption of an SCS is the responsibility of the metropolitan planning organizations. SCAG adopted its first RTP/SCS in April 2012. The plan quantified a 9% reduction by 2020 and a 16% reduction by 2035 (SCAG 2012). In June 2012, CARB accepted SCAG's quantification of GHG reductions and its determination the SCS, if implemented, would achieve SCAG targets. On April 4, 2016, the SCAG Regional Council adopted the 2016 RTP/SCS. The 2016 RTP/SCS quantified an 8% reduction by 2020 and an 18% reduction by 2030 (SCAG 2016). In June 2016, CARB accepted SCAG's quantification of GHG reductions and its determination that the SCS would achieve SCAG targets. On May 7, 2020, the SCAG Regional Council Adopted the 2020 RTP/SCS, which continues the progress made on previous plans and quantified a 19% reduction by 2035. At the time of writing CARB's approval of the GHG reduction quantitation is pending (SCAG 2020).

Advanced Clean Cars Program and Zero-Emissions Vehicle Program

The Advanced Clean Cars program (January 2012) is a new emissions-control program for model years 2015 through 2025. The program combines the control of smog- and soot-causing pollutants and GHG emissions into a single coordinated package. The package includes elements to reduce smog-forming pollution, reduce GHG emissions, promote clean cars, and provide the fuels for clean cars (CARB 2012). To improve air quality, CARB implemented new emission standards to reduce smog-forming emissions beginning with 2015 model year vehicles. It is estimated that, by 2025, cars will emit 75% less smog-forming pollution than the average new car sold today. To reduce GHG emissions, CARB, in conjunction with the EPA and the NHTSA, adopted new GHG standards for model year 2017 to 2025 vehicles; the new standards are estimated to reduce GHG emissions by 34% in 2025. The zero-emission vehicle program will act as the focused technology of the Advanced Clean Cars program by requiring manufacturers to produce increasing numbers of zero-emission vehicles and plug-in hybrid electric vehicles in the 2018 to 2025 model years.

Executive Order B-16-12

EO B-16-12 (March 2012) required that state entities under the governor's direction and control support and facilitate the rapid commercialization of zero-emission vehicles. It ordered CARB, CEC, the California Public Utilities Commission, and other relevant agencies to work with the Plug-in Electric Vehicle Collaborative and the California Fuel Cell Partnership to establish benchmarks to help achieve benchmark goals by 2015, 2020, and 2025. On a statewide basis, EO B-16-12 established a target reduction of GHG emissions from the transportation sector equaling 80% less than 1990 levels by 2050. This directive did not apply to vehicles that have special performance requirements necessary for the protection of the public safety and welfare.

Water

Executive Order B-29-15

In response to the ongoing drought in California, EO B-29-15 (April 2015) set a goal of achieving a statewide reduction in potable urban water usage of 25% relative to water use in 2013. The term of the EO extended through February 28, 2016, although many of the directives have become permanent water-efficiency standards and requirements. The EO includes specific directives that set strict limits on water usage in the state. In response to EO B-29-15, the California Department of Water Resources modified and adopted a revised version of the Model Water Efficient Landscape Ordinance that, among other changes, significantly increases the requirements for landscape water use efficiency and broadens its applicability to include new development projects with smaller landscape areas.

Solid Waste

Assembly Bill (AB) 939 and AB 341

In 1989, AB 939, known as the Integrated Waste Management Act (PRC Sections 40000 et seq.), was passed because of the increase in waste stream and the decrease in landfill capacity. The statute established the California Integrated Waste Management Board, which oversees a disposal reporting system. AB 939 mandated a reduction of waste being disposed where jurisdictions were required to meet diversion goals of all solid waste through source reduction, recycling, and composting activities of 25% by 1995 and 50% by 2000.

AB 341 (Chapter 476, Statutes of 2011 (Chesbro)) amended the California Integrated Waste Management Act of 1989 to include a provision declaring that it is the policy goal of the state that not less than 75% of solid waste generated be source-reduced, recycled, or composted by 2020, and annually thereafter. In addition, AB 341 required the California Department of Resources Recycling and Recovery (CalRecycle) to develop strategies to achieve the state's policy goal. CalRecycle conducted several general stakeholder workshops and several focused workshops, and in August 2015 published a discussion document titled AB 341 Report to the Legislature, which identifies five priority strategies that CalRecycle believes would assist the state in reaching the 75% goal by 2020, legislative and regulatory recommendations, and an evaluation of program effectiveness (CalRecycle 2012).

Local

City of Pasadena Climate Action Plan.

The City's Final Climate Action Plan (CAP) was adopted on March 5, 2018. The City's CAP quantifies existing GHG emissions as well as projected emissions for the years 2020, 2030, 2035 and 2050 resulting from activities within the City's jurisdiction. The CAP also identifies City target emissions levels, below which Citywide GHG impacts would be less than significant. The CAP and the accompanying adopted Initial Study/Negative Declaration (IS/ND) also identify and analyze the GHG emissions that would result from the BAU scenario for the years 2020, 2030, 2035 and 2050. The CAP includes a monitoring and reporting program to ensure its progress toward achieving the specified GHG emissions reductions, and specifies 21 measures that, if implemented, would achieve the specified GHG emissions reductions targets. The CAP was adopted in a public process following adoption of the IS/ND. Subsequent to the adoption of the CAP, the City has also established additional specific measures that if implemented on a project-by-project basis, would further ensure that the City as a whole achieves the specified GHG emissions reduction targets in the CAP (City of Pasadena 2018a).

4.4.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to greenhouse gas emissions are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to greenhouse gas emissions would occur if the project would:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment.
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Through the analysis in the Initial Study (see Appendix A-1), it was determined that the proposed project would not generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gasses (i.e., Thresholds a and b). However, both of these thresholds are re-evaluated in this EIR using the latest construction assumptions and modeling methods.

As discussed in Section 4.4.3, the CAP was adopted in a public process following adoption of the IS/ND. Along with the adoption of the CAP, the City has also established additional specific measures that if implemented on a project-by-project basis, would further ensure that the City as a whole achieves the specified GHG emissions reduction targets in the CAP. The CAP Consistency Checklist is the primary document used by the City of Pasadena to verify project-by-project consistency with the underlying assumptions in the CAP and ensure that the City would achieve its emissions reduction targets. The CAP Checklist includes a three-step process to determine project consistency (City of Pasadena 2018b). Step 1 consists of a Master Land Use Application form, which provides relevant information about the proposed project. Step 2 consists of an evaluation to determine the project's consistency with existing General Plan. If the proposed project is able to answer "yes" to Step 2 and demonstrate the proposed project would be consistent with existing General Plan, for the site, or the proposed project can demonstrate consistency with existing land uses by comparing the proposed project's GHG emissions with those that would be generated under existing land uses, then the proposed project may proceed to Step 3. Step 3 provides three options to evaluate consistency of with the CAP:

- **Option A:** Sustainable Development Actions–Demonstrate that the proposed project is consistent with the Pasadena CAP by incorporating applicable actions intended to ensure that the project contributes its fair share to the City's cumulative GHG reduction goals
- **Option B:** GHG Efficiency -Demonstrate that the proposed project is consistent with Pasadena's per person GHG efficiency threshold
- **Option C:** Net Zero GHG Emissions–Demonstrate that the proposed project would not result in a net increase in GHG emissions

As the proposed Project is construction-focused in nature and would not include residential, commercial or industrial land uses that would generate a service population, Option A was selected to determine consistency with City's CAP and the significance of impacts related to GHG emissions.

4.4.5 Environmental Impacts Analysis

Threshold 4.4a. Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Short-Term Construction Impacts

CalEEMod Version 2016.3.2 was used to estimate potential Project-generated GHG emissions during construction. Construction of the proposed Project would result in GHG emissions primarily associated with use of off-road construction equipment, on-road hauling and vendor (material delivery) trucks, and worker vehicles. All details for construction criteria air pollutants discussed in Section 4.1, Air Quality are also applicable for the estimation of construction-related GHG emissions. As such, see Section 4.1 of this Draft EIR for a discussion of construction emissions calculation methodology and assumptions.

Construction of the proposed Project would result in GHG emissions, primarily associated with the use of off-road construction equipment, haul trucks, on-road vendor trucks, and worker vehicles. SCAQMD's Draft Guidance Document – Interim CEQA Greenhouse Gas Significance Threshold (SCAQMD 2008) recommends that "construction emissions be amortized over a 30-year Project lifetime, so that GHG reduction measures will address construction GHG emissions as part of the operational GHG reduction strategies." Thus, the total construction GHG emissions were calculated, amortized over 30 years, and added to the total operational emissions.

Table 4.4-2 shows the estimated annual GHG construction emissions associated with the proposed Project, as well as the amortized construction emissions over a 30-year Project life.

Table 4.4-2. Estimated Annual Construction GHG Emissions

Year	CO_2	CH_4	N_2O	CO_2e
	Metric Tons per Year			
2021	148.91	0.03	0.00	149.65
2022	371.26	0.06	0.00	372.86
			Total	522.51
			Amortized Emissions	**17.41**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent.
See Appendix C for complete results.

As shown in Table 4.4-2, total construction emissions for the proposed Project were estimated to be 523 MT CO_2e. Estimated amortized Project-generated construction emissions over 30 years would be approximately 17 MT CO_2e per year. As with Project-generated construction air quality pollutant emissions, GHG emissions generated during construction of the proposed Project would be short-term in nature, lasting only for the duration of the construction period for each phase, and would not represent a long-term source of GHG emissions. Because there is no separate GHG threshold for construction, the evaluation of significance is discussed in the operational emissions analysis below.

Long-Term Operational Impacts

As described in Section 3, Project Description, PWP's future schedule of operation and maintenance activities for Project-related facilities would not substantively differ from the current maintenance routine and procedures. No new employees are required for the long-term operation of the Project components; therefore, no long-term operational GHG emissions from mobile sources would result. However, the project would include new hydraulic motors and winches as part of the design for Area 2, which would be electrically powered. Energy demand for the hydraulic motors and winches are estimated to be 4,800 kilowatt hours per year. Table 4.4-3 shows the estimated annual GHG operational emissions associated with the proposed Project, as well as the amortized construction emissions over a 30-year Project life.

Table 4.4-3. Estimated Annual Construction GHG Emissions

Source	CO_2	CH_4	N_2O	CO_2e
	Metric Tons per Year			
Area	0	0	0	0
Energy	3.68	<0.01	<0.01	3.69
Mobile	0	0	0	0
			Amortized Construction Emissions	17.41
			Total	**21.10**

Notes: CO_2 = carbon dioxide; CH_4 = methane; N_2O = nitrous oxide; CO_2e = carbon dioxide equivalent.
See Appendix C for complete results.

As shown in Table 4.4-3, the total proposed Project emissions during operation were estimated to be approximately 3 MT CO2e per year which includes amortized construction emissions of 20 MT CO2e per year. As discussed in Section 4.4.4, the significance determination is based on consistency with the City's CAP using its CAP Consistency Checklist. This CAP Consistency Checklist and the proposed Project's GHG impacts are discussed in Threshold GHG-2.

Although not quantified, the proposed Project would further reduce City's reliance upon purchased imported water supplies from the Metropolitan Water District of Southern California (MWD). The City is a member agency of MWD, which serves wholesale treated water to the City imported from the Colorado River Aqueduct and the State Water Project (SWP). Because the Project would increase the supply of local groundwater in replacement of imported water, there would be a reduction in electricity associated with the water source. For imported water, electricity is needed to supply and transport the water from sources in other parts of California, which is a very energy-intensive process to pump the water across the State through topographical elevation changes. However, for local groundwater, electricity is only needed for pumping. Accordingly, electricity associated with supply of water from MWD is avoided as a result of replacing some of the City's reliance on imported water source with local groundwater supplies.

Threshold 4.4b Would the project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Consistency with the City's CAP

As discussed in Section 4.4.4, the City of Pasadena evaluates GHG significance based on a Project's consistency with the City's CAP using the CAP Consistency Checklist. Step 2 of the Checklist determines the Project's consistency with the land use assumptions used in the CAP. The proposed Project is currently designated as Open Space. As the Project proposed would continue to serve as open space once construction is complete, it is consistent with the existing land use designation. Therefore, the Project would respond Yes to Step 2 of the CAP Checklist and can proceed to Step 3 of the Cap Checklist. Step 3 of the checklist provides 3 options to determine consistency with the CAP. Given that the Project is primarily a construction project, Option A: Sustainable Development Actions was used to determine consistency with the CAP. Table 4.4-4 shows the Project's consistency with each action within the CAP Consistency Checklist.

Table 4.4-4. Climate Action Plan Consistency Checklist

GHG Reduction Strategy	Sustainable Development Actions	Project Compliance
Mandatory Actions		
T-1.2: Continue to improve bicycle and pedestrian safety	*Bicycle Storage*: Does the project provide bicycle storage lockers, racks, or other bicycle storage facilities for residents/employees?	**Not Applicable**. The Project is construction focused and result in water utility infrastructure surrounded by open space. Therefore, the Project would not result in new employees or residents
T-3.1: Decrease annual commuter miles traveled by single occupancy vehicles	*Transportation Demand Management (TDM):* Does the project include a TDM plan? A TDM plan is required for the following projects: multifamily residential development that are 100 or more units; mixed-use developments with 50 or more residential units or 50,000 square feet or more of non-residential development; or non-residential projects which exceed 75,000 square feet. If applicable, please submit the TDM plan for review.	**Not Applicable**. The Project is construction focused and result in water utility infrastructure surrounded by open space similar to existing conditions. Employee trips to and from the Project from maintenance activities would be similar to existing conditions.
T-4.1: Expand the availability and use of alternative fuel vehicles and fueling infrastructure	*Alternative Vehicle Fueling Wiring:* For projects with more than three parking spaces, does the project provide wiring for at least one 240V Type II electric car charger?	**Not Applicable**. The Project is construction focused and would result in water utility infrastructure surrounded by open space and would not add new parking.
E-1.2: Encourage the use of energy conservation devices and passive design concepts that make use of the natural climate to increase energy efficiency	*Passive Design Features*: Does the project utilize passive design techniques such as awnings or overhangs on the east, west, and south facing windows which block the high summer sun but allow in lower winter sun?	**Not Applicable**. The Project is construction focused and would result in water utility infrastructure surrounded by open space after completion of construction activities. Residential or commercial structures would not be built as part of the Project.

Table 4.4-4. Climate Action Plan Consistency Checklist

GHG Reduction Strategy	Sustainable Development Actions	Project Compliance
WC-1.1:Reduce potable water usage throughout Pasadena	*Irrigation Efficiency*: Will the project utilize drought tolerant landscaping and/or drip irrigation and/or weather controllers to reduce outdoor water use?	**Not Applicable.** The Project is construction focused and would result in water utility infrastructure surrounded by open space after completion of construction activities. The Project site would not require irrigation.
WR-1.1: Continue to reduce solid waste and landfill GHG emissions	*Facilitate Recycling*: Does the project include a space for separate trash and recycling bins as well as provide informational signage/handouts for residents/employees outlining materials to be recycled?	**Not Applicable.** The Project is construction focused and would result in water utility infrastructure surrounded by open space after completion of construction activities.
Selective Actions		
WC-2.1: Increase access to and use of non-potable water	*Rainwater Capture and Reuse*: Does the project utilize a rainwater capture and reuse system to reduce the amount of potable water consumed on site?	**Consistent.** The Project is a water utility infrastructure that would add approximately 1,035 acre-ft/yr of diverted flows into the spreading basins for the beneficial use of the City's water rights.
WC-3.1: Improve storm water to slow, sink, and treat water run-off, recharge groundwater, and improve water quality	*Permeable Surfaces:* Is at least 30% of the hardscape (e.g., surface parking lots, walkways, patios, etc.) permeable to allow infiltration? Please include these specifications on the project plans	**Consistent.** The Project would replace existing utility infrastructure. Construction of the streambed shoulder and bank, including the roughened channel, downstream of the new diversion structure and operable weir would be with permeable engineered streambed material (ESM). The ESM selected for the Project would consist of a well-graded mixture of rock, gravel and sand similar to natural streambed material, and would not add any new impervious surfaces within the Arroyo Seco streambed.
WC-3.1: Improve storm water to slow, sink, and treat water run-off, recharge groundwater, and improve water quality	*Stormwater Capture:* Is the project designed to retain stormwater resulting from the 95th percentile, 24-hour rain event as defined by the Los Angeles County 95th percentile precipitation isohyetal map?	**Consistent.** The Project is a water utility infrastructure that would add approximately 1,035 acre-ft/yr of diverted flows into the spreading groundwater basins from the capture of stormwater events within the Arroyo Seco.
UG-1.1: Continue to preserve, enhance, and acquire additional green space throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active recreation	*Greenspace:* Does the project include at least 500 sq. ft. of public use greenspace (landscaped yards, parklets, rooftop garden, etc.)? At a minimum, 50% of the required greenspace must include softscape landscaping (e.g., trees, plants, grass, etc.).	**Consistent.** The Project would result in water utility infrastructure surrounded by open space after completion of construction activities. Areas currently available for public use would not be permanently impacted by the Project implementation.

Table 4.4-4. Climate Action Plan Consistency Checklist

GHG Reduction Strategy	Sustainable Development Actions	Project Compliance
UG-2.1: Continue to protect existing trees and plant new ones to improve and ensure viability of Pasadena's urban forest	*Trees:* Does the project result in a net gain of trees?	**Consistent.** As discussed in Section 4.2, Biological Resources, the Project would result in the removal of 19 protected trees in total, of which all are located in Area 2. A total of 15 protected trees are expected to be encroached upon. The City's replacement requirements range from 2:1 to 12:1, depending on the diameter of the removed tree.

Source: City of Pasadena 2018b

As shown in Table 4.4-4 above, the Project would be consistent with the necessary applicable GHG reduction actions found within the CAP Consistency Checklist. Additionally, the Project would not result in a change in land use that would generate GHG emissions in excess of the Project site's existing land use designation (CAP Checklist Step 2). Therefore, the Project would be consistent with the City's CAP.

Consistency with CARB's Scoping Plan

The CARB Scoping Plan, approved by CARB in 2008 and updated in 2014 and 2017, provides a framework for actions to reduce California's GHG emissions and requires CARB and other state agencies to adopt regulations and other initiatives to reduce GHGs. The Scoping Plan is not directly applicable to specific Projects, nor is it intended to be used for Project-level evaluations.4 Under the Scoping Plan, however, there are several state regulatory measures aimed at the identification and reduction of GHG emissions. CARB and other state agencies have adopted many of the measures identified in the Scoping Plan. Most of these measures focus on area source emissions (e.g., energy usage, high-GWP GHGs in consumer products) and changes to the vehicle fleet (i.e., hybrid, electric, and more fuel-efficient vehicles) and associated fuels (e.g., Low Carbon Fuel Standard), among others. The proposed Project would not conflict with implementation of the measures identified in the Scoping Plan.

Consistency with the Southern California Association of Governments 2020–2045 Regional Transportation Plan/Sustainable Communities Strategy

On May 7, 2020, SCAG's Regional Council adopted Connect SoCal (2020 - 2045 Regional Transportation Plan/Sustainable Communities Strategy) for federal transportation conformity purposes only. In light of the COVID-19 pandemic, the Regional Council will consider approval of Connect SoCal in its entirety and for all other purposes within 120 days from May 7, 2020.

4 The Final Statement of Reasons for the amendments to the CEQA Guidelines reiterates the statement in the Initial Statement of Reasons that "[t]he Scoping Plan may not be appropriate for use in determining the significance of individual projects because it is conceptual at this stage and relies on the future development of regulations to implement the strategies identified in the Scoping Plan" (CNRA 2009b).

Connect SoCal is a long-range visioning plan that builds upon and expands land use and transportation strategies established over several planning cycles to increase mobility options and achieve a more sustainable growth pattern. It charts a path toward a more mobile, sustainable and prosperous region by making connections between transportation networks, between planning strategies and between the people whose collaboration can improve the quality of life for Southern Californians. Because the Project is not growth inducing, this type of consistency analysis does not apply. However, the major goals of the Connect SoCal are outlined in Table 4.4-5, along with the Project's consistency with them.

Table 4.4-5 Project Consistency with the SCAG Connect SoCal RTP/SCS

RTP/SCS Measure	Proposed Project Consistency
Encourage regional economic prosperity and global competitiveness.	*Not applicable.* The Project would not inhibit SCAG from encouraging regional economic prosperity and global competitiveness.
Improve mobility, accessibility, reliability, and travel safety for people and goods.	*Not applicable.* The Project would not inhibit SCAG from strengthening the regional transportation network for goods movement.
Enhance the preservation, security, and resilience of the regional transportation system.	*Not applicable.* The Project would not inhibit SCAG from enhancing the resilience of the regional transportation system.
Increase person and goods movement and travel choices within the transportation system.	*Not applicable.* The Project would not inhibit SCAG from increasing person and goods movement and travel choices within the transportation system.
Reduce greenhouse gas emissions and improve air quality.	*Consistent*. The Project would result in criteria air pollutant and GHG emissions during construction and operation. However, emissions would not exceed the SCAQMD significance thresholds and would be consistent with the City's CAP. The project would also support the use of local water supplies in place of more energy intensive imported water.
Support healthy and equitable communities.	*Not applicable.* The Project would not inhibit SCAG from supporting healthy and equitable communities.
Adapt to a changing climate and support an integrated regional development pattern and transportation network.	*Consistent*. The Project would facilitate adaption to climate change and would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial uses of this important local water resource. The Project would reducing reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD).
Leverage new transportation technologies and data-driven solutions that result in more efficient travel.	*Not applicable.* The Project would not inhibit SCAG from leveraging technology for the transportation system.
Encourage development of diverse housing types in areas that are supported by multiple transportation options.	*Not applicable.* The Project would not inhibit SCAG from encouraging development of diverse housing types.
Promote conservation of natural and agricultural lands and restoration of habitats.	*Consistent*. The Project would provide opportunities for increased aquatic biological functions within the Arroyo Seco by: (1) protecting fish and eliminating the unimpeded passage of stream flows that could carry aquatic animals into the conveyance system, and (2) reducing existing impediments to fish passage at the diversion weir structure.

Source: SCAG 2020.

As shown in Table 4-4.5, the project would be consistent with all applicable measures within the SCAG Connect SoCal RTP/SCS.

Consistency with Senate Bill 32 and Executive Order S-3-05

The Project would not impede the attainment of the GHG reduction goals for 2030 or 2050 identified in Senate Bill (SB) 32 and Executive Order S-3-05, respectively. Executive Order S-3-05 establishes the following goals: GHG emissions should be reduced to 2000 levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050. SB 32 establishes a statewide GHG emissions reduction target whereby CARB, in adopting rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emissions reductions, shall ensure that statewide GHG emissions are reduced to at least 40% below 1990 levels by December 31, 2030. While there are no established protocols or thresholds of significance for that future year analysis, CARB forecasts that compliance with the current Scoping Plan puts the state on a trajectory of meeting these long-term GHG goals, although the specific path to compliance is unknown (CARB 2014).

CARB has expressed optimism with regard to both the 2030 and 2050 goals. It states in the First Update to the Climate Change Scoping Plan that "California is on track to meet the near-term 2020 GHG emissions limit and is well positioned to maintain and continue reductions beyond 2020 as required by AB 32" (CARB 2014). With regard to the 2050 target for reducing GHG emissions to 80% below 1990 levels, the First Update to the Climate Change Scoping Plan states that the level of reduction is achievable in California (CARB 2014). CARB believes that the state is on a trajectory to meet the 2030 and 2050 GHG reduction targets set forth in AB 32, SB 32, and Executive Order S-3-05. This is confirmed in the *2017 Scoping Plan*, which states (CARB 2017):

> The Scoping Plan builds upon the successful framework established by the Initial Scoping Plan and First Update, while identifying new, technologically feasible and cost-effective strategies to ensure that California meets its GHG reduction targets in a way that promotes and rewards innovation, continues to foster economic growth, and delivers improvements to the environment and public health, including in disadvantaged communities.

The Project would not interfere with implementation of any of the previously described GHG reduction goals for 2030 or 2050 because the Project would be consistent with the City's CAP. Because the Project would be consistent with the City's CAP, this analysis provides support for the conclusion that the Project would not impede the state's trajectory toward the previously described statewide GHG reduction goals for 2030 or 2050.

The Project's consistency with the state's Scoping Plan would assist in meeting the City's contribution to GHG emission reduction targets in California. With respect to future GHG targets under SB 32 and Executive Order S-3-05, CARB has also made clear its legal interpretation that it has the requisite authority to adopt whatever regulations are necessary, beyond the AB 32 horizon year of 2020, to meet the SB 32 40% reduction target by 2030 and the Executive Order S-3-05 80% reduction target by 2050. This legal interpretation by an expert agency provides evidence that future regulations will be adopted to continue the trajectory toward meeting these future GHG targets.

Based on the considerations previously outlined, the Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs. This impact would be less than significant.

4.4.6 Cumulative Impacts

As explained earlier, the analysis of a Project's GHG emissions is inherently a cumulative analysis because climate change is a global issue and the emissions from individual Projects are negligible in a global context. Accordingly, the analysis above takes into account the potential for the proposed Project to contribute to a cumulative impact of global climate change, which was determined to be less than significant. The analysis shows that the proposed Project is consistent with the City's CAP reduction measures and SCAG RTP/SCS goals to reduce regional GHG emissions from the land use and transportation sectors by 2020 and 2035. The proposed Project is also consistent with CARB's Scoping Plan. Given the proposed Project's consistency with local, statewide and regional plans adopted for the purpose of reducing GHG emissions, it is concluded that the proposed Project's incremental contribution to GHG emissions and their effects on climate change would not be cumulatively considerable. For these reasons, the proposed Project's cumulative contribution to global climate change is less than significant.

4.4.7 Mitigation Measures

No mitigation measures are required.

4.4.8 Level of Significance After Mitigation

The proposed Project would not result in any potentially significant impacts related to GHG, and all impacts would be less than significant with Project implementation.

4.4.9 References

14 CCR 15000–15387 and Appendices A–L. Guidelines for Implementation of the California Environmental Quality Act, as amended.

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4.5 Hydrology and Water Quality

4.5.1 Methodology

This section describes the existing conditions of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential environmental impacts, and identifies mitigation measures related to implementation of the proposed Project. The analysis of Project impacts related to hydrology and water quality is based on a review of existing resources and applicable laws, regulations, and guidelines, as well as the following:

Appendix F Hydraulics, Sediment Transport, and Groundwater Analysis, Arroyo Seco Canyon Project Diversion, prepared by Psomas, dated August 2018

Appendix A-2 Geotechnical Feasibility Study Report, Proposed Public Restroom, Roadway Improvement, and Stormwater Sediment Basin Project, prepared by Converse Consultants, dated August 23, 2013. (Appendix B to the 2015 Initial Study/Mitigated Negative Declaration)

Appendix B-1 Arroyo Seco Canyon Project- Intake/Diversion Design (Area 2) Draft Basis of Design Report, Prepared by Northwest Hydraulic Consultants, Inc., dated March 2, 2020

Appendix B-2 Arroyo Seco Canyon Project 100% Submittal (Area 3), prepared by Carollo Engineers, dated 2017

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

4.5.2 Existing Conditions

Regional Watershed

The proposed Project is located within the jurisdiction of the Los Angeles Regional Water Quality Control Board (LARWQCB), which administers the Basin Plan and other water quality programs within the coastal watersheds of Los Angeles and Ventura Counties. The LARWQCB jurisdiction covers a 5,600-square-mile area that encompasses all coastal drainages flowing to the Pacific Ocean between Rincon Point (on the coast of western Ventura County) and the eastern Los Angeles County line. The boundaries of the Los Angeles River Basin are demarcated partly by physical watershed divides and partly by administrative boundaries (i.e., Orange County/Los Angeles County line).

Figure 4.5-1, United States Geological Survey (USGS) Watersheds, graphically depicts the watersheds that encompass the Project site. Similarly, Figure 4.5-2, Los Angeles Regional Water Quality Control Board Hydrologic Areas depicts the basin plan watershed and subwatersheds. Information presented in these figures is listed in Table 4.5-1. The USGS Watershed Boundary Dataset delineates watersheds according to hydrologic units, which are nested within one another according to the scale of interest. USGS identifies hydrologic units by name and by

hydrologic unit code (HUC), which gets longer as the watershed boundaries get more detailed. The LARWQCB Basin Plan identifies watersheds in a hierarchical system similar to the USGS Watershed Boundary Dataset, but with somewhat different watershed names and boundaries. These geographic boundaries are likewise watershed-based, but are typically referred to as hydrologic units, areas, and sub-areas. These generally constitute the geographic basis around which many surface water quality problems and goals/objectives are defined in the Basin Plan. The proposed Project is located within the Los Angeles – San Gabriel River hydrologic unit (No. 405), and more specifically within the Raymond hydrologic area (No. 405.3) and Monk Hill hydrologic sub-area (No. 405.32), within the LARWQCB (LARWQCB 2014). The USGS Watershed Boundary Dataset indicates the Project site lies within the 45.6 square-mile Arroyo Seco sub-watershed of the 407.6-square-mile Upper Los Angeles River watershed within the Los Angeles River sub-basin in the Ventura/San Gabriel basin (USGS 2020a).

Table 4.5-1. Watershed Designations by Agency/Source

Agency/Source	HUC/ Basin No.	Analysis Scale	Name	Size (Sq. Mi.)
USGS Watershed Boundary Dataset	180701	Basin	Ventura/San Gabriel	5,606
	18070105	Sub-basin	Los Angeles River	831
	1807010502	Watershed	Upper Los Angeles River	408
	180701050209	Sub-watershed	Arroyo Seco	46
LARWQCB Basin Plan	400	RWQCB Region	Los Angeles	4,412
	405	Hydrologic Unit (HU)	Los Angeles – San Gabriel River	1742
	405.3	Hydrologic Area (HA)	Raymond	92
	405.32	Hydrologic Sub-Area (HSA)	Monk Hill	37

Sources: USGS 2020a; LARWQCB 2014.

Notes: HUC = hydrologic unit code; sq. mi = square miles

Groundwater Basin

As illustrated in Figure 4.5-3, Raymond Basin and Subareas, the Project overlies and recharges the Monk Hill Subarea of the Raymond Basin, which is bordered on the north by the San Gabriel Mountains, on the west by the San Rafael Hills, and on the south and east by the Raymond Fault (DWR 2016). The Monk Hill Subarea is an important source of potable groundwater for many communities in the area including Pasadena, La Cañada-Flintridge and Altadena. The aquifer in the Monk Hill Subarea is generally considered to be an unconfined aquifer, although the presence of relatively thin, silt-rich layers throughout the alluvial aquifer inhibit the vertical flow of groundwater. The aquifer can be divided into four aquifer zones above the crystalline basement complex including the upper and lower sections of the Older Fanglomerate Series (Zones 1 and 2), the Pacoima Formation (Zone 3), and the Saugus Formation (Zone 4) (NASA 2004).

In the Raymond Basin, groundwater generally flows southerly from areas of recharge at the base of the San Gabriel Mountains to areas of discharge along the Raymond Fault. A confluence of groundwater flow regimes occurs within the Monk Hill Subarea; at the western end of the Subarea the flow is predominantly to the southeast which at the eastern end (near the Project area) flow is predominantly to the south (NASA 2004).

The groundwater surface has been measured in the Jet Propulsion Laboratories (JPL) monitoring wells at depths ranging from approximately 22 ft to 270 ft below ground surface. This wide range of depths to groundwater can primarily be contributed to the relatively steep topography present at the JPL facility and local groundwater mounding. It also can be accounted for by seasonal groundwater recharge from the existing spreading grounds and the extraction of groundwater from nearby municipal production wells. Based on monitoring data collected since 1996, groundwater elevations have fluctuated up to 75 ft each year, primarily as a result of these influences (NASA 2004).

Topography and Drainage

The topography in Area 2 ranges from 1,170 to 1,200 ft above mean sea level (amsl) and ranges in Area 3 from 1,100 to 1,130 ft amsl. Existing site drainage generally follows the course of the Arroyo Seco, which flows in a principally southward direction towards the Devil's Gate Dam. Therefore, the "receiving waters" for the Project (i.e., all waters within the flow network downstream of the Project site) include Arroyo Seco, the Los Angeles River and the Pacific Ocean (Carollo Engineers 2013).

In the larger vicinity, stormwater runoff is collected in streets through inlets, catch basins and underground storm drains maintained by the Los Angeles County Flood Control District. Stormwater is then conveyed through the storm drain system to the Arroyo Seco via the Altadena Drain (which discharges near the Behner Water Treatment Plant), the Altcrest Drain (which discharges at the end of W. Altadena Dr.), and BI 0710 – Unit 1 (which discharges at the end of Ventura Street) (County of Los Angeles 2018). These waters then follow Arroyo Seco to the Devil's Gate Dam (Carollo Engineers 2013).

Surface Water Quality

Several water bodies within and adjacent to the watershed are designated as "water quality-limited" for water quality impairments under the federal Clean Water Act's (CWA's) Section 303(d) (Table 4.5-2). Being "water quality-limited" means that a water body is "not reasonably expected to attain or maintain water quality standards" without additional regulation. The law requires that the U.S. Environmental Protection Agency develop total maximum daily loads (TMDLs) for each impaired water body in the nation. The TMDLs specify the maximum amount of a pollutant a water body can receive and still meet water quality standards. A TMDL may also include a plan for bringing an impaired water body back within standards. Table 4.5-2 lists the most recently approved Section 303(d) List of Water Quality Limited Segments located downstream of the Project, as listed in the 2014-2016 Integrated Report, which lists Arroyo Seco from below Devil's Gate Dam to the confluence with the Los Angeles River, the Los Angeles River and Estuary, and San Pedro Bay as impaired water bodies under Section 303(d) of the CWA.

Table 4.5-2. CWA Section 303(d) Impairments

Name	Pollutant/ Stressor	Potential Sources	TMDL Status	Year
Arroyo Seco Reach 2 (West Holly Ave. to Devils Gate Dam)	Indicator Bacteria	Source Unknown	Approved	2012
	Trash	Nonpoint Source /Surface Runoff / Urban Runoff / Storm Sewers	Approved	2008
	Indicator Bacteria	Source Unknown	Approved	2012

Table 4.5-2. CWA Section 303(d) Impairments

Name	Pollutant/ Stressor	Potential Sources	TMDL Status	Year
Arroyo Seco Reach 1 (LA River to West Holly Ave.)	Trash	Nonpoint Source /Surface Runoff / Urban Runoff / Storm Sewers	Approved	2008
Los Angeles River Reach 2 (Carson to Figueroa Street)	Ammonia	Nonpoint Source / Point Source	Approved	2004
	Copper	Source Unknown	Approved	2005
	Indicator Bacteria	Source Unknown	Approved	2012
	Lead	Nonpoint Source / Point Source	Approved	2005
	Nutrients (Algae)	Nonpoint Source / Point Source	Approved	2004
	Oil	Natural Sources	Scheduled	2019
	Trash	Nonpoint Source /Surface Runoff / Urban Runoff / Storm Sewers	Approved	2008
Los Angeles River Reach 1 (Estuary to Carson Street)	Ammonia	Nonpoint Source / Point Source	Approved	2004
	Cadmium	Source Unknown	Approved	2005
	Copper, Dissolved	Nonpoint Source / Point Source	Approved	2005
	Cyanide	Source Unknown	Scheduled	2019
	Indicator Bacteria	Source Unknown	Approved	2003
	Lead	Nonpoint Source / Point Source	Approved	2005
	Nutrients (Algae)	Nonpoint Source / Point Source	Approved	2004
	pH	Nonpoint Source / Point Source	Approved	2003
	Trash	Nonpoint Source /Surface Runoff / Urban Runoff / Storm Sewers	Approved	2008
	Zinc, Dissolved	Nonpoint Source / Point Source	Approved	2005
Los Angeles River Estuary (Queensway Bay)	Chlordane	Source Unknown	Approved	2012
	DDT (sediment)	Source Unknown	Approved	2012
	PCBs	Source Unknown	Scheduled	2019
	Toxicity	Source Unknown	Scheduled	2019
	Trash	Nonpoint Source /Surface Runoff / Urban Runoff / Storm Sewers	Approved	2008
San Pedro Bay Near/Off Shore Zones	Chlordane (tissue & sediment)	Source Unknown	Approved	2012
	PCBs	Source Unknown	Approved	2012
	Total DDT	Source Unknown	Approved	2012
	Toxicity	Source Unknown	Approved	2012

Source: SWRCB 2017

Pursuant to listing, the LARWQCB has been tasked with developing TMDLs for the listed impairments currently lacking USEPA-approved TMDLs in at least one receiving water body, which include cyanide, oil, PCBs and toxicity. There are currently TMDLs approved by the U.S. Environmental Protection Agency that apply to the receiving waters for the Project for the following constituents: ammonia, cadmium, chlordane, copper, DDT, indicator bacteria, lead, nutrients

(algae), PCBs, pH, toxicity, trash and zinc. These impairments are relevant to the proposed Project because runoff from the site (along with runoff from the whole watershed) eventually discharges into or adjacent to these 303(d) impaired waters, including Arroyo Seco, the Los Angeles River and Estuary, and San Pedro Bay.

The LARWQCB implements the *Water Quality Control Plan Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan), which designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan (California Water Code Sections 13240-13247). The Basin Plan provides quantitative and narrative criteria for a range of water quality constituents applicable to certain receiving water bodies and groundwater basins within the Los Angeles Basin. Specific criteria are provided for the larger, designated water bodies within the region, as well as general criteria or guidelines for surface waters and groundwaters. In general, the narrative criteria require that degradation of water quality does not occur due to increases in pollutant loads that will adversely affect the designated beneficial uses of a water body. Surface waters within the Raymond Hydrologic Area and Monk Hill Hydrologic Sub-Area (405.3 and 405.32, designated as the Arroyo Seco Reach 3 in the Basin Plan) have been assigned the following beneficial uses in the Los Angeles Basin Plan as shown in Table 4.5-3. Beneficial uses of groundwaters within the Raymond Basin (DWR Basin No. 4-23) are also listed below in Table 4.5-3.

Table 4.5-3. Beneficial Uses for Surface and Coastal Waters

Surface or Groundwater Body	Hydrologic Unit Basin Number	Beneficial Use										
		MUN	*IND*	*PROC*	*GWR*	*WARM*	*COLD*	*WILD*	*WET*	*REC1*	*REC2*	*AGR*
Arroyo Seco Reach 3 (above Devils Gate Dam)	405.32	●	●	●	●	●	●	●	●	P	●	
Raymond Basin	4-23	●	●	●								●

Source: Los Angeles Basin Plan

Notes:

● = Existing Beneficial Uses

P = Access Prohibited by Los Angeles County Department in the concrete-channelized areas.

The beneficial uses identified in Table 4.5-3 for the surface and groundwater bodies in the Monk Hill Hydrologic Sub-Area/Arroyo Seco Reach 3 Watershed and the groundwaters of the Raymond Basin are defined below:

- **Municipal and Domestic Supply (MUN) –** Includes uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
- **Industrial Service Supply (IND)** – Includes uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.
- **Industrial Process Supply (PROC)** – Includes uses of water for industrial activities that depend primarily on water quality.
- **Ground Water Recharge (GWR)** – Includes uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.

- Warm Freshwater Habitat (WARM) – Includes uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.
- Cold Freshwater Habitat (COLD) – Includes uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
- Wildlife Habitat (WILD) – Includes uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- Wetland Habitat (WET) – Includes uses of water that support wetland ecosystems, including, but not limited to, preservation or enhancement of wetland habitats, vegetation, fish, shellfish, or wildlife, and other unique wetland functions which enhance water quality, such as providing flood and erosion control, stream bank stabilization, and filtration and purification of naturally occurring contaminants.
- Contact Water Recreation (REC-1) – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.
- Non-contact Water Recreation (REC-2) – Includes the uses of water for recreational activities involving proximity to water, but not where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
- Agricultural Supply (AGR) – Includes uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

Hydrology and Sediment Transport

As described in the Flood Hazard, Sediment Management, and Water Feature Analyses Report prepared in 2000 by Philip Williams and Associates, active geomorphic processes within the Arroyo Seco watershed include floods, fire, debris flows, and dry ravel. Floods, fires, and debris flows are events that change the physical condition and function of a watershed over a relatively short time scale. Floods and fire thus play an important role in the frequency and magnitude of sediment transport and net sediment yield. Dry ravel processes are critical to the sediment supply of the alluvial fan environment. The Arroyo Seco watershed has experienced numerous wildfires, including the Woodwardia Fire of 1959, which burned 10,729 acres (or 71% of the watershed), and the more recent Station Fire, which consumed a total of 160,557 acres of land in September of 2009, which equates to approximately 25% of the Angeles National Forest (PWA 2000; NOAA 2009).

Debris flows commonly occur in the San Gabriel Mountains where thick deposits of fine-grained alluvium become saturated during storms. The occurrence of fire in a watershed may encourage soil movement, and thus the entrainment of material by debris flows. In the mountains, debris flows can scour away all hillslope material from soil to boulders and even erode into the underlying bedrock. Debris flows transport material through mountainous terrain and can fill up channels and contribute to the filling of reservoirs and the development of alluvial fans (PWA 2000). In the case of the Arroyo Seco, as previously discussed, in the two

storm seasons following the 2009 Station Fire, excessive amounts of sediment washed down from the watershed and the debris flows damaged City structures, greatly reducing the City's capacity to divert water at the intake structure for spreading within the basins in Area 2.

A Hydraulics, Sediment Transport, and Groundwater Analysis prepared by Psomas in 2018, included in Appendix F of this Draft EIR, includes a hydraulic model based on USGS daily gage data at stream gage #11098000, located upstream of the existing and proposed diversion structures. Daily average discharge data was utilized for the period 1989 to 2014, which was the vetted stream gage data available at the time of the report, and was not strongly influenced by drought. The hydrologic record of flows at the gage station for an updated period is shown in Figure 4.5-4, USGS Stream Gage Station Flow Data for 1989 to 2019 (USGS 2020b). This Figure demonstrates the extremely high variability of flows within the Arroyo Seco over time. As shown, the majority of years experienced average daily flows of less than 300 cubic feet per second (cfs) and peak discharges of less than 600 cubic feet per second (cfs). The highest stream flows occurred in the winter of 2009-2010 when instantaneous peak flows exceeded 4,500 cfs, and in 2004-2005 when average daily flow exceeded 2,000 cfs (USGS 2020b).

As shown in Appendix F, individual water year hydrographs were modeled, which represent typical dry, average and wet years during this study period. To develop representations of wet, average and dry years, the relative deviation percent was calculated for each year by comparing the average annual runoff volume to the annual runoff volume for each year. Years where annual runoff was less than the average were considered dry, while years where the annual runoff was greater than the average were considered wet. Approximately 28% and 72% of annual runoff volumes were determined to be wet years and dry years, respectively. The 1994-1995 water year represents a typical wet year's runoff volume (i.e. 17,957 acre-feet per year [acre-ft/yr]), the 2007-2008 water year represents a typical average year's runoff volume (7,702 acre-ft/yr), and the 2002- 2003 water year represents a typical dry year's runoff volume (2,314 acre-ft/yr).

Evaporation and Percolation Rates

Evaporation rates are relatively high in the Project area due to the arid nature of southern California. Evaporation is the process where liquid becomes a vapor when it is below the boiling point, which takes place at the surface of the liquid. An evaporation pan can be used to determine the rate at which water evaporates, which takes into account various weather factors, such as wind, heat, humidity, etc. Table 4.5-4 below shows the average pan evaporation data for a nearby monitoring station located at the Descanso Gardens located approximately 2.5 miles west of the Area 2 spreading basins.

Table 4.5-4. Typical Monthly Evaporation Rates

Month	Average Pan Evaporation (inches)	Average Pan Evaporation (feet/day)
January	2.06	0.0055
February	2.21	0.0063
March	3.06	0.0082
April	3.88	0.0108
May	4.46	0.0120
June	5.43	0.0151
July	7.13	0.0192

Table 4.5-4. Typical Monthly Evaporation Rates

Month	Average Pan Evaporation (inches)	Average Pan Evaporation (feet/day)
August	6.94	0.0187
September	5.83	0.0162
October	4.39	0.0118
November	3.09	0.0085
December	2.29	0.0062
Annual	**50.77**	**0.0116**

Source: PWA 2000

According to PWP, the current spreading basins reach an equilibrium during recharge events of 18 cfs, meaning that diversions equaling 18 cfs would fill the basins to capacity, with water percolating at generally the same rate as entering the basins; however, higher flows beyond 18 cfs would not be able to be infiltrated due to capacity constraints (Carollo Engineers 2013). Dividing this 18 cfs recharge capacity by the surface area of the spreading basins (approximately 13 acres), the basins currently exhibit an average percolation rate of 2.7 ft/day, or 1.4 cfs/acre.

Percolation testing conducted in 2013 by Converse Consultants, included in Appendix A-2 of this Draft EIR, included three borings within the existing spreading basins (BH-12 in Pond 2; BH-13 in Basin 8; and BH-14 in Basin 13) and three borings within the City's open area, formerly the JPL parking lot (BH-9, BH-10, and BH-11). Tests were performed using the falling head test method in accordance with the Los Angeles County "Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting." The reported percolation rates are shown in Table 4.5-5 below.

Table 4.5-5. Percolation Results

Boring Number	Location	Lowest Percolation Rate		Average Percolation Rate	
		inches/hour	*ft/day*	*inches/hour*	*ft/day*
BH-9	Former Parking Lot	6.58	13.16	7.87	15.74
BH-10	Former Parking Lot	11.52	23.04	15.90	31.80
BH-11	Former Parking Lot	4.50	9.00	6.65	13.30
BH-12	Pond 2	4.70	9.40	24.09	48.18
BH-13	Basin 8	27.51	55.02	58.65	117.30
BH-14	Basin 13	16.96	33.92	28.07	56.14

Source: Appendix A-2

According to Converse, test results for the upper five feet of soils within Area 3 show high to very high percolation rates. Typical permeability rates of gravelly sands range from 2.8 to 280 ft/day; however, the percentage of fine sediments accumulated in soil will reduce the permeability down to 0.2 to 3 ft/day. This places the estimated current percolation rate of the spreading basins of 2.7 ft/day within an expected range, even though this rate is lower than tested. Converse explains some reasons for the high percolation test results as follows: 1) the percolation test holes did not have fine sediments, 2) clean water was used for percolation tests, and 3) soils surrounding the test holes may have been disturbed and loosened during drilling. In summary, the soil borings taken within the existing spreading

basins demonstrate good percolation capacity of the on-site soils without considering fine sediment clogging. Converse recommends that the lowest percolation rates be considered for design purposes, and that fine sediment clogging be considered for the design and maintenance plan (Appendix A-2).

Diversions of Arroyo Seco Surface Water

Historic Diversions

The City has both groundwater rights and surface water rights in the Monk Hill and Pasadena Subareas of the Raymond Basin. The City's surface water rights in the Arroyo Seco overlay the Monk Hill Subarea. The City has surface water rights in the Arroyo Seco and tributaries that pre-date 1914, including the right to take surface water from the stream up to and including 25 cfs. Historically, PWP has either taken the stream water by diverting it at the intake structure (Area 2) for direct use for drinking with the addition of disinfectant (prior to 1972); for treatment at the Behner Water treatment Plant (1972 to 1994); or by recharging the aquifer in the Arroyo Seco spreading grounds (1974 to present).

Due to concerns by water diverters in the early 1970s that the California Department of Health Services (predecessor to California's Division of Drinking Water) would impose tougher water quality standards, thereby preventing the direct take of surface water if diverters lacked adequate treatment, alternative sources were evaluated. Under the direction of the Raymond Basin Management Board, a study on alternative uses for surface water was proposed, and an agreement was signed in 1972 that a study would be undertaken by the California Department of Water Resources. The underlying intent of the study was to determine the effects if parties with surface water rights were allowed to spread and recapture the groundwater in lieu of direct take. The conclusion of the study was the recommendation to revise the Judgment and incorporate a spreading provision.

The Judgment is a legal order that governs the activities of water purveyors in the Raymond Basin, as discussed further below in Section 4.5.3. On January 17, 1974, the Judgment was revised to allow parties that have surface water rights the option to spread the water, as an alternative to direct take, and to recapture a percentage thereof by pumping. Since 1974, PWP has been actively participating in spreading operations, and since 1994, PWP has exclusively spread its diversions. Spreading of the City's surface water right in the spreading basins is prescribed in the Judgment and is a necessary process in order for the City (1) to claim credit for additional pumping rights and (2) to ensure its credit is protected against pumping by other members in the basin.

The amount of pumping credit the City receives after spreading is less than 100%, (between 60% and 80%), meaning that for every 1 acre-foot (325.8 million gallons) of the City's surface water right that is diverted, metered, and spread in the spreading basins, the City receives between 0.6 to 0.8 acre-feet in additional pumping credit, leaving 0.2 to 0.4 acre-feet in the aquifer for protection of the groundwater table (general benefit). No party to the Raymond Basin, including the City, is allowed to pump the remaining amount of City-owned water that is left in the Monk Hill Subarea.

Recent/Current Diversions

PWP has historically diverted up to their allocated surface water rights of 25 cfs, when possible. Under current conditions, the diversion/intake structure and spreading basins in Area 3cannot handle debris and sediment loads carried in stream flows during storm events and operations are shut down during these times. The former headworks facility and sedimentation basins located upstream of Area 2 were designed to remove sediment from the stream flows prior to reaching the diversion structure, but those facilities were destroyed by the debris flows that occurred during the storm events following the 2009 Station Fire (Carollo Engineers 2013), and the system's

ability to settle out sediment and debris prior to entering the intake and conveyance system to the spreading basins was eliminated. Also, sediment has collected behind the weir, limiting the capacity of the diversion pool. As such, the existing diversion/intake structure is not functioning as designed for moderate to high flows due to its inability to accommodate the amount of sediment that accompanies this range of flows; therefore, PWP is not currently able to regularly divert its 25 cfs water rights during the times these flows are available in the stream.

The existing diversion system allows PWP to divert low flows and, thus, the City captures nearly all of the low flows during the dry season (summer to mid-fall), which is typically 0 to 3 cfs (USGS 2020b), and a portion of flows when stream flows are higher, typically around 25 to 30 cfs. However, if higher volume flows with suspended sediment (e.g., the turbidity) in the waters are used for recharge, the ground surface in the spreading basins can become plugged by fine material, such as clays and silts, which reduce percolation and groundwater recharge rates. This results in a need for more maintenance to remove the top layer of fine materials at the spreading basins in order to recover the original recharge rates. During moderate to larger storm events when Arroyo Seco flows are sediment-laden, the stream with its associated sediment load bypasses the diversion structure and continues downstream to Devil's Gate Reservoir.

4.5.3 Relevant Plans, Policies, and Ordinances

Federal

Clean Water Act

The Clean Water Act or CWA (33 U.S.C. 1251 et seq.), as amended by the Water Quality Act of 1987, is the major federal legislation governing water quality. The objective of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Key sections of the act are as follows:

- Sections 303 and 304 provide for water quality standards, criteria, and guidelines. Under Section 303(d) of the CWA, the State of California is required to develop a list of impaired water bodies that do not meet water quality standards and objectives and establish Total Maximum Daily Loads (TMDLs) for each pollutant/stressor. The water quality impairments of the Project's receiving waters are shown in Table 4.5-2 above.
- Section 401 (Water Quality Certification) requires an applicant for any federal permit that proposes an activity which may result in a discharge to waters of the United States to obtain certification from the state that the discharge will comply with other provisions of the act. As the Arroyo Seco is considered federal jurisdictional waters, water quality certification under CWA Section 401 would be required.
- Section 402 establishes the National Pollutant Discharge Elimination System (NPDES), a permitting system for the discharge of any pollutant (except for dredged or fill material) into waters of the United States. This permit program is administered by the State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCB), which have several programs that implement individual and general permits related to construction activities, municipal stormwater discharges, and various kinds of non-stormwater discharges. State and regional water quality related permits and approvals, including through NPDES, are shown in Table 4.5-6.
- Section 404 establishes a permit program for the discharge of dredged or fill material into waters of the United States. This permit program is jointly administered by the U.S. Army Corps of Engineers and the EPA. As the Arroyo Seco is considered federal jurisdictional waters, the Project would require a permit under CWA Section 404.

Numerous agencies have responsibilities for administration and enforcement of the CWA. At the federal level, this includes the EPA and the U.S. Army Corps of Engineers. At the state level, with the exception of tribal lands, the California EPA and its sub-agencies, including the SWRCB, have been delegated primary responsibility for administering and enforcing the CWA in California.

Federal Antidegradation Policy

The Federal Antidegradation Policy (40 CFR 131.12) requires states to develop statewide antidegradation policies and identify methods for implementing them. Pursuant to the Code of Federal Regulations (CFR), state antidegradation policies and implementation methods shall, at a minimum, protect and maintain: 1. existing in-stream water uses; 2. existing water quality where the quality of the waters exceeds levels necessary to support existing beneficial uses, unless the state finds that allowing lower water quality is necessary to accommodate economic and social development in the area; and 3. water quality in waters considered an outstanding national resource.

State/Regional

Poster-Cologne Water Quality Act (California Water Code)

The Porter–Cologne Act (codified in the California Water Code, Section 13000 et seq.) is the primary water quality control law for California. Whereas the CWA applies to all waters of the United States, the Porter–Cologne Act applies to waters of the state, which includes isolated wetlands and groundwater in addition to federal waters. The California Water Code (CWC) authorizes the State Water Resources Control Board (SWRCB) to implement the provisions of the CWA, including the authority to regulate waste disposal and require cleanup of discharges of hazardous materials and other pollutants.

Under the CWC, the State of California is divided into nine Regional Water Quality Control Boards (RWQCBs), which govern the implementation and enforcement of the CWC and the CWA. The Project Site is located within Region 4, also known as the Los Angeles Region (LARWQCB). The RWQCBs develop and enforce water quality objectives and implement plans that will best protect California's waters, acknowledging areas of different climate, topography, geology, and hydrology. Each RWQCB is required to formulate and adopt a Water Quality Control Plan or Basin Plan for its region. The Basin Plan must adhere to the policies set forth in the CWC and established by the SWRCB. In this regard, the LARWQCB issued the Los Angeles Basin Plan on August 29, 2014 for the Coastal Watersheds of Los Angeles and Ventura Counties, with subsequent amendments. The RWQCB is also given authority to issue waste discharge requirements, enforce actions against stormwater discharge violators, and monitor water quality. In California, the NPDES stormwater permitting program is administered by the SWRCB.

In addition to other regulatory responsibilities, the RWQCBs have the authority to conduct, order, and oversee investigation and cleanup where discharges or threatened discharges of waste to waters of the state could cause pollution or nuisance, including impacts to public health and the environment. The act requires a "Report of Waste Discharge" for any discharge of waste (liquid, solid, or otherwise) to land or surface waters that may impair a beneficial use of surface or groundwater of the state. California Water Code Section 13260 subdivision (a) requires that any person discharging waste or proposing to discharge waste, other than to a community sewer system that could affect the quality of the waters of the state, to file a Report of Waste Discharge with the applicable RWQCB. For discharges directly to surface water (waters of the United States), an NPDES permit is required, which is issued under both state and federal law; for other types of discharges, such as waste discharges to land (e.g., spoils disposal and storage), erosion from soil disturbance, or discharges to waters of the state (such as groundwater and

isolated wetlands), Waste Discharge Requirements (WDRs) are required and are issued exclusively under state law. WDRs typically require many of the same best management practices (BMPs) and pollution control technologies as required by NPDES-derived permits.

California Antidegradation Policy

The California Antidegradation Policy, otherwise known as the *Statement of Policy with Respect to Maintaining High Quality Water in California*, was adopted by the SWRCB (State Board Resolution No. 68-16) in 1968. Unlike the Federal Antidegradation Policy, the California Antidegradation Policy applied to all waters of the state (e.g., isolated wetlands and groundwater), not just the surface waters. The policy states that whenever the existing quality of a water body is better than the quality established in individual Basin Plans, such high quality shall be maintained, and discharge to that water body shall not unreasonably affect present or anticipated beneficial use of such water resource.

California Toxics Rule

In 2000, the California Environmental Protection Agency (Cal-EPA) promulgated the California Toxics Rule, which establishes water quality criteria for certain toxic substances to be applied to waters in the State. Cal-EPA promulgated this rule based on Cal-EPA's determination that the numeric criteria are necessary in the State to protect human health and the environment. The California Toxics Rule establishes acute (i.e., short-term) and chronic (i.e., long-term) standards for bodies of water such as inland surface waters and enclosed bays and estuaries that are designated by the LARWQCB as having beneficial uses protective of aquatic life or human health.

Sustainable Groundwater Management Act of 2014

The Sustainable Groundwater Management Act of 2014 (SGMA) requires the designation of groundwater sustainability agencies (GSAs) by one or more local agencies and the adoption of groundwater sustainability plans (GSPs) for basins designated as medium- or high-priority by the California Department of Water Resources (DWR). SGMA grants new powers to GSAs, including the power to adopt rules, regulations, ordinances, and resolutions; regulate groundwater extractions; and to impose fees and assessments. SGMA requires that groundwater resources be managed sustainably for long-term reliability and multiple benefits for current and future beneficial uses and also allows the SWRCB to intervene if local agencies will not or do not meet the SGMA requirements. SGMA applies to all California groundwater basins and requires the DWR to prioritize California's 517 groundwater basins and subbasins as either high, medium, low, or very low (DWR 2019). The Raymond Basin, which underlies the City of Pasadena, was determined by DWR to be "Very Low" priority and is a fully adjudicated basin; therefore, not subject to the requirements to form a GSA or to develop a Groundwater Sustainability Plan.

Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties

The California legislature has assigned the primary responsibility to administer and enforce statutes for the protection and enhancement of water quality, including the Porter–Cologne Act and portions of the CWA, to the SWRCB and its nine RWQCBs. The SWRCB provides state-level coordination of the water quality control program by establishing statewide policies and plans for implementation of state and federal regulations. The nine RWQCBs throughout California adopt and implement Basin Plans that recognize the unique characteristics of each region with regard to natural water quality, actual and potential beneficial uses, and water quality problems. The LARWQCB is responsible for the protection of the beneficial uses of waters within the coastal watersheds of Los Angeles and Ventura counties, including the Project area.

The *Water Quality Control Plan Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan (California Water Code Sections 13240–13247) (LARWQCB 2014). The LARWQCB Basin Plan must conform to the policies set forth in the Porter-Cologne Act as established by the SWRCB in its state water policy. The Porter-Cologne Act also provides the RWQCBs with authority to include within their basin plan water discharge prohibitions applicable to particular conditions, areas, or types of waste. The Basin Plan is continually being updated to include amendments related to implementation of Total Maximum Daily Loads (TMDLs) of potential pollutants or water quality stressors, revisions of programs and policies within the LARWQCB region, and changes to beneficial use designations and associated water quality objectives.

Construction General Permit (SWRCB Order 2009-0009-DWQ, as amended)

For stormwater discharges associated with construction activity in the State of California, the SWRCB has adopted the *General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities* (Construction General Permit) to avoid and minimize water quality impacts attributable to such activities. The Construction General Permit applies to all projects in which construction activity disturbs one acre or more of soil. Construction activity subject to this permit includes clearing, grading, and disturbances to the ground, such as stockpiling and excavation. The Construction General Permit requires the development and implementation of a stormwater pollution prevention plan (SWPPP), which would include and specify water quality BMPs designed to prevent pollutants from contacting stormwater and keep all products of erosion from moving off site into receiving waters. The SWPPP is also required to include a discussion of the proposed program to inspect and maintain all BMPs.

A site-specific SWPPP could include, but not be limited to the following BMPs:

- Erosion Control BMPs – to protect the soil surface and prevent soil particles from detaching. Selection of the appropriate erosion control BMPs would be based on minimizing areas of disturbance, stabilizing disturbed areas, and protecting slopes/channels. Such BMPs may include, but would not be limited to, use of geotextiles and mats, earth dikes, drainage swales, and slope drains.
- Sediment Control BMPs – are treatment controls that trap soil particles that have been detached by water or wind. Selection of the appropriate sediment control BMPs would be based on keeping sediments on-site and controlling the site boundaries. Such BMPs may include, but would not be limited, to use of silt fences, sediment traps, and sandbag barriers, street sweeping and vacuuming, and storm drain inlet protection.
- Wind Erosion Control BMPs – consist of applying water to prevent or minimize dust nuisance.
- Tracking Control BMPs – consist of preventing or reducing the tracking of sediment off-site by vehicles leaving the construction area. These BMPs include street sweeping and vacuuming. Project sites are required to maintain a stabilized construction entrance to prevent off-site tracking of sediment and debris.
- Non-Stormwater Management BMPs – also referred to as "good housekeeping practices," involve keeping a clean, orderly construction site. • Waste Management and Materials Pollution Control BMPs – consist of implementing procedural and structural BMPs for handling, storing, and disposing of wastes generated by a construction project to prevent the release of waste materials into stormwater runoff or discharges through the proper management of construction waste.

The SWRCB adopted a General Permit for Stormwater Discharges from Construction Activities on September 2, 2009 and most recently amended on July 17, 2012 (Order No. 2012-0006-DWQ, General NPDES Permit No.

CAS000002). The Construction General Permit regulates construction activity including clearing, grading, and excavation of areas one acre or more in size and prohibits the discharge of materials other than stormwater, authorized non-stormwater discharges, and all discharges that contain a hazardous substance, unless a separate NPDES permit has been issued for those discharges.

To obtain coverage under the Construction General Permit, a developer is required to file a Notice of Intent (NOI) with the appropriate RWQCB and provide proof of the NOI prior to applying for a grading or building permit from the local jurisdiction, and must prepare a State SWPPP that incorporates the minimum BMPs required under the permit as well as appropriate project-specific BMPs. The SWPPP must be completed and certified by the developer and BMPs implemented prior to the commencement of construction, and may require modification during the course of construction as conditions warrant. When project construction is complete, the developer is required to file a Notice of Termination with the RWQCB certifying that all the conditions of the Construction General permit, including conditions necessary for termination, have been met. Because more than one acre would need to be disturbed for construction activity, the proposed Project would require coverage under the Construction General Permit.

Waste Discharge Requirements for the Discharge of Groundwater from Construction and Project Dewatering to Surface Waters in the Coastal Watersheds of Los Angeles and Ventura Counties (LARWQCB Order No. R4-2018-0125)

This general order is intended to authorize discharges of treated or untreated groundwater generated from permanent or temporary dewatering operations or other applicable wastewater discharges not specifically covered in other general or individual NPDES permits. Discharges from facilities to waters of the United States that do not cause, have the reasonable potential to cause, or contribute to an in-stream excursion above any applicable state or federal water quality objectives/criteria or cause acute or chronic toxicity in the receiving water are authorized discharges in accordance with the conditions set forth in this Order. To demonstrate coverage under the order, dischargers must submit documentation to show that the discharge would not cause or contribute to a violation of any applicable water quality objective/criteria for the receiving waters, or any other discharge prohibition listed in the order. In addition, discharges must perform reasonable potential analysis using a representative sample of groundwater or wastewater to be discharged. The sample shall be analyzed and the data compared to the water quality screening criteria for the constituents listed in the order, and if results show exceedance of water quality screening criteria, the discharge will be required to treat the wastewater to acceptable standards prior to discharge.

NPDES Permit for Discharges of Groundwater from Construction and Project Dewatering

An NPDES Permit for dewatering discharges was adopted by the LARWQCB on September 13, 2018 (Order No. R4-2018-0125, General NPDES Permit No. CAG994004. Similar to the Construction General Permit, to be authorized to discharge under this Permit, a NOI to discharge groundwater generated from dewatering operations during construction must be submitted, and dewatering must be conducted in accordance with the requirements of this Permit. In accordance with the NOI, among other requirements and actions, the discharges shall not cause or contribute to a violation of any applicable water quality objective/criteria for the receiving waters.

California Water Plan

Required by the California Water Code Section 10005(a), the California Water Plan, prepared by the State Department of Water Resources, is the state government's strategic plan for managing and developing water

resources statewide for current and future generations and provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future. The California Water Plan, which is updated every five years, presents basic data and information on California's water resources, including water supply evaluations and assessments of agricultural, urban, and environmental water uses to quantify the gap between water supplies and uses. The California Water Plan also identifies and evaluates existing and proposed statewide demand management and water supply augmentation programs and projects to address the state's water needs.

The goal for the California Water Plan Update is to meet California Water Code requirements, received broad support among those participating in California's water planning, and is a useful document for the public, water planners throughout the state, legislators, and other decision-makers.

NPDES and WDR Permits

The USEPA NPDES Program requires NPDES permits for: (1) Municipal Separate Storm Sewer Systems (MS4) Permit generally serving, or located in, incorporated cities with 100,000 or more people (referred to as municipal permits); (2) 11 specific categories of industrial activity (including landfills); and (3) construction activity that disturbs five acres or more of land. NPDES and WDR programs regulate construction, municipal, and industrial stormwater and non-stormwater discharges under the requirements of the CWA and the Porter–Cologne Water Quality Control Act. The construction stormwater program is administered by the SWRCB, while the municipal stormwater program and other WDRs are administered by the LARWQCB. Table 4.5-6 lists the water-quality-related permits that would apply directly or indirectly (through implementing City ordinances) to the Project, each of which is further described below.

Table 4.5-6. State and Regional Water Quality-Related Permits and Approvals

Program/ Activity	Order Number/ NPDES Number	Permit Name	Affected Area
Construction Stormwater Program	2009-0009-DWQ/ CAS000002, as amended	NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit)	Statewide
Municipal Stormwater Program	LARWQCB Order No. R4-2012-0175-A01 / CAS004001	Waste Discharge Requirements for the Municipal Separate Storm Sewer System (MS4) Discharges (Los Angeles County MS4 Permit)	Coastal Watersheds of Los Angeles County, Except those discharges originating from the City of Long Beach MS4
Discharge of Groundwater from Construction and Project Dewatering to Surface Waters	LARWQCB Order No. Order No. R4-2018-0125	Waste Discharge Requirements for the Discharge of Groundwater from Construction and Project Dewatering to Surface Waters in the Coastal Watersheds of Los Angeles and Ventura Counties	Coastal Watersheds of Los Angeles and Ventura Counties

Notes: NPDES = National Pollutant Discharge Elimination System; MS4 = Municipal Separate Storm Sewer System; WDR = Waste Discharge Requirement

Local

Stormwater Management and Discharge Control Ordinance

The Pasadena Municipal Code, Chapter 8.70, Stormwater Management and Discharge Control, sets forth requirements to regulate non-stormwater discharges to the municipal stormwater system, provides for the control of accidental spills into the stormwater system, and reduce pollutants in stormwater and urban runoff to the maximum extent practicable; The intent of this chapter is to protect and enhance water quality of our watercourses, water bodies, and wetlands in a manner pursuant to and consistent with the Federal Clean Water Act, and pursuant to National Pollutant Discharge Elimination System Permit No. CA0061654, as amended. Specifically, construction activities near a natural water course must (1) maintain that part of the watercourse reasonably free of pollutants and obstacles which would enter, or retard the flow of water through the municipal stormwater system; and (2) must maintain existing structures within or adjacent to such a watercourse so that those structures will not become a hazard to the use, function, or physical integrity of the municipal stormwater system; and (3) not remove healthy bank vegetation in such a manner as to increase the vulnerability of the watercourse to erosion.

Raymond Basin Judgment and 1974 Amendment

PWP's water supplies consist of local groundwater from the Raymond Basin (approximately 40%) and purchases of imported water (approximately 60%). Of the local supplies, PWP receives its water supply from two sources: direct pumping from the Raymond Basin (groundwater) and diverted surface water, which is spread into spreading basins, allowing for groundwater pumping credits. Allocations for the extraction of groundwater supplies are detailed in the Raymond Basin Judgment (Pasadena Water and Power 2016). The City's Urban Water Management Plan (UWMP; Pasadena Water and Power 2016) provides a summary of the Raymond Basin Judgment.

> In order to alleviate overdraft conditions in the Raymond Basin, the Raymond Basin Judgment (Judgment) was signed on December 23, 1944. The Judgment assigns each pumper a "present unadjusted right" corresponding to the average amount of water that they pumped in the five years prior to 1937. Pasadena's present unadjusted right is 12,946 acre-ft/yr. Each pumper's present unadjusted right was scaled down to create the "decreed right" such that the sum of all pumpers' decreed rights is equal to the estimated operating yield of the basin. In the original Judgment, the operating yield was determined to be 21,900 acre-ft/yr for the entire Raymond Basin. However, according to the first modification of the Judgment in 1955, the operating yield was increased to 5,290 acre-ft/yr in the Eastern Unit and 25,480 acre-ft/yr in the Western Unit. This resulted in a total operating yield of 30,770 acre-ft/yr in the Raymond Basin. Therefore, the sum of all water that is pumped—excluding water pumped from individual storage accounts or as a result of spreading or injection credits—is regulated so as not to exceed the total operating yield of the basin. Based on the new operating yield, PWP's decreed right was calculated to be 12,807 acre-ft/yr from the Western Unit (Monk Hill and Pasadena Subareas); PWP has no water right in the Eastern Unit (Santa Anita Subarea). In 2009, the Raymond Basin Management Board (RBMB) implemented a resolution to the 1955 decreed rights to slow declining water levels in the Western Unit of Raymond Basin.
>
> This resolution called for a cooperative pumping reduction for parties with water rights in the Pasadena Subarea effective July 1, 2009, where RBMB seeks to reduce water production incrementally over five years until a 30% reduction is achieved. Hence, PWP's water right was decreased by 2,503 AF over 5 years to a final right of 10,304 acre-ft/yr beginning in 2014.

A 1974 modification to the Raymond Basin Judgment allows each pumper with surface runoff diversion rights to recharge the Raymond Basin with surface water, and to then pump a portion of the recharged volume in addition to their decreed right water right. 60% to 80% of the recharged volume may be pumped depending on the spreading basin used for recharge. The ability to spread surface runoff provides benefits associated with natural water treatment because the alluvium can function as a filter to remove certain constituents from the water. In addition, the ability to spread surface runoff provides storage benefits, because surface water that is diverted and spread during the wet season can be stored in the basin for use in periods of higher demand. Pumping credits from the spreading of diverted surface runoff provided an average of 1,850 acre-ft/yr of additional groundwater over the 2001-2015 period, ranging from approximately 300 acre-feet in dry years to 5,000 acre-feet in wet years.

The Judgment states that PWP, which diverts surface water for beneficial use from a source contributing to the supply of groundwater in the Raymond Basin area (i.e. the Arroyo Seco), has the right to continue to divert a maximum amount of 25 cfs of water (City of Pasadena v. City of Alhambra 1984). As stated in the Judgment, the water "shall be spread for percolation into the underground in the existing water conservation facilities of the Los Angeles County Flood Control District, or in such additional spreading grounds as the parties may acquire or construct, or in any natural stream channels leading to such existing or future spreading grounds, provided that all such spreading locations shall be within the Monk Hill Basin or Pasadena Subarea hydrologic subdivision of the Western Unit of the Raymond Basin Area" (City of Pasadena v. City of Alhambra 1984).

4.5.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to hydrology and water quality are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to hydrology and water quality would occur if the project would:

a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.

b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

   i) result in substantial erosion or siltation on or off site;

   ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site;

   iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or

   iv) impede or redirect flood flows.

d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation.

e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

Through the analysis in the Initial Study (see Appendix A-1), it was determined that the proposed Project would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality; substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin; conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan; or, in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation. (i.e., Thresholds a, b, d, and e). Accordingly, with the exception of threshold b, these issues are not further analyzed in the EIR. Threshold b, addressing the potential to deplete groundwater supplies or interfere with groundwater recharge, was brought up as a concern during public comments on the Initial Study and thus will be further analyzes in the EIR. Based on the remaining thresholds, a significant impact related to hydrology and water quality would occur if the project would:

b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:
    i) result in substantial erosion or siltation on or off site;
    ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site;
    iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or
    iv) impede or redirect flood flows.

4.5.5 Environmental Impacts Analysis

Threshold 4.5b Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

Short-Term Construction Impacts

Construction activities that involve earthwork/grading would require water for dust suppression to comply with South Coast Air Quality Management District (SCAQMD) Rule 403 related to mandatory dust control measures during activities that are capable of generating fugitive dust (see Section 4.1, Air Quality). In Area 3, the earthwork/grading activities are expected to require approximately 4,000 gallons per day (gpd) of water, delivered via water truck. One water truck operating each Monday-Friday of construction activities at Area 3, from approximately April 2022 through October 2022, would equate to 145 days of water use, resulting in approximately 580,000 gallons [1.78 acre-foot] of water. Regular use of a water truck is not expected to be necessary in Area 2 due to the damp soils associated with the Arroyo Seco.

The use of 580,000 gallons of water over the course of construction activities for the proposed Project is not expected to have an impact on groundwater supplies. According to the City's Urban Water Management Plan (UWMP), PWP's projected water supplies, including purchased Metropolitan Water District (MWD) water and groundwater, are 33,618 acre-ft/yr for 2020 and 33,670 acre-ft/yr for 2025 (Pasadena Water and Power 2016). Proposed construction activities would total approximately 0.0053% of the annual available water supply in the

PWP service area, which is a negligible amount. As mentioned, this water would either be brought to the Project site by water trucks or would be provided via a temporary metered connection off of the PWP distribution system, whereby the water trucks would fill up onsite. Temporary use of water for dust control would not directly withdraw or otherwise substantially deplete groundwater supplies in the Raymond Basin.

As described in Section 3.0, construction activities at Area 2 would require the diversion of surface flows away from the construction area by installing a temporary coffer dam and pumping the water around construction activities in Area 2, to be released further downstream in the Arroyo Seco. Because no water would be diverted into the intake/conveyance system during this time, the spreading basins would not be operational during construction within Area 2. Additionally, during construction in Area 3, groundwater recharge at the existing spreading basins would be suspended as the Arroyo Seco flows would not be diverted into the spreading basins and PWP would not be able to claim pumping credits for groundwater because the water would not be infiltrated into the groundwater basin via the spreading basins. Therefore, for approximately 3 months of 2021 and for approximately 9 months of 2022, the stream flows would remain in the Arroyo Seco without diversion. Since construction is scheduled for the drier months of the year, there would be little likelihood of operating the Devil's Gate Dam and losing the water downstream.

It is expected that the lack of diversion during these construction periods, which avoid the peak wet season months to the extent feasible, when high stream flows are more likely, would not substantively affect groundwater supplies. As further described below, the spreading basins are most efficient at augmenting groundwater infiltration during high-flow events, when the majority of flows would otherwise wash downstream to Devil's Gate Reservoir. Taking the spreading basins offline during two dry seasons in a row would not substantially deplete groundwater supplies. First, the stream flows would continue to percolate in the Arroyo Seco streambed during drier months, which would still allow those flows to enter the Monk Hill Subarea (a sub-aquifer of the Raymond Basin). Second, the lack of pumping credits available to PWP due to temporary loss of spreading would ultimately be recaptured through the long-term operational increase in capacity for percolation at the spreading basins in Area 3.

As described above, disrupted infiltration of surface water into the Monk Hill Subarea would result in a negligible impact to groundwater supplies due to the short-term nature of the disruption and the capacity of the adjacent Arroyo Seco streambed to continue to percolate water into the groundwater basin. Additionally, this negligible disruption would be entirely off-set over time by the increased percolation associated with the expanded spreading basins during long-term operations of Area 3, as discussed below. Similarly, temporary demands for potable water during construction would represent approximately 0.0053% of the annual available water supply in the PWP service area, which is a negligible amount. Therefore, short-term construction activities would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin, and impacts would be less than significant.

Long-Term Operational Impacts

As previously described, the 1974 Amendment to the Raymond Basin Judgment allows for surface water rights holders to recharge the groundwater with their assigned surface water flows by spreading for percolation in spreading grounds, and to later extract a percentage of the recharged water (60-80% depending on where the recharge occurs). The remaining portion of the water recharged in spreading basins may not be pumped from the aquifer. According to the Judgment and reaffirmed in the 1974 Amendment, PWP has surface water rights to 25 cfs flowing in Arroyo Seco.

Proposed facilities in Areas 2 and 3 would allow PWP to more fully utilize its 25 cfs right when compared to the current conditions that require moderate to high flows to bypass the diversion/intake structure due to the previous damage to the facility and the inability to remove sediment and debris prior to entering the spreading basins. The proposed Project's Area 3 configuration includes a maintainable sedimentation basin (Basin A) located prior to the entry of flows into the spreading basins. This improvement upon the current design would substantively reduce sediments in the spreading basins that settle on the ground surface of the basin and decrease infiltration rates.

The current spreading basins are observed by PWP to reach an equilibrium during recharge events of 18 cfs. This means that the spreading basins will fill at a sustained rate of 18 cfs and maintain their capacity without overflowing because inflow equals the rate of percolation (outflow). The percolation rate is calculated by dividing the 18 cfs recharge capacity by the surface area of the spreading basins (approximately 13 acres) and yields an average of 2.7 ft/day, or 1.4 cfs/acre. Historically, flows up to approximately 25 cfs have been diverted to the spreading basins, but not at a sustained rate and not when stream flows exceed 25 cfs. In these situations, PWP has ceased diversions and the entirety of the Arroyo Seco flows are allowed to bypass the spreading basins completely.

As previously discussed, typical permeability rates of gravelly sands range from 2.8 to 280 ft/day; however, the percentage of fine sediments accumulated in soil will reduce the permeability down to 0.2 to 3 ft/day. This places the estimated current percolation rate of the spreading basins of 2.7 ft/day within an expected range, even though this rate is lower than tested. As shown in Table 4.5-5, according to the results of the soil borings conducted for the project, the upper five feet of soils within Area 3 have high to very high percolation rates. In summary, the soil borings taken within the existing spreading basins demonstrate good percolation capacity of the on-site soils without considering fine sediment clogging. Converse recommends that the lowest percolation rates be considered for design purposes, and that fine sediment clogging be considered for the design and maintenance plan (Appendix A-2).

With the proposed diversion of 25 cfs, at infiltration rates currently observed in the existing spreading basins (2.7 ft/day), approximately 18 acres of effective recharge area in the Project basins would be required to maximize the utilization of PWP's surface water rights. At higher percolation rates, such as those observed during the Geotechnical Feasibility Study (Appendix A-2), less basin acreage would be required to accommodate the full 25 cfs. In addition to the approximately 13 acres of spreading basins that currently exist in the Arroyo Seco, PWP proposes the construction of approximately 4.5 acres of spreading within Basins E through J, which includes replacement of 1.6 existing acres and expansion of 3 new acres. This total, 16 acres, would be large enough to percolate approximately 22 cfs at a percolation rate of 2.7 ft/day. A percolation rate of 3.1 ft/day would be required to accommodate the full 25 cfs within this 16 acres of spreading basins, which is anticipated to be achievable. With regrading, construction and operation of Basin A, and proper annual maintenance to remove fine sediments accumulating in the basins, percolation rates are anticipated to be adequate to achieve the allocated 25 cfs.

Regarding the amount of water that is anticipated to be percolated into the groundwater basin with the proposed Project, a review of the baseline conditions within the Arroyo Seco was performed. The high variability in stream flows from month to month and year to year are demonstrated in Figure 4.5-4, USGS Stream Gage Station Flow Data for 1989 through 2019. Based on the data gathered from the USGS gaging station from 1989 through 2019, the average in-stream flows are 6,890 acre-ft/yr (USGS 2020b).

In order to project the increase in diversions as a result of the Project, a comparison is made to existing conditions. The existing condition is represented by analyzing 1989 through 2019 stream flow data and assumes diversions of up to 25 cfs for stream flows up to 25 cfs. Under the current conditions, no diversions from the existing intake

can occur when stream flows are greater than 25 cfs; therefore, the City can divert an average of 2,045 acre-ft/yr. Under the proposed Project conditions (i.e. diverting up to 25 cfs for storm flows <100 cfs), the City could divert approximately 3,080 acre-ft/yr; therefore, the Project would add approximately 1,035 acre-ft/yr of diverted flows into the spreading basins. This number is based on historic data, which is the best available information related to the future flows within the Arroyo Seco, and future flows would continue to be subject to various factors such as number, intensity, and duration of rainfall events, as well as drought conditions. Prior to the use of the City's spreading basins, when water was diverted for direct use from the Arroyo Seco directly into the water treatment facility for potable use, the conditions for diversion were not limited to the same considerations related to managing sediment for spreading, and records show diversions exceeding 5,000 acre-ft/yr. Therefore, the Project's goal of increasing the beneficial use of the City's water rights, can also be seen as restoring a portion of its historic use.

Figure 4.5-5, Estimated Project Contribution to Average Monthly Distribution of Stream Flow Volume, graphically illustrates the following: (1) shown in red, the amount of Arroyo Seco flow that is typically within the streambed each month (as measured from 1989 through 2019); (2) shown in blue, the amount that is typically diverted under existing conditions (i.e. diverting up to 25 cfs and bypassing all flows in the storm event >25 cfs); and (3) as shown in green, the anticipated amount of increased diversion given proposed Project improvements (i.e. diverting up to 25 cfs for storm flows <100 cfs). As shown, the proposed Project would result in no changes to flows during dry months, as low flows are diverted in the current condition. However, the proposed Project would allow the City to divert more water from the higher-flow storm events. In summary, the proposed Project elements would increase Arroyo Seco diversion almost exclusively during wet winter months with high stream flows.

The proposed expansion of the spreading basins in Area 3 would increase annual percolation into the Monk Hill Subarea beyond the current condition, and therefore would result in a beneficial effect on groundwater supplies. Of this annual average amount of additional diverted water, some would be lost to evapotranspiration, as diverted stream flows would be spread out over a wider surface area in the proposed basins (approximately 16 acres) when compared to the current basins (approximately 13 acres). Assuming no improvement upon the presently observed percolation rate of 2.7 feet per day (ft/day), the average pan evaporation of 0.01 ft/day observed at the LACDPW Descanso Gardens Station would be negligible (PWA 2000). Although the proposed Project might slightly increase total evaporation, the contribution to groundwater recharge significantly exceeds this amount.

In summary, the proposed Project would allow higher flow storm events to be diverted at Area 2 because of the improved intake design and because more sediment-laden flows could be conveyed to and settled in Basin A, thereby capturing more of the high flows for infiltration into the groundwater basin. Additionally, the expanded basin size and potentially increased percolation rates would allow for PWP to divert and recharge its 25 cfs surface water rights to a fuller extent. Because more surface area available for spreading and percolation, combined with more water available for spreading, directly results in more groundwater recharge, the proposed Project would result in a net benefit for groundwater supplies within the Raymond Basin.

The increase in spreading basin surface area leading to greater recharge potential, improvements in the intake structure which would allow for continued diversion of PWP surface water rights during high flows, and the inclusion of an improved sedimentation basin to maintain higher infiltration rates, would all contribute to increased groundwater recharge in the Arroyo Seco Spreading Grounds as compared with the existing condition. Therefore, long-term operational activities would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin, and impacts would be less than significant.

Threshold 4.5c Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

i) result in substantial erosion or siltation on or off site?

Short-Term Construction Impacts

Prior to commencement of grading within Area 2, a temporary coffer dam would be installed in the Arroyo Seco upstream and downstream of the intake replacement area within Area 2, which would provide a dry area for construction activities within the streambed. The coffer dam would capture the streamflows and allow them to be contained, pumped into a flexible pipeline that would bypass the construction area, and then outlet downstream of the construction area. The Project would involve the removal of sediment and debris that has accumulated upstream and downstream of the existing weir, and demolition would commence.

Improvements in Area 2 include the demolition and removal of the following structures: (1) existing concrete diversion weir, associated masonry abutments, and rock wall built over concrete dam that extends under the trail; (2) intake structure, metal ladder and platform, and trash racks; (3) 10-foot by 15-foot concrete slab adjacent to the Gabrielino Trail/Access Road, and (4) excavations of soil/sediment, rocks, debris, and vegetation within the upstream diversion pool, downstream streambed, and on the adjacent slopes on the downstream side of the diversion weir.

During construction, erosion control measures would be implemented per the requirements of the Project's SWPPP, as required by the Construction General Permit, which is discussed further below under Threshold 4.5cii, which would address water quality impacts. Additionally, construction activities have the potential to disturb sediment within the streambed, thereby potentially increasing sediment-laden flows downstream during construction and silt deposits. Therefore, in order for these construction activities to occur within and adjacent to the streambed, dewatering must be controlled in compliance with the Waste Discharge Requirements for the Discharge of Groundwater from Construction and Project Dewatering to Surface Waters in Coastal Watersheds of Los Angeles and Ventura Counties (Order No. R4-2018-0125, NPDES No. CAG994004). This permit requires permittees to conduct monitoring of dewatering discharges and adhere to effluent and receiving water limitations contained within the permit so that the water quality of surface waters is protected. Application for the permit would involve collecting and analyzing groundwater samples to determine its constituents. In the event that contamination is identified, the permit would include specific types of treatment requirements to ensure compliance with the discharge standards. The permit also establishes requirements for initial and continuous groundwater testing throughout the dewatering process to ensure that the water remains suitable for discharge and that the impacts of dewatering discharges do not constitute a significant and adverse impact to drainages.

The Arroyo Seco flows are relatively clear during non-storm events, and the Project's construction activities are scheduled to generally occur outside of the rainy season, when storm events would be more likely to occur and carry heavy sediment loads. Therefore, dewatering activities are anticipated to temporarily divert relatively clear flows, if water is present.

Construction activities within Area 3 would not require the diversion of any flows or otherwise require dewatering, as the earthwork would be above the water table and outside of the streambed of the Arroyo Seco. Therefore,

compliance with the requirements of the Project Dewatering to Surface Waters Permit would ensure that the temporary diversion of the Arroyo Seco to allow for construction within the streambed would not result in substantial erosion or siltation, and impacts would be less than significant.

Long-Term Operational Impacts

The proposed improved spreading basins would allow the City to capture high volume flows (up to 25 cfs), allowing for additional diversions during major storm events, which typically occur in the wet season when water levels are generally not a limiting factor for the downstream natural system. Conversely, during dry season low flows, the Project would have very little change (i.e., immeasurable, if any) to current diversions within the Arroyo Seco or contribution to any existing limiting factors. As described above, the Hydraulics, Sediment Transport, and Groundwater Analysis prepared by Psomas in 2018 (Report), included in Appendix F of this Draft EIR, includes a hydraulic model based on USGS daily gage data for the period 1989 to 2014, which was the vetted stream gage data available at the time of the report, and was not strongly influenced by drought. To develop representations of wet, average and dry years, the relative deviation percent was calculated for each year by comparing the average annual runoff volume to the annual runoff volume for each year. Years where annual runoff was less than the average were considered dry, while years where the annual runoff was greater than the average were considered wet. Approximately 28% and 72% of annual runoff volumes were determined to be wet years and dry years, respectively. For modeling purposes, the 1994-1995 water year was used to represent a wet year's runoff volume (i.e. 17,957 acre-feet per year [acre-ft/yr]), the 2007-2008 water year was used to represent an average year's runoff volume (7,702 acre-ft/yr), and the 2002- 2003 water year is used to represent a dry year's runoff volume (2,311 acre-ft/yr).

The Report modeled the proposed Project management conditions (i.e. the "with-diversion" scenario) to divert all flows up to 25 cfs, while additionally diverting the first 25 cfs from higher stream flows up to 100 cfs. When stream flows are above 100 cfs, no diversions would occur, (i.e. flows would completely bypass the diversion structure, as even the proposed intake/diversion structure would not be capable of regularly diverting during such high-flow events). The Report took the most conservative approach to assess the impacts of the Project by modeling the "without-diversion" scenario to represent the baseline in the comparison for possible change in conditions. The City currently diverts stream flows, although not to the extent allowed by the Judgment or by available conditions. Furthermore, the modeling of the "with-diversion" scenario is conservative because it represents flows without consideration to evaporation, infiltration, evapotranspiration or other forms of loss besides friction. Therefore, the impacts of increased diversions resulting from the Project as addressed through the Hydraulics, Sediment Transport, and Groundwater Analysis, reflect the maximum possible changes from existing conditions.

A USACE Hydrologic Engineering Center River Analysis System (HEC-RAS) model was run for each of the three representative water years (i.e. wet, dry, and average), with and without the proposed Project diversions, to determine the impact of the Project on maximum depth of flows and maximum velocity (Psomas 2018).

Dry Year Velocity and Depth. The maximum velocity in the "with-diversion" scenario was determined to be higher than in the "without-diversion" scenario in some locations immediately upstream of the Dam. In the primary stream channel upstream of the Dam, the maximum velocity doubles from approximately 2.5 feet per second (fps) in the without-diversion scenario to approximately 4.2 fps in the with-diversion scenario. In addition, there is an approximate doubling of velocity in some portions of the backwater area upstream and to the west of the Dam from approximately 0.3 fps in the without-diversion scenario to approximately 0.6 fps in the with-diversion scenario (Psomas 2018).

The driver for the increased velocity in the without-diversion scenario is because small discharge events (Q<25 cfs) begin to fill the reservoir prior to a significant event (Q>>25 cfs). When the smaller events pond upstream of the Dam, the larger event's maximum velocity is lower because of backwatering from the Dam due to ponding. In contrast, when water has not ponded upstream of the Dam, no backwatering will occur during a more significant event and velocities will be higher in the main stream and in some of the backwatering areas. It is important to note that these higher velocities can occur in a dry, average or wet year regardless of whether diversions occur if an early runoff event in the season is relatively large and little or no backwatering has occurred prior to the runoff event. It is also important to note that the total change in velocity is relatively low and occurs well below (v=0.6 fps) or just below (v=4.0 fps) a typical velocity (i.e. 4.5 fps) for initiation of sediment transport in sandy bed, vegetated streams (Psomas 2018).

The representative dry year without-diversions and with-diversions maximum depth drops by approximately 1.3 feet. In the without-diversion scenario, the total runoff for the representative dry year is approximately 2,480 acre-feet (af), while the with-diversions for the representative dry year is approximately 550 af. Therefore, the difference in runoff volume accounts for the difference in maximum depths. It is important to note that the area of inundation is approximately the same between the two scenarios, owing largely to the shape of the reservoir upstream of the Dam (Psomas 2018).

Average Year Velocity and Depth. Unlike the dry year scenarios, the maximum velocity in the without-diversion scenario is higher than in the with-diversion scenario in some locations immediately upstream of the Dam. In the primary stream channel upstream of the Dam, the maximum velocity doubles from approximately 2.5 fps in the with-diversion scenario to approximately 5.5 fps in the without-diversion scenario. This is an approximate doubling of velocity in some portions of the backwater area upstream of the Dam from approximately 0.6 fps in the with-diversion scenario to approximately 1.0 fps in the without-diversion scenario (Psomas 2018).

The reason for these differences is similar to the dry year scenarios, except that the reservoir has relatively high ponding in the with-diversion scenario compared to the without-diversion scenario before a significant (Q>>25 cfs) event occurs. In the representative average year scenario, the resulting maximum velocities are relatively higher than in the representative dry year scenario (5.5 fps vs. 4.2 cfs, respectively). It appears that the difference in modeled maximum velocity is a function of hydrograph shape (i.e. rate of flow versus time) as opposed to other hydraulic or hydrologic factors (Psomas 2018).

The representative average year without-diversion and with-diversions maximum depth are indistinguishable from one another because the maximum water surface elevation (WSE) is the same (approximate WSE of 1,035 feet). The factor that controls the depth and WSE is the operation of Devil's Gate Dam. Despite the same maximum depths, the with-diversion scenario has greater inundation durations at the reservoir fringes because the with-diversion scenario reservoir depth reaches the operational curve elevation more slowly than does the without-diversion scenario (Psomas 2018).

Wet Year Velocity and Depth. Like the other representative scenarios, there are differences in maximum velocity upstream of the reservoir. The difference between the representative wet year without-diversion and with-diversion maximum velocity is lower in magnitude than in the similar representative dry and average scenarios. This appears to be a function of the rate at which the reservoir fills in the represented wet year scenarios. In the wet year scenarios, the difference in maximum velocity in the channel upstream of the reservoir is approximately 3.0 cfs and 1.5 cfs for the with-diversion and without-diversion scenarios, respectively. One difference between the

representative wet year scenarios and other scenarios is how far upstream the differences are observed. In the case of the wet year scenarios, the differences in velocity are observed in the channel upstream of the ponded reservoir, while in the representative average scenarios the differences are confined to downstream of the infiltration basins on the east bank. The difference in extent of impacts is a function of the extent of ponding and ponded elevation in the reservoir, which alters the backwatering further upstream than in the average scenario conditions. The difference is not attributable to change in hydrology resulting from Project-related diversions since the largest discharges (Q>100 cfs) are not impacted by the diversions (Psomas 2018).

Like the representative average year scenarios, the representative wet year maximum depths are indistinguishable because the Dam operational curve is controlling the maximum depth in the reservoir (approximate WSE of 1,035 feet). Like the average year scenarios, the with-diversion scenario has greater inundation durations at the reservoir fringes because the with-diversion scenario reservoir depth reaches the operational curve elevation more slowly than does the without diversion scenario (Psomas 2018).

In summary, the results of HEC-RAS modeling indicated relatively small, and in some cases negligible, effects on maximum velocity and depth of flows within the Arroyo Seco when comparing the with-diversion (proposed Project conditions) to the without-diversions (baseline conditions). The effects of the proposed Project were limited to the stream channel within the lower Devil's Gate Reservoir and the backwater area immediately upstream of the Devil's Gate Dam. It was determined that these effects would be a function of both Dam operations (i.e. timing of releases, extent of reservoir filling) as well as increased stream diversions resulting from this proposed Project, and their individual effects were not distinguished (Psomas 2018).

Sediment Transport. The 2018 Report included a USACE Sediment Analysis Methods (SAM) model, which was used to calculate sediment transport potential within Arroyo Seco with and without the proposed Project. The SAM Sediment Hydraulic Package is an integrated system of programs developed through the Flood Damage Reduction and Stream Restoration Research Program to aid in the analyses associated with designing, operating, and maintaining flood control channels and stream restoration projects. SAM combines the hydraulic information and the bed material gradation information to compute the sediment transport capacity for a given channel or floodplain hydraulic cross-section for a given discharge at a single point in time (Psomas 2018).

For the analysis, sediment sampling was conducted by R. T. Frankian & Associates at a total of 6 locations, approximately every 2,000 feet within the Arroyo Seco streambed from 200 feet upstream of the existing diversion structure to 200 feet upstream of the Devil's Gate Dam face, which is a distance of approximately two miles. Since SAM is a single point model, two specific locations were chosen for modeling. The first model location is approximately 200 feet upstream of the JPL Bridge; the second model location is approximately 1,100 feet downstream from the JPL Bridge. Both locations are relatively distant from the influence of confluences and structures, and neither is located in the reservoir, which would not be appropriate for modeling with SAM. These two locations are representative of the two primary stream morphologies found in the Project's study area (Psomas 2018).

The SAM model was run at Sample Location No. 2 and No. 3 for 25 cfs. The SAM runs were intended to indicate the possible change in sediment transport potential at the two locations resulting from implementation of the proposed Project. The analysis identified a disparity in the sediment transport potential between the two locations. The difference was attributed to the hydraulics at each location. The steeper, narrower Location No. 2 has higher velocity, steeper slope and narrower top width relative to Location No. 3, which is below the channel's grade break. This finding matches the finding of Phillip Williams Associates Report (PWA 2000) that significant sediment deposition occurs in what is referred to as the "upper reservoir." The implication for this finding is that the lower portion of the Arroyo Seco

study area behaves in a similar way to an alluvial fan whereby sediment is deposited in patterns associated with flow path uncertainty, and sediment transport below the grade break is strongly a function of local hydraulics.

In dry, average, and wet representative years, modeled diversions from Arroyo Seco have an effect on velocity in select areas of the reservoir upstream of Devil's Gate Dam. The effects on velocity are small in absolute terms. In cases where diversions do not effect early-season large runoff events, differences in maximum velocity would be negligible between the with-diversion and without-diversion scenarios for any representative year. In contrast, the extent which the reservoir is full in either the with-diversion and without-diversion scenarios may affect the change in velocity by creating a backwater condition in the reservoir. Because the dominant driver of runoff in coastal southern California is large winter storms, only in years where the primary source of water to the Devil's Gate Reservoir is runoff events near or below 25 cfs are velocities expected to be affected by diversions. It should be noted that the representative dry year is only minimally affected in this manner.

Effects on maximum depth in dry, average, and wet representative years in Arroyo Seco are largely mediated by the amount of ponding in Devil's Gate Reservoir. Ultimately, the ponding in the reservoir is a function of the rate, frequency and volume of inflow, and the dam operation outflow. In representative average and wet years, the modeled extent of ponding is a function primarily of Dam operations for both the with-diversion and without-diversion scenarios. In dry years, numerical modeling indicates that maximum depth is primarily driven by the volume of water entering the reservoir in the absence of reaching the Dam operational curve elevation. In dry years, diversions may have an effect on maximum water depth in the reservoir, and modeling indicates that maximum depth in these years is partially a function of when in the season the largest runoff events occur. That is, representative dry years with diversions and a few relatively large runoff events will have a similar maximum depth in the reservoir compared to representative dry years without diversions. In contrast, in dry years without a few relatively large events, modeling predicts that the difference in reservoir maximum depth will be greater. Finally, in representative wet and average years the duration of inundation can be impacted on the fringes of the reservoir by diversions. Diversions in these years appear to increase the inundation duration somewhat by increasing the volume of runoff required to initiate Dam operations.

The numerical modeling presented here indicates that relatively small effects on maximum velocity and maximum depth would occur from the proposed Project. These effects (e.g. change in velocity) are limited generally to the stream channel within the lower reservoir and the backwater area immediately upstream and to the west of the Dam. Additional minor effects (e.g. change in duration of inundation) are indicated at the reservoir edge and appear to be strongly a function of Dam operations as well as diversions. SAM modeling of two locations within the Project's study area indicates that there is greater sediment transport potential at 25 cfs in upper portions of Arroyo Seco, which are steep and narrow, compared to portions below the topographic break, which are wider and flatter. This finding echoes that of PWA (2000) that found that significant sediment deposition occurs in the "upper reservoir." The implication for the proposed Project is that for low discharges in Arroyo Seco, the diversion of 25 cfs from the Arroyo Seco is expected to be unimportant to overall sediment transport potential because the controlling elements of sediment transport are geologic factors. Moreover, in large runoff events that are typically the dominant delivery mechanism of sediment in southern California (Inman and Jenkins 1999) no diversions are proposed; therefore, high flow events would bypass the intake within Area 2.

In summary, an increase in the surface water diversions at Area 2 are intended to increase the amount of surface water flow entering the spreading basins in Area 3. These proposed increased diversions, however, would be a continuation of current diversion practices during dry weather flows, and would result in a measurable increase in diversion only during larger flows. Therefore, the proposed Project would not change drainage patterns, but would merely redirect additional surface flows. The spreading basins in Area 3 would be similar in type and structure to

the existing spreading basins and thus would not increase the potential for erosion above that of the existing condition. As discussed above, flows up to 25 cfs would be diverted to the spreading basins for infiltration, and the diversion of 25 cfs from the Arroyo Seco is expected to be insignificant to overall sediment transport potential. As demonstrated through the Sediment Analysis Methods (SAM) modeling and the conclusions of the Hydraulics, Sediment Transport, and Groundwater Analysis, the proposed Project would not measurably alter the course of the Arroyo Seco, impact overall sediment transport, or result in substantial erosion or siltation on-site or off-site, and impacts would be less than significant.

Threshold 4.5c **Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:**

ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site?

Short-Term Construction Impacts

As discussed under Threshold 4.5ci above, construction of the diversion structure in Area 2 would require temporary diversion of Arroyo Seco Creek flows through the installation of a coffer dam upstream of the construction activity area. Stream flows would temporarily pool upstream of this coffer dam and would be pumped beyond the Area 2 construction back into the Arroyo Seco channel. Construction of the diversion structure would be scheduled to avoid the wet/rainy season that might lead to increased stream flows that could cause flooding upstream of the coffer dam. Ponded water and stream flow shall be monitored during the diversion structure construction to ensure that pumping is sufficient to prevent upstream flooding.

Under current practices, low flows are diverted year-round, as feasible, into the intake structure and conveyed downstream into the Area 3 spreading basins. During construction activities, no diversion would occur. Therefore, low-flows would remain in the streambed throughout the duration of construction activities. As depicted in Figure 4.5-4, stream flows are highly variable from month to month and from year to year; therefore, the presence of low flows within the Arroyo Seco just downstream of the construction area would not result in a substantial increase in the rate or amount of surface runoff in a manner which would result in flooding because the Arroyo Seco is capable of accommodating a high variation in flows throughout the year. The coffer dam would not be present during the wet/rainy season. Even with completion of the new diversion weir and intake structure there would be no diversions the following year during construction of Area 3 improvements. Flows would continue downstream within the Arroyo Seco streambed during construction, which would include a portion of the 2021-22 rainy season. However, the lack of diversion during short-term construction activities in Area 3 would also fall within the range of conditions regularly experienced by the highly variable flows within the Arroyo Seco, as illustrated by Figure 4.5-4. Additionally, there are no habitable structures that would be subject to damage downstream of Area 2, as all flows are eventually impounded behind the Devil's Gate Dam, if they aren't diverted into the spreading basins. Because the Arroyo Seco flows are ultimately held back at the Dam, which is designed to contain the high variability of storm flows, any variations in in-stream flows due to short-term construction activities that would result in the temporary lack of diversions into the spreading basins would be well within the natural variation of flows in the Arroyo Seco and would not increase the rate or amount of surface runoff in a manner which would result in flooding on or off site. Impacts would be less than significant and no mitigation is required.

Long-Term Operational Impacts

The proposed improvements within Area 2 would be in the same location as the existing infrastructure. Construction of the streambed shoulder and bank, including the roughened channel, downstream of the new diversion structure and operable weir would be with permeable engineered streambed material (ESM). The ESM selected for the Project would consist of a well-graded mixture of rock, gravel and sand similar to natural streambed material, and would not add any new impervious surfaces within the Arroyo Seco streambed.

The expanded spreading basins within Area 3 would also be in the same location of the existing basins and would not substantially alter the existing drainage pattern of the site or alter of the course of a stream or through the addition of impervious surfaces. The Basin A is a new sedimentation basin that would be constructed of concrete to allow for the turbid flows to settle before entering into the basins. This minor amount of impervious surface has been calculated into the design of the spreading basins, which would be enlarged under the proposed Project. As previously described, approximately 13 acres of existing spreading basins currently exist in the Arroyo Seco, and PWP has planned the construction of approximately 4.5 acres of spreading within Basins E through J, which includes replacement of 1.6 existing acres and expansion of 3 acres. The total of 16 acres would allow for the percolation of the estimated additional 1,035 acre-ft/yr in diversions from the Project. Flows from the new/expanded spreading basins would retain connectivity to the existing basins further to the south and would continue to function in the same manner as the existing condition, which allows any flows that cannot be accommodated within the basins to outlet into the Devil's Gate Reservoir.

In summary, the proposed improvements in the diversion structure and spreading basins would not change drainage patterns nor involve the addition of impervious cover that would impede infiltration of stormwater. Alterations in the diversion structure would increase water spreading within the basins during high flows, but would not result in the flooding of any structures. The diversion structure would be designed to divert up to the City's 25 cfs surface water right, and by design, it would not be capable of flooding other structures due to the outlet design at the terminus of the spreading basins. Rehabilitation of existing spreading basins and the grading/excavation of additional basins would increase infiltration capacity by removing less permeable materials, thus decreasing the potential for flooding and surface flows. Impacts would be less than significant and no mitigation is required.

Threshold 4.5c **Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:**

iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

Short-Term Construction Impacts

Under the current conditions, all stormwater flows are conveyed within the Project study area via sheetflows into the Arroyo Seco. There are no constructed storm drain facilities within the Project study area, other than the existing subterranean Altadena Storm Drain, the Altacrest Drain and BI 0710 – Unit 1. No realignments are proposed for these drains as part of the Project and these drains do not receive stormwater from the Project area. Therefore, the Project would have no impact on the capacity of "existing or planned stormwater drainage systems" and as discussed under Threshold 4.5cii, the proposed Project have a less than significant impact on the capacity of the Arroyo Seco to accommodate additional flows during construction activities.

Regarding the potential for sources of polluted runoff, construction activities could result in short-term erosion and associated siltation of the Arroyo Seco. Erosion-induced sedimentation affects water quality and interferes with photosynthesis; oxygen exchange; and the respiration, growth, and reproduction of aquatic species. Additionally, other pollutants, such as nutrients, trace metals, and hydrocarbons, can attach to sediment and be transported to the Devil's Gate Reservoir, which could contribute to the degradation of water quality. Furthermore, during grading and temporary stockpiling of soil in Area 3, there is the potential for soil migration off-site via wind.

Non-sediment-related pollutants that are also of concern during construction relate to accidental spills and leaks of construction-related pollutants, such as: petroleum products from construction vehicles chemicals; concrete-related pollutants; lubricants and degreasers; and paints, glues and/or solvents.

However, the proposed Project would comply with the provisions of the Construction General Permit (CGP), which is NPDES General Permit for Storm Water Associated with Construction Activities (Order No 2009-009-DWQ as amended by 2010-0014-DWQ and 2012-0006-DWQ, NPDES No. CAS000002). Because the proposed Project is greater than 1 acre in size, the Applicant would be required to submit a Notice of Intent to the LARWQCB in order to obtain approval to complete construction activities under the CGP. This permit would include a number of design, management, and monitoring requirements for the protection of water quality and the reduction of construction phase impacts related to stormwater (and some non-stormwater) discharges. Permit requirements would include the preparation of a SWPPP, implementation and monitoring of BMPs, implementation of best available technology for toxic and non-conventional pollutants, implementation of best conventional technology for conventional pollutants, and periodic submittal of performance summaries and reports to the LARWQCB. The SWPPP would apply to the Project as a whole and would include reference to the major construction areas, materials staging areas, and haul roads. Typical BMPs that could be incorporated into the SWPPP include the following:

- Diverting off-site runoff away from the construction site
- Vegetating landscaped/vegetated swale areas as soon as feasible following grading activities
- Placing perimeter straw wattles to prevent off-site transport of sediment
- Using drop inlet protection (filters and sand bags or straw wattles), with sandbag check dams within paved areas
- Regular watering of exposed soils to control dust during demolition and construction
- Implementing specifications for demolition/construction waste handling and disposal
- Using contained equipment wash-out and vehicle maintenance areas
- Maintaining erosion and sedimentation control measures throughout the construction period
- Stabilizing construction entrances to avoid trucks from imprinting soil and debris onto City roadways
- Training, including for subcontractors, on general site housekeeping

Incorporation of required BMPs for materials and waste storage and handling, and equipment and vehicle maintenance and fueling would reduce the potential discharge of polluted runoff from construction sites, consistent with the State NPDES General Construction Permit. Compliance with existing regulations would prevent violation of water quality standards and minimize the potential for contributing sources of polluted runoff. Therefore, compliance with existing regulations would ensure that the Project would not add substantial sources of polluted runoff or otherwise substantially degrade surface quality from demolition and construction activities. Impacts would be less than significant and no mitigation is required.

Long-Term Operational Impacts

Area 2 does not currently contain a stormwater drainage system; stormwater drains naturally along the Arroyo Seco channel. Area 3 receives stormwater from three storm drains that discharge into the Arroyo Seco and bypass the Project basins, the Altadena Storm Drain, the Altacrest Drain and BI 0710 – Unit 1. No realignments are proposed for these drains as part of the Project and these drains do not receive stormwater from the Project area. Project components, both in Areas 2 and 3, would not be substantively different in type or function from the existing structures and materials. Thus, the proposed Project would not contribute additional sources of polluted runoff and impacts would be less than significant.

Threshold 4.5c Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

iv) impede or redirect flood flows?

Short-Term Construction Impacts

As stated above under Threshold 4.5ci above, stormwater drainage in Area 2 currently follows the natural flow of the Arroyo Seco channel and thus would be temporarily altered during construction in this Area using a coffer dam and sump pump; however, these diversions would be temporary and would be scheduled so as to avoid wet/rainy season where heavy rainfall is more likely. No flows would be diverted into Area 3 during construction and thus any potential flooding would not be impeded by construction in this area but would flow parallel to Project construction activities. Impacts related to the temporary diversion of flows around the construction within Area 2 would be less than significant and no mitigation is required.

Long-Term Operational Impacts

An Arroyo Seco Canyon Diversions Biological Impacts Memorandum (provided as Appendix I to the Biological Resources Technical Report [Appendix D of this Draft EIR]), analyzed the indirect Project impacts to downstream habitats due to the increase in the amount of water diverted into the spreading basins. The Memorandum considered impacts of the maximum possible change in diversion from existing conditions. The Memorandum concluded that the proposed additional diversions would not impact habitat in the downstream reach of the Arroyo Seco as long as the flow of groundwater remains unobstructed within the Arroyo Seco consistent with the current conditions (Psomas, 2018). The present condition of subsurface seepage below the diversion weir would be maintained by constructing a modified structure at similar depth to the current structure. No instream flow release criteria have been used in the preliminary design, but the diversion design includes gates and piping that would allow for release of surface water for instream flow in the future, if such requirements are developed. Instream flow releases would not, however, prevent flows from becoming very low or zero when natural inflows are low, which occurs during most years in the summer and fall (Appendix F).

As stated above under Threshold 4.5c(i) above, the expanded spreading basins within Area 3 would provide additional capacity to accommodate diversions from the Arroyo Seco. This would be an expansion of an existing condition and would not otherwise impede or redirect flood flows in a manner that is substantively different from current conditions. The proposed diversion structure would divert low and intermediate flows of up to 25 cfs to the

spreading basins, and the diversion structure would be bypassed during large storm events to avoid any potential debris damage. Area 3 is not proposed in an existing flood plain as identified by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps. Thus, any flows that are not diverted to the spreading basins (i.e. flows above 25 cubic feet per second), would not be affected by Project improvements. Impacts would be less than significant and no mitigation is required.

4.5.6 Cumulative Impacts

Groundwater Supplies/Recharge

The geographic context for the analysis of cumulative impacts related to groundwater supplies and recharge is the Raymond Basin, as identified in Figure 4.5-3. Of the cumulative projects listed in Section 3.5, Cumulative Impacts and on Figure 3-5, Cumulative Projects, the Devil's Gate Reservoir Sediment Removal and Management Project and the LACFCD Pump back/Intake at Devil's Gate to Eaton Canyon both have potential to directly impact groundwater recharge, as they both relate to impounded water behind the Devil's Gate Dam. The general area of these projects is identified in Figure 3-5, Cumulative Projects, in Section 3, Project Description. Impacts related to hydrology and water quality for the Devil's Gate project was evaluated through CEQA documentation, as described in Section 4 of this Draft EIR, and was determined to be less than significant, with no mitigation required.

The Devil's Gate project would remove accumulated sediment and associated vegetation within the reservoir. Reductions in sediment as a result of the project would allow for more capacity to retain water behind the Dam for longer periods of time, or as determined appropriate by the LACFCD. It is LACFCD opinion that percolation rates behind the dam are not high. As stated in the PWA report, Section 8.1.1 Percolation, "From their (LACFCD) experience managing other reservoirs and deep pit spreading basins, the LACDPW has raised questions as to whether or not ponding behind Devil's Gate Dam would actually increase percolation rates to groundwater over the long-term. They have noted that percolation rates may be very high initially at such facilities but tend to decrease if water is stored for extended period."

The LACFCD Pump back/Intake at Devil's Gate to Eaton Canyon project would pump impounded water from Devil's Gate Reservoir into the spreading basins at Area 3 or convey it cross town into spreading basins at Eaton Canyon when not in use. This project would also increase opportunities for groundwater recharge in the Raymond Basin, as increased spreading equates to increased groundwater percolation. An average of over 6,900 acre-feet of stormwater passes through Devil's Gate Dam annually and is lost to the ocean. While the Devil's Gate Sediment Removal project would restore reservoir capacity, the pump-back project would draw from this reservoir and add an estimated additional average annual recharge of 1,700 AF by utilizing the existing and expanded spreading basins. In the current condition, these portions of the spreading basins are dry, and therefore, are not contributing to the beneficial recharge of the groundwater basin. Increases in the amount of time that the basins contain water would result in maximizing the recharge of the basin.

Therefore, when considering these two projects in combination with the proposed Project, which is estimated to result in an additional 1,035 acre-feet/yr of infiltration, of which only 60% to 80% would be reused in the potable water supply system (i.e. 20% to 40% would remain in the Monk Hill Subarea, less any evaporation), the results of these two cumulative projects are anticipated to result in beneficial impacts to the Raymond Basin.

The Explorer Groundwater Well project would result in additional treatment of groundwater to remove target chemicals (e.g. perchlorate and volatile organic compounds [VOCs]) from the aquifer and then treat the water

through an expanded treatment train at the Monk Hill Treatment System (MHTS), thereby providing more water for potable supplies. It is not anticipated that this project would result in more pumping from the Monk Hill Subarea, as the Raymond Basin is adjudicated and must be managed in compliance with its sustainable yield. As such, groundwater supplies and sustainability is not anticipated to be negatively affected by this project.

None of the cumulative projects listed in Section 4.2.2, List of Cumulative Projects would result in substantive amounts of new impervious surfaces that could hinder recharge efforts or otherwise substantially interfere with groundwater recharge. Similarly, these cumulative projects are not developing new land uses that could create new demands for potable water supplies that could otherwise impede sustainable management of the basin.

Development of other cumulative projects beyond those identified in Section 4.2.2, List of Cumulative Projects, may affect groundwater supply by (1) increased land use intensities resulting in increased water usage and/or (2) increased land use intensities resulting in increased impervious surfaces, to the extent that groundwater recharge is affected. The majority of projects within the Los Angeles River Watershed are located in urbanized, built-out communities in which many development projects are located on sites that are already fully covered or partially covered with impervious surfaces. Overall development of cumulative projects is not anticipated to have a substantial, adverse effect on groundwater recharge in the Raymond Basin, to the extent that a net deficit in aquifer volume or a lowering of the local groundwater level would occur. Regionally, land use changes are anticipated and accounted for through the City's UWMP, which is updated every 5 years and accounts for population and employment growth set forth in the City's General Plan. UWMPs calculate water demand projections and show how anticipated future water demand will be fulfilled, and also include drought planning to ensure a reliable supply in the event of a drought, as well as analyses and evaluations of groundwater supplies in accordance with the sustainable yield of the groundwater basin. As such, to the extent that other cumulative projects are generally consistent with regional growth patterns and projections, the projects would not be expected to result in increased water usage causing a net deficit in aquifer volume or a lowering of the local groundwater level. Further, compliance with the California Green Building Code would be required for new development. For redevelopment projects, this generally indicates that newly installed appliances and plumbing would be more efficient than those used within the structures originally located on the redevelopment sites. This ensures that development projects do not result in wasteful or inefficient use of limited water resources.

Because the proposed Project and cumulative projects would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that they could cumulatively impede sustainable groundwater management of the basin, cumulative impacts to groundwater resources during construction and operation of the proposed Project and related projects would not be cumulatively considerable, and would not result in significant cumulative impacts.

Hydrology/Water Quality

The geographic context for the analysis of cumulative impacts related to hydrology and water quality is the Arroyo Seco Sub-watershed boundary, as identified on Figure 4.5-1. Of the cumulative projects listed in Section 4.2.2, List of Cumulative Projects, the Previously Approved Components of Arroyo Seco Canyon Project (Area 1 improvements); Devil's Gate Reservoir Sediment Removal and Management Project; and Oak Grove Area Improvements (OGAI) Project have the potential to directly impact hydrology and water quality in the Arroyo Seco Sub-watershed boundary. Impacts related to hydrology and water quality for these cumulative projects were evaluated through CEQA documentation, as described in Section 4 of this Draft EIR and were determined to be less than significant, with no mitigation required.

Cumulative hydrology impacts could result from other cumulative projects that collectively alter the course of surface water flow or increase flood hazards within the Arroyo Seco Sub-watershed boundary, either through diverting floodways or constructing structures within the floodways. The proposed Project and other cumulative projects (i.e. both listed projects and regional projects) in the areas discharging within the Los Angeles River watershed would be subject to state and regional water quality permit requirements, including the Construction General Permit and the Los Angeles County NPDES permit requirements.

Each of the cumulative projects would be required to comply with RWQCB standards for water discharge during construction and operation phases. Each cumulative project would be required to employ site design features, treatment control, and source control best management practices, as necessary, to control for drainage. For projects that would be located on vacant land, proposed surface conditions must mimic existing patterns to the extent feasible. Adherence to the Los Angeles County Municipal Separate Storm Sewer System (MS4) Permit (Order No. R4-2012-0175 as amended by State Water Board Order WQ 2015-0075, NPDES Permit No. CAS004001), as well as requirements for low impact development (LID), would be required for all cumulative projects to minimize adverse effects to hydrology and water quality.

Cumulative water quality impacts can result from projects that combine to either pollute or increase the turbidity of water. In the absence of regulatory controls, the primary potential cumulative effect would be alterations to the natural hydrology of the Arroyo Seco Sub-watershed by land use changes through increased potential for the release of non-point-source pollutants (i.e., motor fuels, trash, and sediment). Each of the cumulative projects would be required to comply with RWQCB standards for water discharge during construction and operation phases. Each cumulative project would employ site design features, treatment control, and source control best management practices, as necessary, to control for erosion and stormwater pollution, and compliance with the MS4 permit and LID would be required.

Because the proposed Project and cumulative projects would not alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in such a manner that could cause substantial erosion, siltation, flooding or polluted runoff, cumulative impacts to hydrology and water quality during construction and operation of the proposed Project and related projects would not be cumulatively considerable, and would not result in significant cumulative impacts.

4.5.7 Mitigation Measures

No mitigation measures are required.

4.5.8 Level of Significance After Mitigation

The proposed Project would not result in any potentially significant impacts related to Hydrology and Water Quality, and all impacts would remain less than significant with Project implementation.

4.5.9 References

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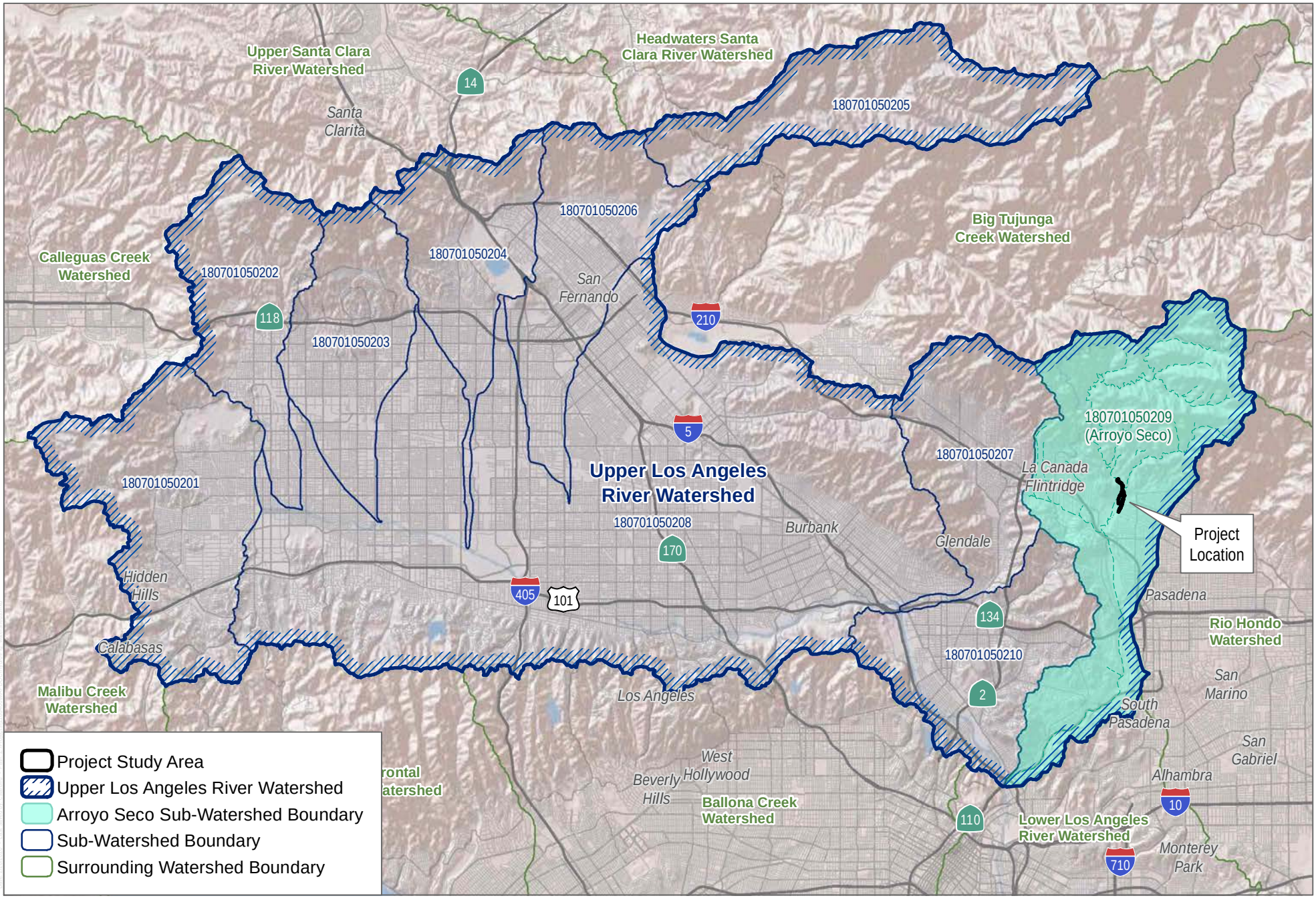
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SOURCE: Esri, Digitial Globe, Open Street Map

DUDEK

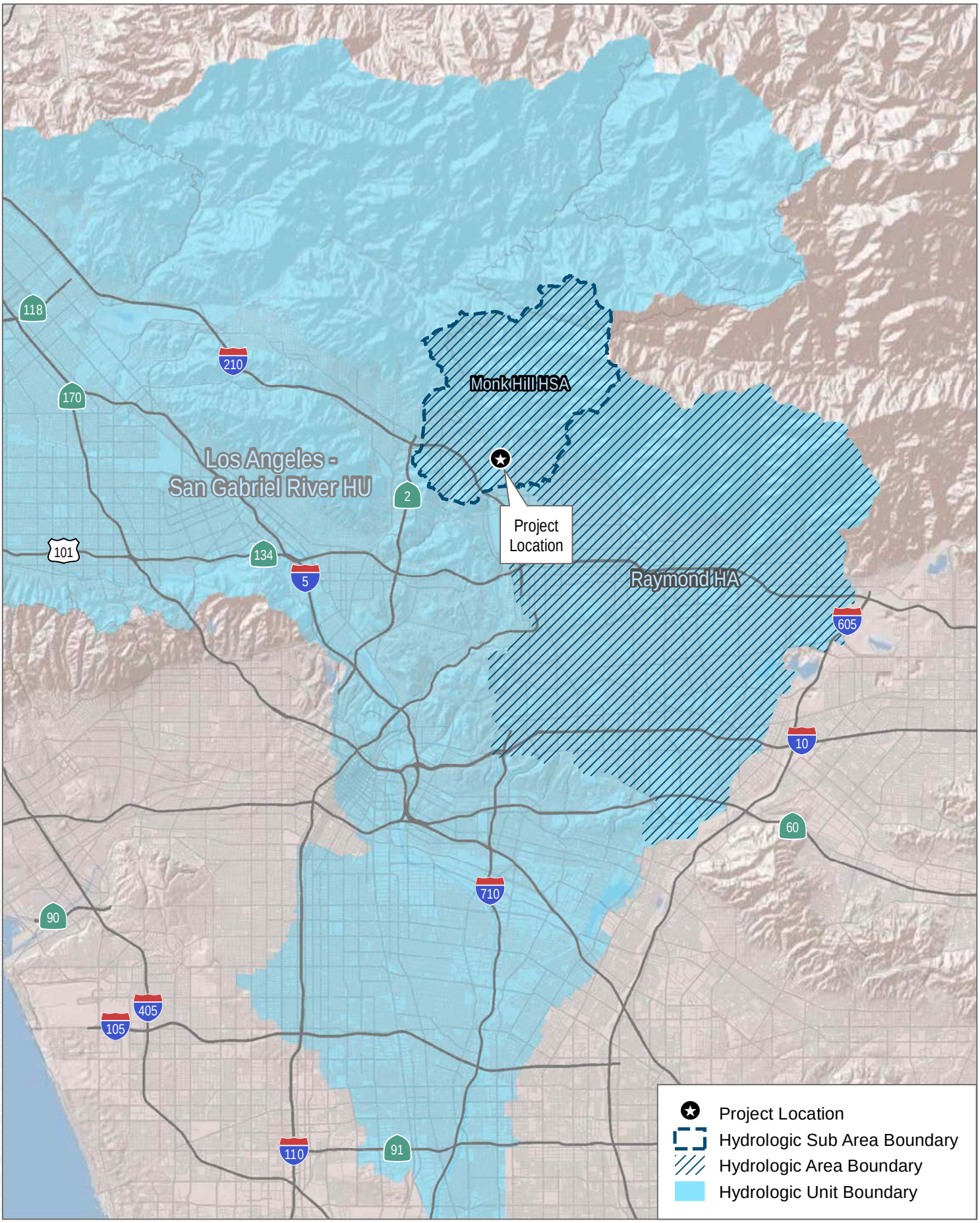
0 12,000 24,000 Feet

FIGURE 4.5-1

United States Geological Survey Watersheds

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Esri, Open Street Map

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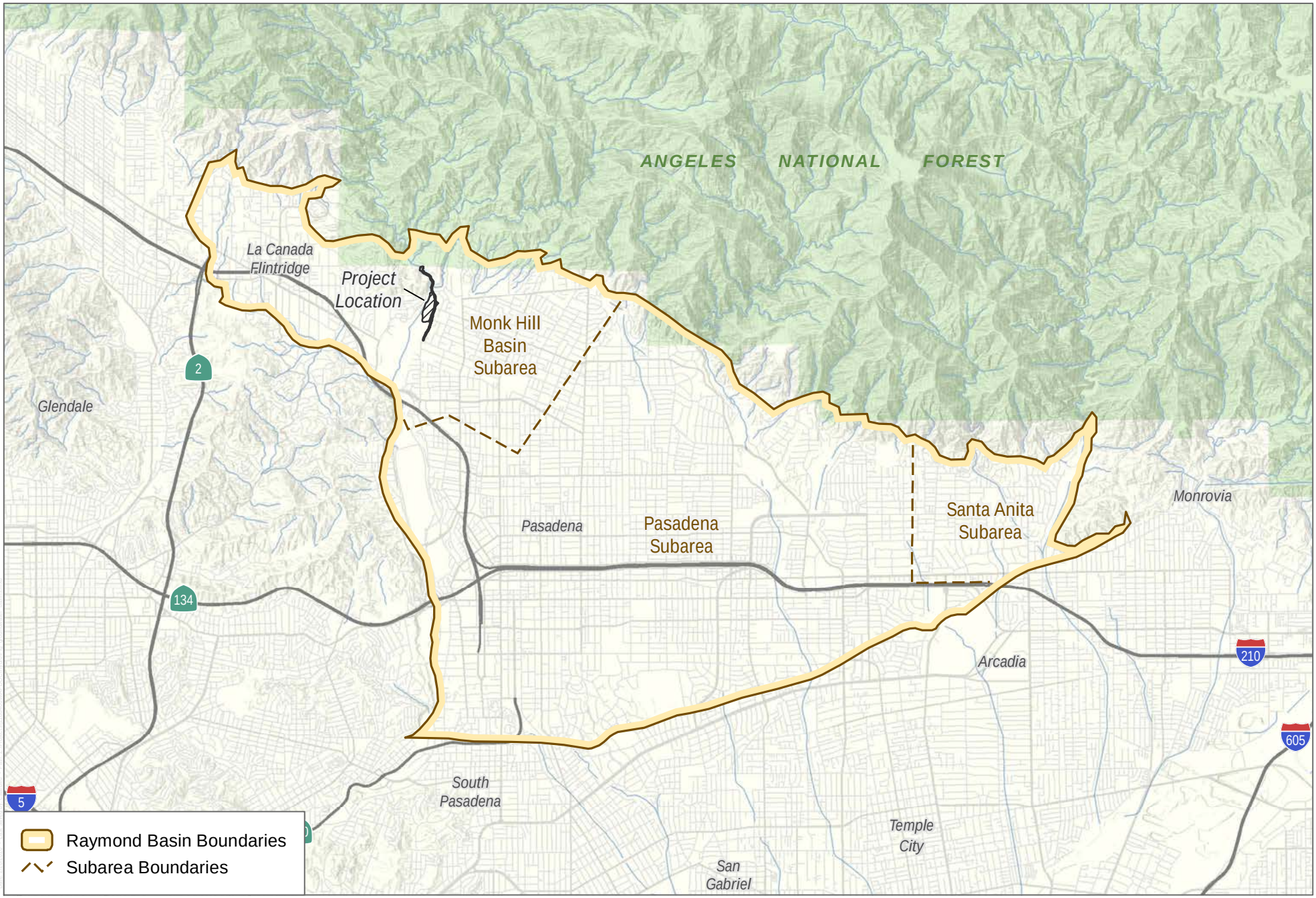
0 13,000 26,000 Feet

FIGURE 4.5-2

Regional Water Quality Control Board Hydrologic Areas

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Esri, Open Street Map

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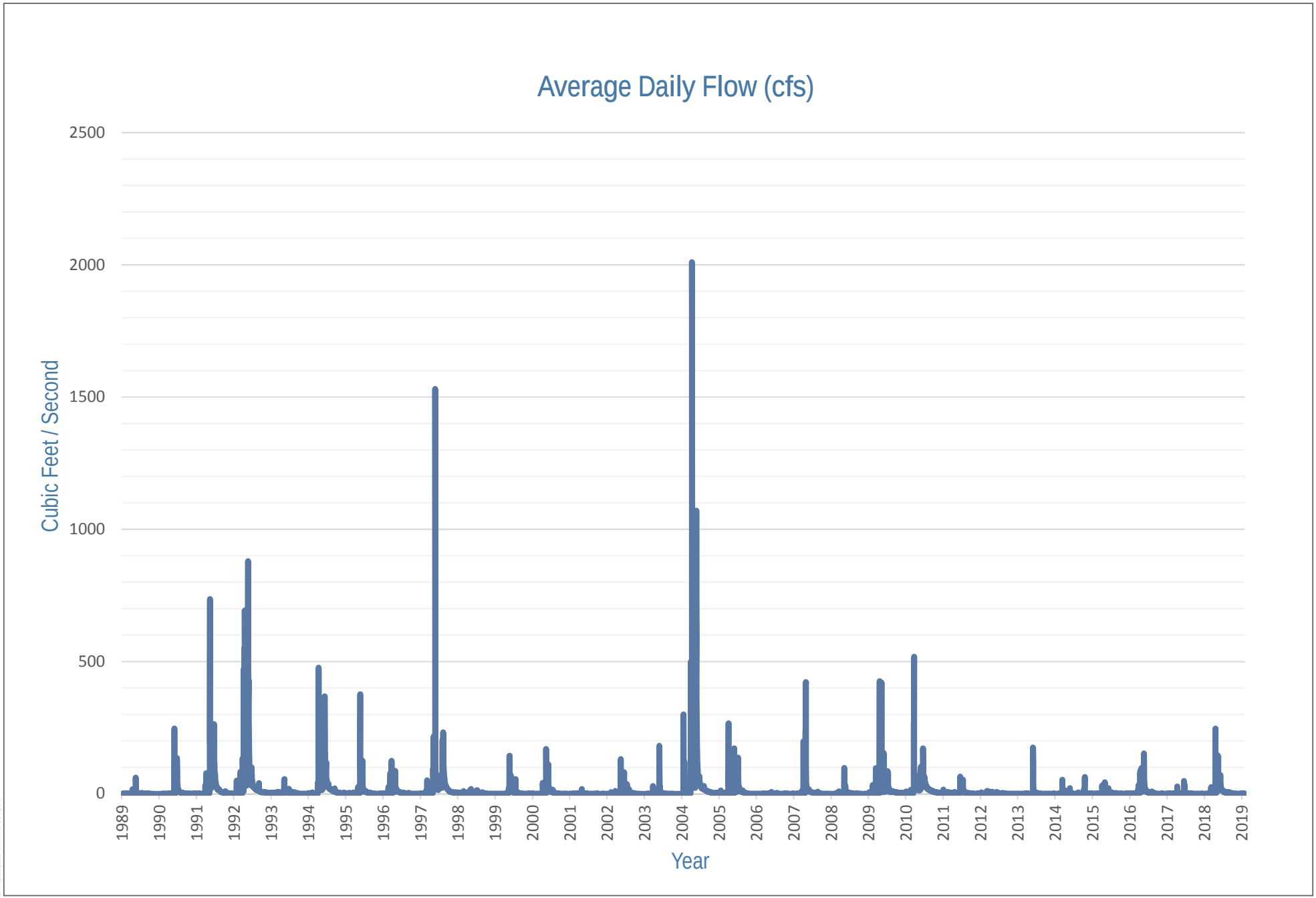
0 5,000 10,000 Feet

FIGURE 4.5-3

Raymond Basin and Subareas

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: USGS

FIGURE 4.5-4

USGS Stream Gage Station Flow Data for 1989 through 2019

Arroyo Seco Canyon Project Areas 2 and 3

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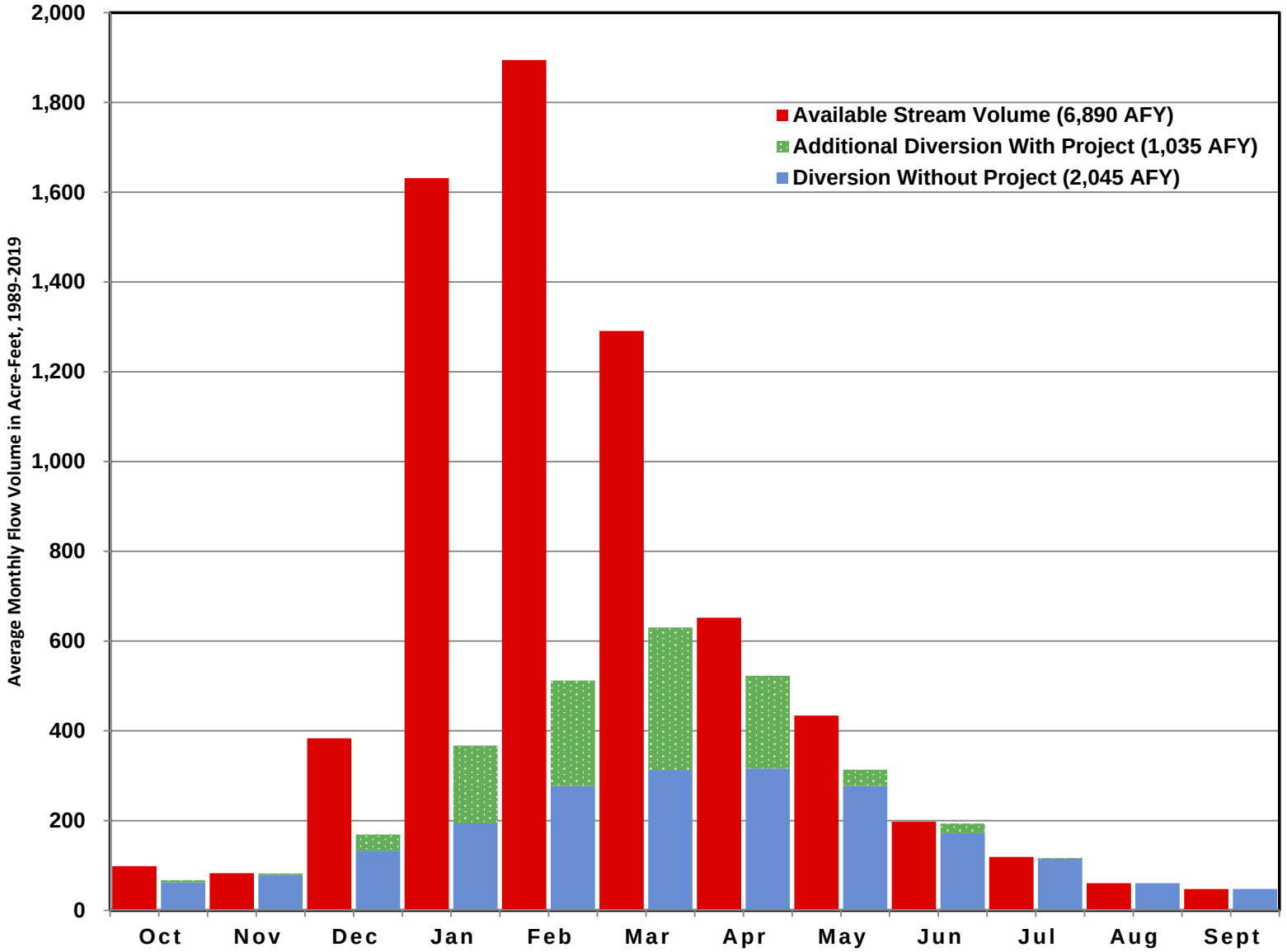


FIGURE 4.5-5

Estimated Project Contribution to Average Monthly Diversion Volume

Arroyo Seco Canyon Project Areas 2 and 3

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4.6 Noise

4.6.1 Methodology

This section describes the existing conditions of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential impacts, and identifies mitigation measures related to implementation of the proposed Project. The analysis of the Project impacts related to noise and vibration is based on:

Appendix G: Field Noise Measurement Data, December 2019; Construction Noise Modeling Input/Output, February 2020; and Traffic Noise Modeling Input/Output (during Construction), February 2020

Although not a part of the proposed Project, there are specific components in Area 2 that are approved to move forward without additional environmental review that are included in the equipment and activity assumptions that constitute the basis for the noise analysis and this section. The improvements to be conducted in Area 2, which have been previously approved to proceed in accordance with the 2015 ASCP MND, include:

1. Removal of existing *K*-rails along an approximate 150-foot-long segment of the Gabrielino Trail/Access Road between Bridge No. 3 and the intake structure, and
2. Stabilization and repaving of a portion of the Gabrielino Trail/Access Road with asphalt.

These non-Project improvements are included in the noise analysis assumptions because their construction is anticipated to occur simultaneously with the proposed Project improvements, likely using the same equipment. As such, it was determined to be unrealistic to parse out the short-term construction activities of the various Project components; therefore, the noise impacts of constructing all improvements within Area 2 are considered in this section.

Similarly, although not a part of the proposed Project, there are specific components in Area 3 that are approved to move forward without additional environmental review that are included in this section and in the construction noise assumptions. The improvements to be conducted in Area 3, which have been previously approved to proceed in accordance with the 2015 ASCP MND, include:

1. Demolition of various facilities, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chainlink fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins;
2. Construction and operation of new pre-fabricated restroom, new sewer lift station, and associated pipelines, including a new 12-inch-diameter potable water pipeline and a new sewer line within the JPL Bridge;
3. Construction and operation of new pipelines, including a 12-inch-diameter well line, 16-inch-diameter utility service line, and 12-inch-diameter booster line;
4. Removal of the Behner WTP's influent and effluent lines and removal of the 8-inch-diameter sludge line from the Behner WTP;
5. Construction and operation of the recreational parking lot at the northern end of Area 3;

6. Construction/realignment and operation of Explorer Road; and
7. Construction of new fencing, gates, a roundabout, a guard station, a trail pathway, and signs at the northern end of the parking lot.

Additional details related to these non-Project components are included in Appendix A-3, 2015 ASCP Initial Study/Mitigated Negative Declaration.

The non-Project components within Areas 2 and 3 listed above were previously approved for both short-term construction and long-term operations. Only the short-term construction activities for these non-Project components are modeled in the noise analysis, as all operational aspects were approved through the 2015 IS/MND and there would be no changes associated with the long-term operations of the proposed Project when compared to the 2015 IS/MND, as further described in Section 3, Project Description, of this Draft EIR.

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

4.6.2 Existing Conditions

Noise-Sensitive Receptors

Noise-sensitive receptors include land uses where an excessive amount of noise would interfere with normal operations or activities and where a high degree of noise control may be necessary. Examples include schools, hospitals, and residential areas. Recreational areas may be considered noise-sensitive where quiet and solitude may be an important aspect of the specific recreational experience (City of Pasadena 2002).

As described in Section 2, Environmental Setting, the Project site consists of two primary areas, as shown on Figure 2-1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements, which are connected by the North Arroyo Boulevard (i.e., Gabrielino Trail/Access Road). The proposed Project involves construction activity and facility improvements in Areas 2 and 3, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The former Travelling Screen and Chlorine Building (Screen Building) adjacent to Area 2 and the Behner WTP adjacent to Area 3 would be used for temporary construction materials and equipment staging only.

Area 2. The nearest homes to Area 2 are approximately 800 feet to the east on Canyon Dell Drive in Altadena, part of unincorporated Los Angeles County. A U.S. Forest Service (USFS) compound (which includes a residence) is located approximately 870 feet to the northwest, in the City of Pasadena. Residential neighborhoods to the west in the City of La Cañada Flintridge are more than 1,700 feet from Area 2.

Area 3. Single-family residential neighborhoods exist to the east of Area 3. Some homes are in the City of Pasadena and others are in Altadena. The closest homes to Area 3 are on Ridgeview Drive in Altadena and Crestford Drive in Pasadena, approximately 250 feet from the Project site. North Windsor Avenue, between the I-210 freeway and Explorer Drive, would be used by traffic generated by the proposed Project. There are homes adjacent to North Windsor Avenue in the City of Pasadena and in the community of Altadena. Passive and active recreational areas, including the Gabrielino Trail, are near all Project areas and are described in Section 4.7, Recreation.

Existing Noise Levels

Area 2 is located in a rural setting approximately 800 feet from suburban development. Local noise sources include occasional vehicles, recreational visitors, wind, and other natural sounds. Average hourly daytime noise levels (Leq) are estimated to be 40 to 45 A-weighted decibels (dBA) Leq.

Area 3 is located within a developed area and includes the City's open space area (i.e., former JPL East Parking Lot). The principal local noise sources in the surrounding area are (1) industrial activities, including material handling equipment at the JPL campus to the west and (2) vehicles coming to, using, and leaving the parking lot. Average hourly daytime noise levels are estimated to be 50 to 55 dBA Leq.

Ambient noise level measurements were conducted on December 3, 2019 near the residential receptors east and southeast of Area 3, including along North Windsor Avenue. Table 4.6-1 provides the location, date, and time the noise measurements were taken. The noise measurements were taken using a Soft-DB Piccolo sound level meter equipped with a 0.5-inch, pre-polarized condenser microphone with pre-amplifier. The sound level meter meets the current American National Standards Institute standard for a Type 2 (General Purpose) sound level meter. The accuracy of the sound level meter was verified using a field calibrator before and after the measurements, and the measurements were conducted with the microphone positioned approximately five feet above the ground.

Five short-term noise measurement locations (ST) that represent existing sensitive receivers were selected near the Project Site. These locations are depicted as receivers ST1–ST6 on Figure 4.6-1, Noise Measurement Locations. The measured energy-averaged (L_{eq}), minimum (L_{min}) and maximum (L_{max}) noise levels are provided in Table 4.6-1. The field noise data sheets are included in Appendix G. The primary noise sources at the sites identified in Table 4.6-1 consisted of traffic along adjacent and distant roadways; distant landscaping activities noise, distant barking dogs, and birdsong represented secondary noise sources. As shown in Table 4.6-1, the measured sound levels ranged from approximately 57 dBA L_{eq} at ST4 to 66 dBA L_{eq} at ST5.

Table 4.6-1. Measured Noise Levels

Receptors	Location	Date	Time	L_{eq} (Dba)	L_{min} (Dba)	L_{max} (Dba)
ST1	East of Project Site, adjacent to residence at 898 W. Altadena Drive	12/3/2019	9:42 a.m.–9:57 a.m.	62.2	50.7	80.7
ST2	East of Project Site, adjacent to residence at 892 W. Mariposa Street	12/3/2019	10:11 a.m.–10:26 a.m.	62.8	53	82.7
ST3	Southeast of Project Site, at western edge of Sunset Overlook Park, along Windsor Avenue	12/3/2019	10:41 a.m.–10:56 a.m.	62.6	54.5	75.2
ST4	Southeast of Project Site, adjacent to residence at 978 Kent Street	12/3/2019	11:04 a.m.–11:20 a.m.	57.2	50.9	74
ST5	Southeast of Project Site, adjacent to residence at 2245 North Windsor Avenue	12/3/2019	11:29 a.m.–11:44 a.m.	66.4	52.5	80.4

Source: Appendix G
Notes: L_{eq} = equivalent continuous sound level (time-averaged sound level); L_{max} = maximum sound level during the measurement interval; dBA = A-weighted decibels.

4.6.3 Relevant Plans, Policies, and Ordinances

Federal

There are no federal noise standards that would directly regulate environmental noise during construction and operation of the proposed Project. The following is provided because guidance summarized herein is used or pertains to the analysis.

Federal Transit Administration

Though not regulatory in nature, the U.S. Department of Transportation Federal Transit Administration (DOT) has established vibration guidance for various land uses based on their potential for human annoyance and activity disruption. In general, and according to DOT guidelines, groundborne vibration of 75 velocity decibels (VdB) or greater would be considered potentially annoying. Vibration of 85 VdB or greater would likely be highly annoying and disruptive for most land uses (DOT 2018). (VdB is a unit used to measure and describe vibration.) These guidelines are generally used to evaluate the significance of operational effects from transit projects. However, these guidelines are referenced in this EIR for the purposes of quantitatively describing the levels of vibration that are typically considered disruptive.

Typically, potential building and structural damages are the foremost concern when evaluating the impacts of construction-related vibration. Table 4.6-2 summarizes the DOT's vibration guidelines for building and structural damage.

Table 4.6-2. Groundborne Vibration Damage Potential

Building Category	Vibration Damage (in/sec PPV)
I. Reinforced-concrete, steel or timber (no plaster)	0.5
II. Engineered concrete and masonry (no plaster)	0.3
III. Non-engineered timber and masonry buildings	0.2
IV. Buildings extremely susceptible to vibration damage	0.12

Source: DOT 2018.

Notes: PPV = peak particle velocity

State

Government Code Section 65302(g)

California Government Code Section 65302(g) requires the preparation of a noise element in a general plan, which must identify and appraise the noise problems in the community. The noise element must recognize the guidelines adopted by the Office of Noise Control in the State Department of Health Services and shall quantify, to the extent practicable, current and projected noise levels for the following sources in the general plan's planning area:

- Highways and freeways
- Primary arterials and major local streets

- Passenger and freight on-line railroad operations and ground rapid transit systems
- Aviation and airport-related operations
- Local industrial plants
- Other ground stationary noise sources contributing to the community noise environment

California General Plan Guidelines

The California General Plan Guidelines, published by the Governor's Office of Planning and Research (OPR), provides guidance for the acceptability of specific land use types within areas of specific noise exposure. Table 4.6-3 presents guidelines for determining acceptable and unacceptable community noise exposure limits for various land use categories. The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution. OPR guidelines are advisory in nature. Local jurisdictions, including the City of Pasadena, have the responsibility to set specific noise standards based on local conditions.

Table 4.6-3. Land Use Compatibility for Community Noise Environments

Land Use	Community Noise Exposure (CNEL)			
	Normally Acceptable[1]	*Conditionally Acceptable*[2]	*Normally Unacceptable*[3]	*Clearly Unacceptable*[4]
Residential-low density, single-family, duplex, mobile homes	50–60	55–70	70–75	75–85
Residential – multiple-family	50–65	60–70	70–75	70–85
Transit lodging – motel, hotels	50–65	60–70	70–80	80–85
Schools, libraries, churches, hospitals, nursing homes	50–70	60–70	70–80	80–85
Auditoriums, concert halls, amphitheaters	NA	50–70	NA	65–85
Sports arenas, outdoor spectators sports	NA	50–75	NA	70–85
Playgrounds, neighborhood parks	50–70	NA	67.5–77.5	72.5–85
Golf courses, riding stables, water recreation, cemeteries	50–70	NA	70–80	80–85
Office buildings, business commercial and professional	50–70	67.5–77.5	75–85	NA
Industrial, manufacturing, utilities, agriculture	50–75	70–80	75–85	NA

Source: OPR 2003

Notes: CNEL = community noise equivalent level; NA = not applicable

1 Normally Acceptable: Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

[2] Conditionally Acceptable: New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features have been included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning, will normally suffice.

[3] Normally Unacceptable: New construction or development should be discouraged. If new construction of development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise-insulation features must be included in the design.

[4] Clearly Unacceptable: New construction or development should generally not be undertaken.

Local

While the proposed Project would be located in the City of Pasadena, there are nearby noise-sensitive receptors in the cities of Pasadena and La Cañada Flintridge, as well as the unincorporated community of Altadena. The applicable noise standards of all three jurisdictions are provided below.

City of Pasadena

The City of Pasadena has established guidelines and standards in its General Plan and Municipal Code. The Noise Element recognizes that construction activity is a source of occasional temporary nuisance noise throughout the City and that these and other such nuisance noises are common to cities and, because of their unpredictable nature, must be addressed on a case-by-case basis.

The following policies are applicable to the Project:

> **Policy 7b:** The City will encourage limitations on construction activities adjacent to sensitive noise receptors.
>
> **Policy 7c:** The City will encourage construction and landscaping activities that employ techniques to minimize noise.

The City Municipal Code (Title 9, article IV, Chapter 9.36, Noise Restrictions) is the City's Noise Ordinance. It is the City's policy ". . . to prohibit unnecessary, excessive and annoying noises from all sources . . . Noise at certain levels is detrimental to the health and welfare of the general public". The following sections of the Noise Ordinance are applicable to the Project:

Section 9.36.050 – General Noise Sources

This is applicable for long-term, operational noise and states "It is unlawful for any person to create, cause, make or continue to make or permit to be made or continued any noise or sound which exceeds the ambient noise level at the property line of any property by more than 5 decibels". In accordance with Section 9.36.040, adjustments are made to the allowable noise level for steady audible tones, repeated impulsive noise, and noise occurring for limited time periods.

Section 9.36.070 – Construction Projects

This section is applicable for Construction Projects and states:

A. No person shall operate any pile driver, power shovel, pneumatic hammer, derrick power hoist, forklift, cement mixer or any other similar construction equipment within a residential district or within a radius of 500 feet therefrom at any time other than as listed below:
   1. From 7:00 AM to 7:00 PM Monday through Friday;
   2. From 8:00 AM to 5:00 PM on Saturday; and

3. Operation of any of the listed construction equipment is prohibited on Sundays and holidays.

B. No person shall perform any construction or repair work on buildings, structures or projects within a residential district or within a radius of 500 feet there from in such a manner that a reasonable person of normal sensitiveness residing in the area is caused discomfort or annoyance at any time other than as listed below:
   1. From 7:00 AM to 7:00 PM Monday through Friday;
   2. From 8:00 AM to 5:00 PM on Saturday; and
   3. Performance of construction or repair work is prohibited on Sundays and holidays.

C. For purposes of this section, holidays are New Year's Day, Martin Luther King Jr. Day, Lincoln's Birthday, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Day after Thanksgiving, and Christmas.

Section 9.36.080 – Construction Equipment.

This section states that "It is unlawful for any person to operate any powered construction equipment if the operation of such equipment emits noise at a level in excess of 85 dBA when measured within a radius of 100 feet from such equipment".

Los Angeles County

The Los Angeles County noise restrictions are applicable to the properties within the Altadena community. Section 12.08 of the County of Los Angeles Code (County Code) contains the County Noise Ordinance. The County sets maximum construction noise levels "at residential structures." As shown in Table 4.6-5 below, the daytime noise level limit at single-family residences for mobile construction equipment is 75 dBA. The County's Noise Ordinance requirements are not applicable to mobile noise sources such as automobiles or heavy trucks when traveling in a legal manner on public roadways or on private property. Mobile noise source control is preempted by federal and State laws.

Table 4.6-4. County of Los Angeles Construction Noise Limits

Time Interval	Single-Family Residential (dBA)	Multi-Family Residential (dBA)	Semi-Residential or Commercial (dBA)
Mobile Equipment			
Daily, except Sundays and legal holidays, 7:00 AM to 8:00 PM	75	80	85
Daily, 8:00 PM to 7:00 AM, and all day Sunday and legal holidays	60	64	70
Stationary Equipment			
Daily, except Sundays and legal holidays, 7:00 AM to 8:00 PM	60	65	70
Daily, 8:00 PM to 7:00 AM, and all day Sunday and legal holidays	50	55	60

Source: County of Los Angeles 2013

City of La Cañada Flintridge

The City of La Cañada Flintridge does not have quantitative standards for construction noise.

Applicable Vibration Standards

Neither the City of Pasadena nor the City of La Cañada Flintridge has vibration standards. Section 12.08.560 of the Los Angeles County Code states, "Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet (46 meters) from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec over the range of 1 to 100 Hertz".

4.6.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to noise are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to noise would occur if the project would:

a) Result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
b) Result in generation of excessive groundborne vibration or groundborne noise levels.
c) For a project located in the vicinity of a private airstrip or an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Through the analysis in the Initial Study (see Appendix A-1), it was determined that the proposed Project would not expose people residing or working in the Project area to excessive noise levels as a result of the Project being located in the vicinity of a private airstrip or an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport. (i.e., Threshold c). Accordingly, this issue is not further analyzed in the EIR. Based on the remaining thresholds, a significant impact related to noise would occur if the project would:

a) Result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
b) Result in generation of excessive groundborne vibration or groundborne noise levels.

4.6.5 Environmental Impacts Analysis

Threshold 4.6a. Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Construction of the Project improvements would be phased, with construction in Area 2 requiring approximately 3 months (August 2021 through October 2021), and construction in Area 3 requiring approximately 9 months (March 2022 through November 2022). During construction of the proposed Project, activities would include demolition of existing structures, site preparation, grading/excavation, construction of structures, paving, dewatering, and application of architectural coating. Construction-related noise would also be generated on local roadways, from worker vehicles and trucks accessing the Project site.

On-Site Construction Noise

Construction activities would require the use of standard construction equipment such as loaders, dozers, backhoes, dump trucks, graders, pumps, rollers, and cranes. Construction equipment with substantially higher noise-generation characteristics (such as pile drivers, rock drills, blasting equipment) would not be necessary for the proposed Project, although the use of a hoe ram (i.e., a percussive hammer-type device) is anticipated during demolition. Additionally, in the interest of minimizing the export of excavated materials from the Project site, the City may implement a mechanical shaker to sort and sift through excavated soils to separate finer soils from larger rocks. These devices have been accounted for in the construction noise analysis.

The range of maximum noise levels for various types of construction equipment at a distance of 50 feet is depicted in Table 4.6-6. The noise values represent maximum noise generation, or full-power operation of the equipment. Simultaneous operation of more than one piece of equipment would increase the sound level of the equipment operating individually. As an example, a loader and two dozers, all operating at full power and relatively close together, would generate a maximum sound level of approximately 90 dBA at 50 feet from their operating locations. As one increases the distance between equipment, and/or the separation of areas with simultaneous construction activity, dispersion and distance attenuation reduce the effects of separate noise sources added together. In addition, typical operating cycles may involve 2 minutes of full-power operation, followed by 3 or 4 minutes at lower levels. The average noise level during construction activity is generally lower, since maximum noise generation may only occur up to 50% of the time.

Table 4.6-6. Construction Equipment Maximum Noise Emission Levels

Equipment	Maximum Sound Level (dBA) 50 Feet from Source
Roller	74
Concrete vibrator	76
Pump	76
Saw	76
Backhoe	80
Air compressor	81

Table 4.6-6. Construction Equipment Maximum Noise Emission Levels

Equipment	Maximum Sound Level (dBA) 50 Feet from Source
Generator	81
Compactor	82
Concrete pump	82
Crane, mobile	83
Concrete mixer	85
Dozer	85
Grader	85
Impact wrench	85
Loader	85
Pneumatic tool	85
Jackhammer	88
Truck	88
Paver	89

Source: DOT 2018.

The nearest sensitive receptors to Area 2 are the residential land uses approximately 800 feet to the east in Altadena, part of unincorporated Los Angeles County, the USFS compound approximately 870 feet to the northwest in Pasadena, and residential land uses approximately 1,700 feet to the west in the City of La Cañada Flintridge[1]. The nearest sensitive receptors to Area 3 are the residential land uses approximately 250 feet to the east in Altadena and in Pasadena. Whereas the Area 2 active Project construction area is quite small, the construction area constituting Area 3 is relatively large. While the nearest work within Area 3 would take place within 250 feet of the nearest residences, construction activities would more typically take place approximately 400 feet from the nearest residences[2].

The Federal Highway Administration's (FHWA) Roadway Construction Noise Model (RCNM) (FHWA 2008) was used to estimate construction noise levels at the nearest noise-sensitive land uses. Although the model was funded and promulgated by the Federal Highway Administration, the RCNM is often used for non-roadway projects because the

1 Pedestrians, hikers, bicyclists, and equestrians could come near construction activities in Areas 2 and 3 while using the Gabrielino Trail/Access Road. These recreational users are not considered noise-sensitive receptors because they are mobile and a temporary presence, like pedestrians on a residential street, or bicyclists on a bike path. Nearby recreational users would have the option of modifying their activities to avoid exposure to undesirable noise levels. Additionally, because the users of the trail are by definition mobile, the duration of noise exposure of any one individual to noise from construction would be brief.

2 Because proposed construction activities would take place both near and far relative to any one noise-sensitive receiver, the concept of the "acoustic center" is used for providing typical noise levels. The acoustic center is the idealized point from which the energy sum of all activity noise, near and far, would be centered. The acoustic center is derived by taking the square root of the product of the nearest and the farthest equipment noise–receiver distances.

same types of equipment used for roadway projects are also used for other project types. Input variables for the RCNM consist of the receiver/land use types, the equipment type and number of each (e.g., two graders, a loader, a tractor), the duty cycle for each piece of equipment (e.g., percentage of hours the equipment typically works per day), and the distance from the noise-sensitive receiver. No topographical or structural shielding was assumed in the modeling. The RCNM has default duty-cycle values for the various pieces of equipment, which were derived from an extensive study of typical demolition activity patterns (FHWA 2008). Those default duty-cycle values were used for this noise analysis.

Using the Federal Highway Administration's RCNM construction noise model and construction information (types and number of construction equipment by phase), the estimated noise levels from construction were calculated (summarized in Table 4.6-7). At Area 2, noise levels were estimated at the residential areas to the east and to the west, and the USFS compound to the northwest; at Area 3, noise levels were estimated at the nearest residences (located to the east) for both the relatively brief periods of time during which construction would take place at the nearest source-receiver distances, and during the longer periods of time when construction would take place both near and far from adjacent receivers. The RCNM inputs and outputs are provided in Appendix G. Note that these estimates are conservative, as they do not account for any potential reduction in noise levels from topographical shielding, ground absorption effects, or atmospheric absorption.

Table 4.6-7 Construction Noise Modeling Results

Project Phase	Noise-Sensitive Receiver	Nearest or Typical Construction Activity Distance (feet)	L_{eq} (dBA)
Area 2 Construction Phases			
Area 2 - Demolition	Residences to the east of Project Site	Nearest / Typical Construction Work (800')	63
	USFS Compound to the northwest of Project Site	Nearest / Typical Construction Work (870')	62
	Residences to the west of Project Site	Nearest / Typical Construction Work (1,700')	56
Area 2 - Site Preparation	Residences to the east of Project Site	Nearest / Typical Construction Work (800')	59
	USFS Compound to the northwest of Project Site	Nearest / Typical Construction Work (870')	58
	Residences to the west of Project Site	Nearest / Typical Construction Work (1,700')	53
Area 2 - Grading/Excavation	Residences to the east of Project Site	Nearest / Typical Construction Work (800')	62
	USFS Compound to the northwest of Project Site	Nearest / Typical Construction Work (870')	61
	Residences to the west of Project Site	Nearest / Typical Construction Work (1,700')	56
Area 2 - Building Construction	Residences to the east of Project Site	Nearest / Typical Construction Work (800')	60
	USFS Compound to the northwest of Project Site	Nearest / Typical Construction Work (870')	59
	Residences to the west of Project Site	Nearest / Typical Construction Work (1,700')	53

Table 4.6-7 Construction Noise Modeling Results

Project Phase	Noise-Sensitive Receiver	Nearest or Typical Construction Activity Distance (feet)	L_{eq} (dBA)
Area 2 - Paving	Residences to the east of Project Site	Nearest / Typical Construction Work (800')	62
	USFS Compound to the northwest of Project Site	Nearest / Typical Construction Work (870')	61
	Residences to the west of Project Site	Nearest / Typical Construction Work (1,700')	55
Area 2 - Dewatering	Residences to the east of Project Site	Nearest / Typical Construction Work (800')	55
	USFS Compound to the northwest of Project Site	Nearest / Typical Construction Work (870')	55
	Residences to the west of Project Site	Nearest / Typical Construction Work (1,700')	49
Area 3 Construction Phases			
Area 3 - Demolition	Residences to the east of Project Site	Nearest Construction Work (250')	67
		Typical Construction Work (400')	68
Area 3 - Site Preparation	Residences to the east of Project Site	Nearest Construction Work (250')	60
		Typical Construction Work (400')	61
Area 3 - Grading/Excavation	Residences to the east of Project Site	Nearest Construction Work (250')	68
		Typical Construction Work (400')	69
Area 3 - Building Construction	Residences to the east of Project Site	Nearest Construction Work (250')	61
		Typical Construction Work (400')	63
Area 3 - Paving	Residences to the east of Project Site	Nearest Construction Work (250')	66
		Typical Construction Work (400')	67
Area 3 - Architectural Coating	Residences to the east of Project Site	Nearest Construction Work (250')	55
		Typical Construction Work (400')	56

Source: Appendix G

As shown in Table 4.6-7, the highest noise levels from Area 2 construction are predicted to occur at residences located to the east of the work (located in Altadena, in unincorporated Los Angeles County) during the demolition phase, when noise levels are estimated to be approximately 63 dBA L_{eq}. This would be less than the Los Angeles County noise standard for construction of 75 dBA. At the USFS compound (located within the City of Pasadena), the highest estimated noise levels are estimated to be approximately 62 dBA $L_{eq.}$ This level would be less than the noise limit of 85 dBA set forth in Section 9.36.080 of the City of Pasadena Municipal Code. At residences located to the west (located in the City of La Cañada Flintridge), the highest estimated noise levels are estimated to occur during demolition and grading / excavation, when noise levels are estimated to be approximately 56 dBA L_{eq}. This noise level is relatively low, by community noise standards; construction work may be audible at times, but would not be considered to be intrusive by a person of average sensibilities. Thus, the construction noise impacts from Area 2 would be less than significant, and no mitigation is required. Additionally, the construction work within Area 2 must be conducted in accordance with Section 9.36.070 of the City of Pasadena Municipal Code, which limits

noise-generating construction activities to between the hours of 7:00 AM and 7:00 PM Monday through Friday and between the hours of 8:00 AM and 5:00 PM Saturday in or within 500 feet of a residential district. No noise-generating construction activities would be conducted on Sundays and federal holidays.

At noise-sensitive areas adjacent to Area 3 (residents within Altadena and the City of Pasadena), the highest construction noise levels at the nearby residences located are predicted to occur during the demolition phase and grading/excavation phases, when noise levels are estimated to be approximately 67 dBA L_{eq} and 68 dBA L_{eq}, respectively, when construction occurs near the eastern Project boundary. More typically, when construction activities occur throughout Area 3, noise levels would range from approximately 51 to 63 dBA L_{eq}. These levels are below the noise limits of 75 dBA set by Section 12.08 of the County Code (i.e., County Noise Ordinance) and of the limit of 85 dBA set forth in Section 9.36.080 of the City of Pasadena Municipal Code. Therefore, impacts would be less than significant.

During the louder phases of construction, the estimated noise levels would be approximately 5 decibels above measured ambient noise levels; the noise would be audible and could interfere with the typical/normal volumes of speech of persons outside. Pedestrians, hikers, bicyclists, and equestrians could come near construction activities in Areas 2 and 3 while using the Gabrielino Trail/Access Road. These recreational users are not considered sensitive receptors to noise because they are mobile and a temporary presence, similar to pedestrians on a residential street. Although there is an expectation for noise in natural open space areas, such as the Arroyo Seco, to be minimal, the proposed Project's construction activities would be temporary and not unusual in duration or intensity. Recreational users of the Gabrielino Trail/Access Road would have the option of modifying their activities to avoid exposure to undesirable noise levels. Additionally, because the users of the trail are by definition mobile, the duration of noise exposure of any one individual to noise from construction would be brief.

As previously discussed in Section 2, Environmental Setting, of this Draft EIR and presented in Table 2-1, the City is committed to implementing noise mitigation, as repeated below in MM-NOI-1, through the implementation of the adopted Mitigation Monitoring and Reporting Program (MMRP) associated with the 2015 IS/MND. Therefore, MM-NOI-1 would be incorporated into the Project without alterations from the MMRP, in order to further reduce noise from construction within Area 3 and to support Policies 7b and 7c of the Pasadena Comprehensive General Plan's Noise Element. MM-NOI-1 specifies noise-control measures to minimize noise effects upon sensitive receptors. In addition, the Project would be conducted in accordance with the City's Municipal Code requirements regarding limitations on noise-generating construction activities to the specified hours.

The effectiveness of MM-NOI-1 would vary from several decibels, which in general is a relatively small change, to ten or more decibels, which subjectively would be perceived as a substantial change, depending upon the specific equipment and the original condition of that equipment, the specific locations of the noise sources and the receivers, etc. Installation of more effective silencers could range from several decibels to well over 10 decibels. Reduction of idling equipment could reduce overall noise levels from barely any reduction to several decibels.

Implementation of MM-NOI-1 and compliance with applicable municipal code restrictions related to construction activities would ensure that short-term construction noise generated by on-site construction activity would not result in substantial temporary increases in ambient noise levels in the vicinity of the Project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

Off-Site Roadway Construction Noise

The Project would result in local, short-term increases in roadway noise as a result of construction traffic. Project-related traffic would include workers commuting to and from Areas 2 and 3; vendors bringing materials; and haul trucks removing demolished structural materials, vegetative materials, and excavated soils from the Project site, as well as trucks entering the Project area to deliver materials, concrete, etc. Construction trucks hauling soils and debris to and from off-site disposal facilities are expected to come to the site from I-210 at the Windsor Avenue off-ramp and head north on Windsor Avenue to the intersection with Ventura Street. At this intersection is a fork in the road, one leading to Explorer Road into Area 3 and the other leading to the gated North Arroyo Boulevard, which passes adjacent to residential properties and the Behner WTP. North of the JPL Bridge, North Arroyo Boulevard (the Gabrielino Trail/Access Road) would be used for construction vehicles and equipment transport to and from Area 2. Explorer Road and potentially North Arroyo Boulevard would be used to access Area 3.

Construction worker estimates and vendor truck trips by construction phase were based on information provided by the City. These include:

- 26 daily worker trips during Area 2 and Area 3 construction work;
- 2 daily vendor trucks during most of the construction work (both Areas 2 and 3);
- An average of 14 haul truck trips per day during Area 2 work;
- A peak of 86 daily haul truck trips during Area 2 work for approximately 5 working days,
- An average of 84 haul truck trips per day during Area 3 work; and,
- A peak of 475 daily haul truck trips during Area 3 demolition work, for approximately 10 working days.

Using the construction trip estimates and the FHWA traffic noise prediction model (TNM 2.5) (FHWA 2004), traffic noise level modeling was performed in order to estimate the temporary increase in noise from construction worker and heavy truck trips, when added to the existing traffic volumes. Based upon a review of average daily traffic volumes (ADT) for weekday counts conducted by the Los Angeles County Department of Public Works (LACDPW), the most recent available ADTs were selected. On North Windsor Avenue between Woodbury Road/Oak Grove Drive and Figueroa Drive, the most recent ADT (conducted in 2017) was 12,128 vehicles per day. On North Windsor Avenue between Figueroa Drive and Ventura Street the most recent ADT (conducted in 2019) was 8,121 vehicles per day. The existing average daily weekday ADT for Explorer Road north of Windsor Avenue (in 2017) was 3,492 (County of Los Angeles 2020). Typically, a growth factor would be applied to traffic volume years not occurring in the baseline year (2019); however, based upon a review of historic ADT counts in the area (which seemed to trend both slightly positive and slightly negative in recent years), it was deemed inappropriate to assume a growth rate.

The ADT volumes cited above for North Windsor Avenue and Explorer Road were used as the basis to which the typical and peak-period construction vehicles were added, for the purpose of estimating the resulting traffic noise increase during Project construction. As shown in Table 4.6-8, during both typical and peak-period Area 2 work, the increase in average hourly traffic noise levels would be approximately 1 dB, when rounded to whole decibels. Although individual truck pass-bys would be clearly audible, the change in traffic noise level on an hourly average basis would be negligible.

Table 4.6-8. Construction Traffic Noise Modeling Results

Receiver	Existing (L_{eq} (dBA)	Existing plus Area 2 Work (Typical) (L_{eq} (dBA)	Existing plus Area 2 Work (Peak) (L_{eq} (dBA)	Increase (Typical) (dB)	Increase (Peak) (L_{eq}) (dB)	Existing plus Area 3 Work (Typical) (L_{eq} (dBA)	Existing plus Area 3 Work (Peak) (L_{eq} (dBA)	Increase (Typical) (L_{eq}) (dB)	Increase (Peak) (L_{eq}) (dB)
Receiver 1 - North Windsor Avenue - Woodbury Road / Oak Grove Drive to Figueroa Drive	65	66	66	1	1	66	68	1	3
Receiver 2 - North Windsor Avenue - Figueroa Drive to Ventura Street	64	64	65	0	1	64	67	0	3
Receiver 3 - Explorer Road - North of North Windsor Avenue	51	n/a	n/a	n/a	n/a	53	57	2	6

Source: Appendix G

Note: Traffic noise modeling receivers located at a receiver distance of 50 feet from roadway centerline for North Windsor Avenue and 150 feet for Explorer Road, based on typical source-receiver distances in these areas.

n/a – no truck traffic anticipated on Explorer Road during Area 2 work.

As shown in Table 4.6-8, during typical Area 3 work, the increase in average hourly traffic noise levels would range from approximately 0 dB (when rounded to whole numbers) to 1 dB along North Windsor Avenue and approximately 2 dB along Explorer Road. Again, individual truck pass-bys would be audible; however, because a change in noise level of 3 dB or less is typically not readily perceptible to the average listener, these short-term noise increases would be less than significant.

During peak-period construction work in Area 3, an increase of approximately 3 dB is predicted along North Windsor Avenue, and an increase of approximately 6 dB is predicted along Explorer Road. Because a change in noise level of 3 dB or less is typically not readily perceptible to the average listener, the increase along North Windsor Avenue is not considered significant. The short-term noise increase along Explorer Road would be perceptible; however, the predicted noise level from Area 3 peak-period traffic would be quite low and would be less than existing measured ambient noise levels in the vicinity (i.e., ambient noise levels of approximately 62 to 63 dBA dBA L_{eq}).

Therefore, construction traffic, including haul/dump trucks related to construction activities, would not result in substantial temporary or permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. Impacts would be less than significant and no mitigation is required.

Long-Term Operational Impacts

As described in Section 3, Project Description, PWP's future schedule of operation and maintenance activities for Project-related facilities would not substantively differ from the current maintenance routine and procedures. No new employees are required for the long-term operation of the Project components; therefore, no long-term operational noise or vibration from traffic would result. At Area 2, there would be the addition of two new hydraulic motors and two hydraulically operated winches. The motors, which would be relatively small (approximately 5.5 inches in length) would be used to actuate the slide gate and screen at the intake (outside of the service building). The hydraulically operated winch would be located at the crest gate, but the equipment to control the winch would be located within the proposed approximately 106-square foot Service Building, and thus completely enclosed. The operation of this equipment would be generally limited to during storm events. Typically, the crest gate would be in either the up or down position and there would be no mechanical noise. The crest gate would only modulate a small percentage of the time (approximately 15 days out of an average year, at which time where there would be intermittent operation). In all, it is estimated that the crest gate would be repositioned up or down approximately 10 times in an average year during the winter/wet season, with each change taking a few minutes. In summary, mechanical equipment noise would be infrequent and relatively low in noise level, and therefore would result in a less than significant noise impact. Therefore, at Area 3, no long-term operational noise or vibration from mobile equipment or stationary machinery would result. As such, the Project not result in generation of a substantial permanent increase in ambient noise levels in the vicinity of the Project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. Impacts would be less than significant and no mitigation is required.

Threshold 4.6b Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

Short-Term Construction Impacts

Construction activities that might expose persons to excessive ground-borne vibration or ground-borne noise could cause a potentially significant impact. Ground-borne vibration information related to construction activities (including demolition) has been collected by the California Department of Transportation (Caltrans 2013). Information from Caltrans indicates that continuous vibrations with a peak particle velocity of approximately 0.1 inches per second begin to annoy people. The heavier pieces of construction equipment, such as bulldozers, would have peak particle velocities of approximately 0.089 inches per second or less at a distance of 25 feet. The same vibration level (0.089 inches per second PPV at a distance of 25 feet) is cited for a hoe ram (DOT 2018).

Ground-borne vibration is typically attenuated over short distances. At the distance from the nearest vibration-sensitive receivers near Area 2 (residences located approximately 800 feet to the east) to where demolition / construction activity would be occurring on the Project site, and with the anticipated construction equipment, the peak particle velocity vibration level would be approximately 0.0005 inches per second. These vibration levels would be well below the vibration threshold of potential annoyance of 0.1 inches per second, as well as Los Angeles County's threshold of perception standard of 0.01 inches per second.

At the distance from the nearest vibration-sensitive receivers near Area 3 (residences located approximately 250 feet to the east) to where demolition/construction activity would be occurring on the Project site, and with the anticipated construction equipment, the peak particle velocity vibration level would be approximately 0.0028 inches per second. These vibration levels would also be well below the vibration threshold of potential annoyance of 0.1 inches per second, as well as Los Angeles County's threshold of perception standard of 0.01 inches per second.

The major concern with regards to construction vibration is related to building damage, which typically occurs at vibration levels of 0.5 inches per second or greater for buildings of reinforced-concrete, steel or timber construction. As discussed above, the anticipated vibration levels associated with on-site Project construction and at Areas 2 and 3 would be approximately 0.0005 and 0.0028 inches per second respectively, which are well below the threshold of 0.5 inches per second for building damage. Therefore, short-term construction activities of the proposed Project would not result in generation of excessive short-term groundborne vibration or groundborne noise levels. Impacts would be less than significant and no mitigation is required.

Long-Term Operational Impacts

As described in Section 3, Project Description, PWP's future schedule of operation and maintenance activities for Project-related facilities would not substantively differ from the current maintenance routine and procedures. No new employees are required for the long-term operation of the Project components; therefore, no long-term operational vibration from traffic would result. As discussed previously, Area 2 would include the installation of several pieces of mechanical equipment (motors and winches). However, these items would be relatively small, would not produce substantial levels of groundborne vibration and would operate infrequently. At Area 3, no new noise-generating land uses are proposed; therefore, no long-term operational vibration from mobile equipment or stationary machinery would result. As such, the Project will not result in generation of excessive long-term groundborne vibration or groundborne noise levels. Impacts would be less than significant and no mitigation is required.

4.6.6 Cumulative Impacts

The cumulative projects listed in Section 4.2.2, List of Cumulative Projects, summarizes the potential for overlapping short-term construction activities between the proposed Project and cumulative projects. The general area of these projects is identified in Figure 3-5, Cumulative Projects, in Section 3, Project Description. The geographic scope of the area potentially affected by cumulative noise impacts from construction and operation consists of receptor locations that could be exposed to noise and/or vibration from the proposed Project and from related projects. Because both noise and vibration attenuate with distance, the geographic scope consists of the Project study area and related projects within approximately 0.25-mile. Additionally, both noise and groundborne vibration are relatively ephemeral in nature; thus, Project timing is an important consideration.

As discussed in greater detail in Section 4, Environmental Impact Analysis of this Draft EIR, the cumulative projects were chosen based on direction from the City. ASCP Area 1 construction, while relatively near Area 2, is anticipated to begin in 2023 (and thus, after the completion of the proposed Project). The Devil's Gate Reservoir Sediment Removal and Management Project is located to the southwest of Area 3; sediment removal and placement is ongoing and expected to conclude in Fall 2022, with habitat restoration continuing through Fall 2023; the OGAI projects could begin construction as early as 2021 if funds become available, but

is located over 0.42-mile from the Project site. The LACFCD Pumpback/Intake at Devil's Gate (Devil's Gate Dam to Eaton) project would begin sometime after the completion of Devil's Gate and the proposed Project; and the Explorer Groundwater Well construction could potentially be concurrent with proposed Project Area 3, although no CEQA documentation has yet been prepared. Of the projects identified and described in Section 4, Environmental Impact Analysis, the Devil's Gate Reservoir Sediment Removal and Management Project is the one nearest to the Project site[3] and with a potential overlap in construction activities. Therefore, the Devil's Gate project is the one with the greatest potential to result in cumulative noise impacts with regards to the proposed Project.

On-Site Construction Noise

As discussed above, the analysis of on-site construction noise determined that at noise-sensitive areas adjacent to Area 3 (the portion of the Project site nearest to the Devil's Gate project), the highest construction noise levels at the nearby residences are predicted to occur during the demolition phase and grading / excavation phases, when noise levels are estimated to be approximately 67 dBA L_{eq} and 68 dBA L_{eq}, respectively, when construction occurs near the eastern Project boundary. These noise levels were below the limits set by the City and County Code requirements and were less than significant. MM-NOI-1 would be implemented to further reduce noise from construction within Area 3 and to support Policies 7b and 7c of the Pasadena Comprehensive General Plan's Noise Element.

The Project would also comply with Section 9.36.070 of the City of Pasadena Municipal Code, which limits noise-generating construction activities to between the hours of 7:00 AM and 7:00 PM Monday through Friday and between the hours of 8:00 AM and 5:00 PM Saturday in or within 500 feet of a residential district. The Devil's Gate project's construction equipment noise emissions were determined in that project's EIR to be less than significant; furthermore, the portion of the Project site representing an active work area (Basin J) is located approximately 500 feet from the Devil's Gate project site to the southwest. Therefore, it is unlikely that construction noise from the two projects would combine in a measurable fashion at nearby noise-sensitive receivers, located approximately 250 feet or more further to the east (at 750 feet from the Devil's Gate work, the noise level would be diminished by approximately 10 dB compared to the same noise level at 250 feet). Therefore, with implementation of MM-NOI-1 and compliance with applicable municipal code restrictions related to construction activities for the Project and cumulative projects, short-term construction noise generated by on-site construction activity would not result in cumulatively considerable substantial temporary increases in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.

[3] Note that construction equipment assumptions associated with specific components in Areas 2 and 3 that are approved to move forward without additional environmental review have been incorporated as part of the construction noise analysis addressed in Section 4.6.5, and are thus not considered as part of this cumulative impacts discussion.

Off-Site Roadway Construction Noise

As discussed above, the analysis of off-site construction noise determined that the short-term noise level increase from the Project along North Windsor Avenue would be 1 dB or less; along Explorer Road, the short-term noise level increase would be 2 dB or less. Explorer Road (and the receivers near Explorer Road) are located approximately 0.7-mile or further from the construction route associated with the Devil's Gate project (North Windsor Avenue, Oak Grove Drive, Berkshire Place). The portion of the Project's construction route that would be in proximity to and partially coincident with the Devil's Gate project is limited to the area of North Windsor Avenue at Oak Grove Drive and adjacent to the I-210 freeway. As shown in Table 4.6-8, the predicted noise level increase in this area would be 1 dB or less. Similarly, the predicted noise level increase in this area from the Devil's Gate project is 0 dB[4]. Thus, while individual truck pass-by noise would be clearly audible to nearby noise-sensitive receivers located near North Windsor Avenue and Oak Grove Drive, the cumulative increase would be negligible, less than significant and not cumulatively considerable.

Vibration

The proposed Project and related projects may generate vibration during construction processes. Ground vibration generated by construction equipment spreads through the ground and diminishes greatly in magnitude with increases in distance. As described above, vibration produced during construction of the Project would be well below thresholds of perception, annoyance or building damage. The Devil's Gate project EIR determined that there could be an exceedance of the Los Angeles County threshold of perception; a mitigation measure was required, restricting the use of large bulldozers and other large equipment within 180 feet of residential uses. With implementation of this mitigation measure, it was determined that the resultant vibration would be less than significant. Additionally, the closest portion of the Project site representing an active work area (Basin J) is located approximately 500 feet from the Devil's Gate Project site to the southwest[5]. Therefore, construction vibration from the two projects are not expected to combine at nearby noise-sensitive receivers. Cumulative impacts related to construction vibration would therefore be less than significant.

Long-Term Operational Impacts

Once operational, the proposed Project would not generate new sources of noise or groundborne vibration. As such, it would not have the potential to contribute to any long-term, cumulatively considerable impacts related to operational noise or vibration.

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4 As shown in Table 3.14-6, Final EIR Devil's Gate Reservoir Sediment Removal and Management Project. Los Angeles County. Accessed 02/19/2020. https://dpw.lacounty.gov/wrd/Projects/DevilGate/FEIR/Devils_Gate_FEIR_2014_10_20_Vol_1_Section_3.pdf. October 2014

5 At 500 feet, and with the anticipated construction equipment, the peak particle velocity vibration level would be approximately 0.001 inches per second, which would be well below the vibration threshold of potential annoyance of 0.1 inches per second, as well as Los Angeles County's threshold of perception standard of 0.01 inches per second.

4.6.7 Mitigation Measures

MM-NOI-1 The City and/or their Construction Contractor shall implement the following noise reduction measures during all construction activities:

- Equip all construction equipment (fixed or mobile) with properly operating and maintained mufflers, consistent with or exceeding manufacturers' standards.
- Ensure that construction equipment engine enclosures and covers as provided by manufacturers shall be in place during operation.
- Place all stationary construction equipment so that the equipment is as far as feasible from noise-sensitive receptors and so that the emitted noise is directed away from the noise-sensitive receptors.
- Locate equipment and materials staging in areas that will create the greatest distance between staging area noise sources and noise-sensitive receptors during Project construction.
- Ensure that construction equipment is shut down when not in use.
- Limit haul truck deliveries to the same hours specified for the operation of construction equipment.

4.6.8 Level of Significance After Mitigation

With implementation of MM-NOI-1, temporary noise increases from construction activities would be less than significant.

No mitigation is required for short-term construction vibration, or long-term operational noise or vibration impacts.

4.6.9 References

Caltrans (California Department of Transportation). 2013. *Transportation and Construction Vibration Guidance Manual*. Division of Environmental Analysis, Environmental Engineering, Hazardous Waste, Air, Noise, Paleontology Office. September 2013.

City of Pasadena. 2002. *City of Pasadena Revised Noise Element of the General Plan: Existing and Future Conditions*. December 2002. Accessed February 21, 2020. https://ww5.cityofpasadena.net/planning/wp-content/uploads/sites/56/2017/07/Existing-and-Future-Conditions-Report.pdf.

County of Los Angeles. 2013. Los Angeles, California County Code. Municipal Code Corporation for the County.

County of Los Angeles. 2020. Department of Public Works, Traffic Counts [online database]. Search for the following streets/cross streets: Windsor Avenue. Accessed February 20 2020, https://pw.lacounty.gov/tnl/trafficcounts/.

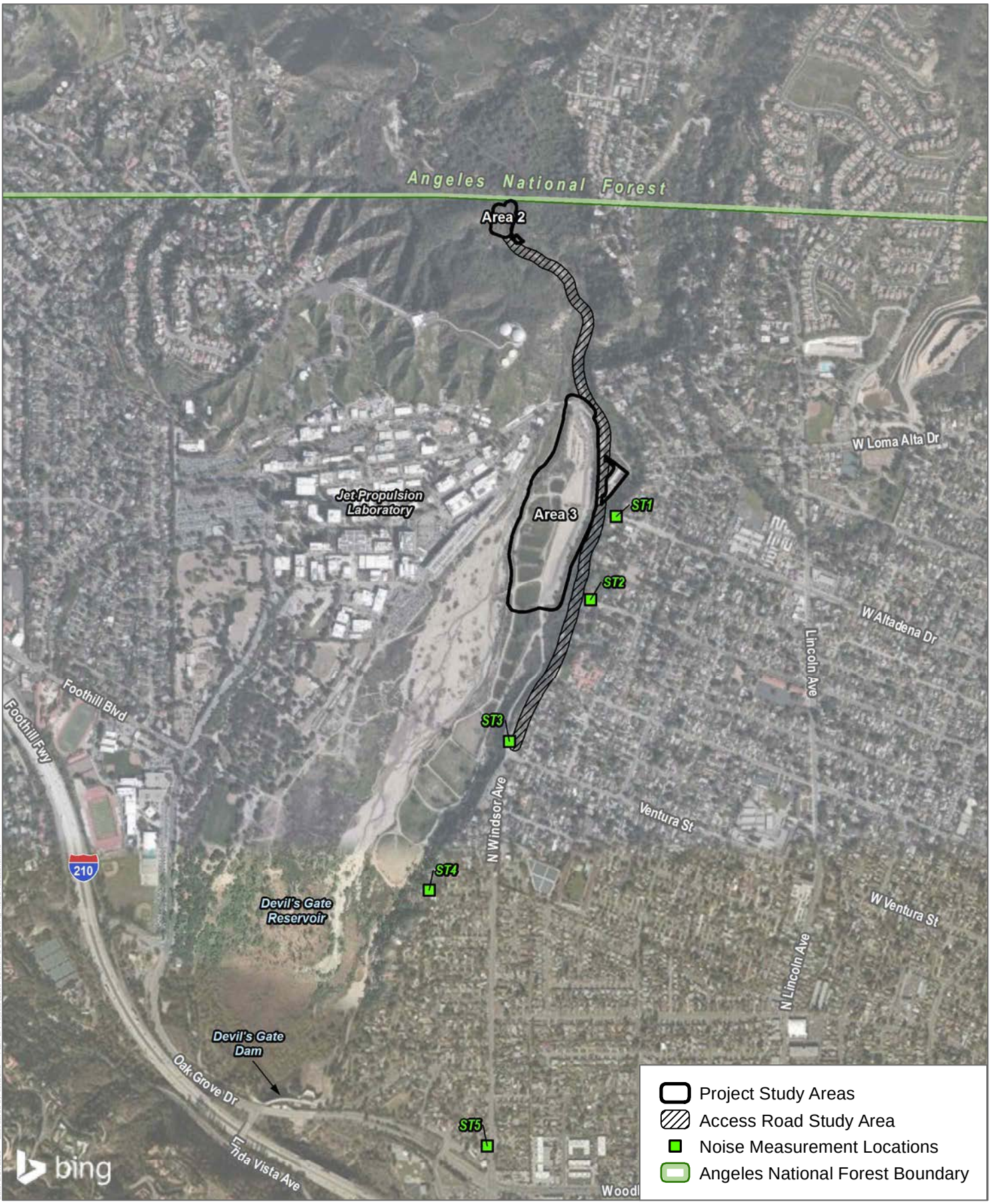
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FHWA (Federal Highway Administration). 2004. FHWA Traffic Noise Model, Version 2.5. Washington, D.C.: Office of Environment and Planning. February 2004.

FHWA. 2008. Roadway Construction Noise Model (RCNM). Accessed October 15, 2019. https://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/.

OPR (State of California Office of Planning and Research). 2003. *State of California General Plan Guidelines*. Governor's Office of Planning and Research. October 2003.

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SOURCE: Bing 2019, Open Street Map 2019

FIGURE 4.6-1

Noise Measurement Locations

Arroyo Seco Canyon Project Areas 2 and 3

DUDEK

0 550 1,100 Feet

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4.7 Recreation

4.7.1 Methodology

This section describes the existing conditions of recreational resources of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential impacts to recreational resources, and identifies mitigation measures related to implementation of the proposed Project. Recreational resources include facilities developed for recreation, such as (but not limited to) designated parks, trails, and picnic areas, as well as land where dispersed recreational activities exist, such as hiking, biking, horseback riding, and bird-watching/nature walks.

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

4.7.2 Existing Conditions

Regional Recreational Facilities

Angeles National Forest

The Angeles National Forest includes 662,983 acres located within Los Angeles, San Bernardino and Ventura Counties. According to the Land Management Plan (LMP) for the Southern California National Forests, including the Angeles National Forest (ANF), national forests offer an escape from busy urban life by providing open space and a wide variety of recreation opportunities. They serve as an outdoor classroom, a 'living laboratory,' for learning about our natural and cultural heritage and the importance of conservation.

Land use zones set forth in the LMP were used to map the ANF for the purpose of identifying appropriate management types of 'uses' that help demonstrate the United States Forest Service's (USFS) intent regarding the anticipated level of public land use in all areas of the national forest. As identified in the 2014 Amendment to the LMP, the areas within the Arroyo Seco watershed within the ANF are identified as "Non-Forest System Land", "Developed Area Interface", "Back Country", "Back Country, Motorized Use Restricted" and "Back Country, Non-Motorized" (USFS 2005).

The Developed Area Interface zone includes a broad range of higher intensity uses, with a management intent to limit development to a slow increase of carefully designed facilities to help direct use into the most suitable areas and concentrating on improving existing facilities before developing new ones. The Back Country zone allows a broad range of uses, with a management intent to retain the natural character inherent in this zone and limit the amount and type of development. The Back Country, Motorized Use Restricted zone allows a range of low-intensity uses, with a management intent to retain the natural character of the zone and limit development to new road construction and maintenance and no increase or a very low level of increase in development. The Back Country, Non-Motorized zone allows for a range of non-motorized public uses, with a management intent to typically retain the undeveloped character and natural appearance of this zone and to limit the level of development. Facility construction except trails is generally not allowed, but may occur in remote locations where road access is not needed for maintenance (USFS 2005).

The proposed Project is not located within the boundaries of the ANF; however, Area 2 is located just south of the USFS boundary. Recreational users of the Gabrielino Trail/Access Road regularly enter into the ANF and are within the portion of the San Gabriel Mountains managed by the Los Angeles Gateway Ranger District, which is not located within the designated National Monument (USFS 2005).

Rim of the Valley Corridor

The National Parks Service (NPS) recommended to the United States Congress in 2016 that a 170,000-acre boundary adjustment be made to include the Rim of the Valley Corridor into the Santa Monica Mountains National Recreation Area (SMMNRA). The Rim of the Valley Corridor is the area generally including the mountains encircling the San Fernando, La Crescenta, Santa Clarita, Simi, and Conejo Valleys in southern California. The NPS stated in its "Rim of the Valley Corridor Special Resource Study" that the SMMNRA boundary adjustment would increase recreational opportunities to a range of southern California urban communities. Figure 4.7-1, Recreational Areas and Proposed Boundary of the Rim of the Valley Corridor, identifies the proposed Rim of the Valley Trail and its associated boundary adjustment area, as well as other lands designated for recreation within southwestern Los Angeles County (NPS 2015).

The proposed boundary adjustment would add portions of the Los Angeles River and Arroyo Seco corridors, the Verdugo Mountains-San Rafael Hills, the San Gabriel Mountains foothills, the Simi Hills, the Santa Susana Mountains, and the Conejo Mountain area to SMMNRA. Existing parks such as Griffith Park, Hansen Dam Recreation Area, Sepulveda Basin (recreation areas and wildlife reserve), Los Encinos State Historic Park, Debs Park, El Pueblo de Los Angeles Historical Monument, and Los Angeles State Historic Park would serve as major portals into the Rim of the Valley Corridor area. The boundary adjustment would include cultural resources related to space exploration (i.e., NASA Jet Propulsion Laboratory [JPL]) and the Cold War that are located in the Arroyo Seco corridor and Simi Hills (NPS 2015).

As shown on Figure 4.7-1, the proposed Rim of the Valley Trail alignment would utilize the existing Gabrielino Trail/Access Road in the Angeles National Forest, connecting to the Arroyo Seco Trail at the JPL Bridge, which continues southerly adjacent to the NASA JPL campus and Oak Grove Sports Fields on the east side of the Devil's Gate Reservoir within the Hahamongna Watershed Park. The proposed Rim of the Valley Trail alignment would continue to use existing trails in the Central Arroyo Seco adjacent to Brookside Golf Course and the Rose Bowl, through the Lower Arroyo Seco, and into the City of Los Angeles (NPS 2016).

Local Recreational Facilities

City of Pasadena Recreational Facilities

The Arroyo Seco is the City's largest natural open space and is described as a deeply cut canyon linking the San Gabriel Mountains to the Los Angeles River. The Arroyo extends eight miles in Pasadena and includes three distinct geographic areas which are also citywide parks – Hahamongna Watershed Park (HWP) in the Upper Arroyo Seco, the Central Arroyo Seco, and the Lower Arroyo Seco. All three parks have a system of trails that connect the three areas to each other and to the larger regional trail system for horses and hikers (City of Pasadena 2012). Bicycles are permitted on existing paved surfaces within the HWP, although they are not allowed on the trails in the Arroyo Seco to keep horses and bicycles separate (City of Pasadena 2003). In addition to the HWP, Central Arroyo Seco, and Lower Arroyo Seco, the City of Pasadena and the County of Los Angeles have numerous other recreational opportunities in the vicinity of the Project, as shown on Figure 4.7-2, Recreational Facilities in the Project Vicinity.

A listing of the recreational facilities owned and operated by the City of Pasadena are listed in Table 4.7-1.

Table 4.7-1. Pasadena Recreational Facilities

Parks/ Facilities	Address	Sports Field	Basket Ball Court	Tennis Court	Play-ground	Picnic	Other Facility	Parking	Rest-room
Allendale Park	1130 South Marengo Avenue, 91109	•			•	•	•	•	•
Brenner Park	235 Barthe Drive, 91103		•		•	•			•
Brookside Park	360 North Arroyo Boulevard, 91103	•		•	•	•	•		•
Central Park	275 South Raymond Avenue, 91105				•	•	•		
Central Park Center	37 E. Del Mar Blvd., 91105				•	•	•		•
Defenders Park	W Colorado Blvd & N Orange Grove Blvd 91103					•			
Eaton-Blanche Park	3100 East Del Mar Boulevard, 91107	•	•	•	•	•		•	•
Grant Park	232 S Michigan Ave, 91106	•	•	•	•	•			•
Gwinn Park	Orange Grove Blvd & N Sunnyslope Ave, 91107	•				•			
Hahamongna Watershed Park	Oak Grove Drive & Foothill Boulevard, La Cañada Flintridge, CA 91011	•				•		•	•
Hamilton Park	3680 Cartwright St., 91107	•	•	•	•	•		•	•
Jackie Robinson Community Center	1020 N Fair Oaks Ave, 91103						•	•	•

Table 4.7-1. Pasadena Recreational Facilities

Parks/ Facilities	Address	Sports Field	Basket Ball Court	Tennis Court	Play-ground	Picnic	Other Facility	Parking	Rest-room
Jefferson Park	1501 East Villa Street, 91103	•	•		•	•			•
La Casita Del Arroyo	177 S Arroyo Blvd, Pasadena, CA 91105						•	•	•
La Pintoresca Park	45 E Washington Blvd. Pasadena, CA 91103	•	•		•	•	•	•	•
La Pintoresca Teen Education Center	1415 N. Raymond Ave., 91103				•		•		•
Lower Arroyo Park Area	415 S Arroyo Blvd, 91105						•	•	
McDonald Park	1000 Mountain Avenue, 91104	•			•	•			•
Memorial Park	85 E Holly St, 91103				•	•	•		•
Robinson Park	1081 N Fair Oaks Ave, 91103	•	•		•		•	•	•
Robinson Park Recreation Center	1081 North Fair Oaks Avenue 91103	•	•		•		•	•	•
San Rafael Park	Melrose Ave. & Glen Sumer Road, 91105				•	•			
Singer Park	W. California Blvd. and St. John Ave. 91105				•	•			•
Sunnyslope Park	N Sunnyslope Ave & Paloma St., 91107				•	•			
Victory Park	2575 Paloma St., 91107	•			•	•	•	•	•

Table 4.7-1. Pasadena Recreational Facilities

Parks/ Facilities	Address	Sports Field	Basket Ball Court	Tennis Court	Play-ground	Picnic	Other Facility	Parking	Rest-room
Victory Park Recreation Center	2575 Paloma St., 91107						•	•	•
Villa-Parke	363 East Villa Street, 91101	•	•		•	•	•	•	•
Villa-Parke Community Center	363 East Villa Street, 91101		•		•		•	•	•
Viña Vieja Park	3026 E Orange Grove Blvd, 91107	•				•	•	•	•
Washington Middle School Gym	171 E. Howard St., 91104	•	•					•	•
Washington Park	700 E Washington Blvd., 91104	•	•	•	•	•	•	•	•
Wrigley Gardens	391 S Orange Grove Blvd, 91184						•		•

Source: City of Pasadena 2020a

Arroyo Seco Master Plans

The importance of the Arroyo Seco as a valued resource to the City as a whole, prompted the need for the Arroyo Seco Master Plans. The Arroyo Seco provides opportunities for recreation as well as a rich ecosystem of natural flora and fauna within the Pasadena city limits. The Plans address development of recreational, educational and interpretive opportunities and protection and restoration of the ecosystem, while recognizing the important existing water supply and flood control functions of the area. The four planning documents that make up the Arroyo Seco Master Plans are, Design Guidelines for the Arroyo Seco (2003); Hahamongna Watershed Park Master Plan (2003); Lower Arroyo Master Plan (2003); and Central Arroyo Master Plan (2005) (City of Pasadena 2012).

Hahamongna Watershed Park (HWP) represents the lower 320 acres of the total 1,330 acres of the Upper Arroyo Seco. Hahamongna contains 90 acres of dedicated parkland known as the Oak Grove Area. This citywide park is largely natural open space area that provides passive recreational uses that coexist with the flood management operations of the Los Angeles County Flood Control District. The City of Pasadena established Hahamongna Watershed Park in 1993. Recreational uses in the park include hiking, bicycling, horseback riding, picnicking, soccer, baseball, softball, and disc golf.

The HWP/Upper Arroyo Seco provides recreational opportunities for area residents and visitors. Area 3 of the Project site is located within HWP, which has numerous trails that provide opportunities for hiking and equestrian activity in the area, including the Gabrielino Trail that provides access up the Arroyo Seco Canyon and into the ANF. Additionally, the Arroyo Seco Trail runs along both sides of the Arroyo Seco and is part of the Rim of the Valley Trail Corridor that connects the Santa Monica Mountains and the San Gabriel Mountains through trails in the San Fernando and La Crescenta Valleys (see Figure 4.7-1). This trail also continues south along the Central and Lower Arroyo Seco to connect with the Los Angeles River Trail. North of Devil's Gate Dam, there are several local trails on both sides of the Arroyo Seco, including the East Rim Trail, the West Rim Trail, the Mountain View Trail, the Flint Wash Trail, the Gould Canyon Trail, the Altadena Crest Trail, and the Gabrielino Trail.

The Central Arroyo Seco contains a total of 254 acres of parkland and open space. The developed public parkland in the Central Arroyo, Brookside Park and Area H, is 81 acres in size. The Central Arroyo Seco is the most developed of the three sections of the Arroyo. Both the Rose Bowl Stadium and Brookside Park are in the Central Arroyo. The Rose Bowl loop provides a 3-mile circuit around the periphery of the stadium and the golf courses and provides the most active outdoor gym in the city. The Central Arroyo is a popular location for large-scale events, primarily due to abundant parking and its proximity to the Rose Bowl.

The Lower Arroyo Seco contains a total of 150 acres of parkland and open space. The 51-acre developed parkland in the Lower Arroyo includes the casting pond, archery range, and the low-flow project area. The Pasadena Municipal Code designates it a Natural Preservation Area as indicated by its largely open space character (PMC 3.32.100). Prominent vistas of cultural landmarks such as the historic Colorado Street Bridge and the ribbon of historic arroyo stonewalls give this portion of the Arroyo Seco its distinction and contribute to the individual's recreational experience.

Trails

There are numerous recreational trails located in the Project area that provide recreational opportunities for pedestrians and equestrians. These trails are described below.

Gabrielino Trail/Access Road. The Gabrielino Trail is a regional trail that begins at the intersection of Windsor Avenue and Ventura Street. The trail lies along the east boundary of HWP north of Ventura Street. The Gabrielino Trail also functions as the vehicular access road that runs along the eastern boundary of Area 3 of the proposed Project and continues northward through Area 2 and into the ANF.

West Rim Trail. The West Rim Trail runs at the upper western edge of the Hahamongna Watershed (Oak Grove) Park, the West Rim Trail leads north from the Flint Wash trailhead connection to the Equestrian Staging Area and the upper terrace picnic area. The trail is currently restricted to equestrian and hiking use only. The northernmost portion of the trail is located within Area 3 of the proposed Project.

East Rim Trail. The East Rim Trail runs at the upper eastern edge of the HWP and connects with the West Rim Trail and provides a circular loop of connectivity from Oak Grove Park to the eastern side of the spreading basins, continuing southward on the east side of the Devil's Gate Reservoir. This trail follows the alignment of the Explorer Road, which traverses adjacent to the eastern edge of Area 3

Arroyo Seco (Rim of the Valley) Trail. The Arroyo Seco Trail, which is a portion of the Rim of the Valley Trail, links all three sections of the Arroyo Seco together. The Arroyo Seco Trail runs lower and below the East Rim and West Rim trails.

Altadena Crest Trail. The Altadena Crest Trail is located in the northern part of HWP and provides access to the Gabrielino Trail from the community of Altadena. This trail is currently restricted to equestrian and hiking use only.

Flint Wash Trail. The Flint Wash Trail is a County-maintained trail that begins at the southwest corner of HWP at the confluence of Flint Wash and Devil's Gate Reservoir. This Trail is located approximately 1-mile southwest of Area 3 of the Project site.

Gould Canyon Trail. The Gould Canyon trailhead is located just west of HWP and connects to the La Cañada Flintridge trail system. This trail is located approximately 0.57-mile southwest of Area 3 of the Project site.

Maintenance Roads/Unnamed Trails. In addition to designated trails, there is a network of informal trails (i.e., City-owned maintenance roads and LACFCD/Southern California Edison [SCE] easements) that are interconnected within the City's spreading basins that allow for connection between the Hahamongna Watershed (Oak Grove) Park and West Rim Trail on the west of Devil's Gate Reservoir to the East Rim Trail, Gabrielino Trail on the east of Devil's Gate Reservoir, and the Arroyo Seco Trail. These maintenance roads are often used as unofficial trails when reservoir water levels within the Devil's Gate Reservoir and conditions permit (County of Los Angeles 2013).

4.7.3 Relevant Plans, Policies, and Ordinances

Federal

There are no applicable federal regulations related to recreation.

State/Regional

There are no applicable state regulations related to recreation.

Local

City of Pasadena General Plan

The Project site has a General Plan Land Use designation of Open Space. "Open Space" is defined as, "…a variety of active and passive public recreational facilities and for City-owned open space facilities. This includes natural open spaces and areas which have been designated as environmentally and ecologically significant. This category also applies to land which is publicly owned, though in some instances public access may be restricted. Most importantly, this designation only applies to lands owned by the City" (City of Pasadena 2015).

The City of Pasadena's General Plan includes eight guiding principles that cumulatively represent the community's vision for the future. The guiding principles were developed through an extensive program of community outreach and input conducted over a six-year period. The guiding principles include, Land Use; Mobility; Housing; Green Space, Recreation and Parks; Open space and Conservation; Noise; Safety; and

Updates to the General Plan. The Green Space, Recreation and Parks; and Open space and Conservation Elements include goals, objectives and policies related to recreation, which pertain to the proposed Project. Applicable General Plan goals, objectives and policies are outlined below.

The Green Space, Recreation and Parks Element and Master Plan

The Green Space, Recreation and Parks Element and Master Plan of the City's General Plan (adopted November 2007) serves as a framework of the community's goals and objectives for open space, parks, and recreation facilities and programs. The Element and Master Plan work together to identify existing facilities and programs, assess how they are used, identify where additional park facilities or recreation programs are needed, and recommend how to best meet these needs (City of Pasadena 2015). The following objectives and policies are applicable to recreational facilities as they relate to the proposed Project (City of Pasadena 2007):

> Objective 1 – *Stewardship of the natural environment*: encourage and promote the stewardship of Pasadena's natural environment, including water conservation, clean air, natural open space protection, and recycling.
>
> > *Policy 1.2 – Protect Open Spaces:* Protect natural open areas, watersheds, and environmentally sensitive areas such as Hahamongna, Eaton Canyon, riparian areas, and other open spaces.
>
> Objective 2 – *Preservation and protection of the Arroyo Seco and adjacent open space areas*: recognize the importance to Pasadena of the history, cultural resources, and unique character of the Arroyo Seco, and conserve and enhance these assets.
>
> > *Policy 2.3 – Balance recreation with environmental protection*: Implement the Arroyo Seco Master Plans by balancing recreational opportunities with protection and restoration of the ecosystem, while recognizing the important existing water resources and flood management functions of the area.
> >
> > *Policy 2.4 – Promote multi-faceted use of the Arroyo*: Through implementation of the Arroyo Seco Master Plans, continue to maintain and enhance the area as a prime resource for quality of life of Pasadena residents.
>
> Objective 7 – Provide access to Parks: New projects should be planned so that neighborhood recreational needs of its future citizens are largely met on site or nearby and so that future facilities are integrated with, provide support for, and enhance the effectiveness of the overall recreation system in Pasadena. Growth and expansion in a particular area should be accompanied by commensurate growth and expansion in recreation facility, programming capacity, and natural open space capacity.
>
> > *Policy 7.2 – Access to open spaces within projects:* Projects should be connected to the public realm through vistas, physical access, and/or sightlines. Provide an adequate total quantity and equitable distribution of public or publicly accessible open spaces throughout the City.

Objective 17 – Facilitate ongoing community dialogue to ensure that residents' open space, parkland, and recreation needs are met.

Policy 17.1 - Community Input and Feedback: Provide methods for community members to offer ongoing information on their experiences with recreation and parks management, programs, and facilities. Surveys, questionnaires, website forms, and targeted outreach methods will provide feedback on areas in need of improvement and areas where goals are being met.

Open Space and Conservation Element

The Open Space and Conservation Element of the General Plan was adopted by the City Council on January 23, 2012. The Open Space and Conservation Element provides a blueprint for natural open space and conservation. Together with the Green Space, recreation and Park Element and Master Plan, the Open Space and Conservation Element serves as a framework of goals and policies to assure efficient stewardship of the City's green spaces, recreation facilities, and natural resources (City of Pasadena 2015). The following goals and objectives are applicable to recreational facilities as they relate to the proposed Project (City of Pasadena 2012):

Open Space Goal – Preserve, Acquire and Create Open Space

Objective: Preserve currently zoned open spaces, natural open spaces, hillsides, viewsheds, watersheds and recreational areas.

Open Space Goal – Develop Access & Connectivity for Wildlife and People

Objective: Ensure that all Pasadena residents have access to information about where open spaces are located and the transportation opportunities and options for getting to them.

Open Space Goal – Preserve, Restore and Maintain the Eaton Canyon Corridor and the Arroyo Seco

Objective: Preserve, restore and maintain the natural character of the Eaton Canyon Corridor and the Arroyo Seco as self-sustaining healthy ecosystems of plants and animals. Their natural character will continue to inspire people, as it has throughout time.

Objective: Promote responsible human interfaces with these unique natural environments in open space planning.

Open Space Goal – Welcome and Value the Importance of Citizen Participation

Objective: Citizen participation shall play a major role in all phases of open space planning.

Objective: The City shall provide the public with timely information regarding open space planning and decision making.

City of Pasadena Zoning Code

The proposed Project site is zoned as Open Space (OS). Zones are designated to implement the General Plan be ensuring those who live and work in the City that the stability and character of the community will be

preserved. As described in Section 17.26.020(A) of the City's Zoning Code, "The OS district is applied to sites with open space, parks, and recreational facilities of a landscaped, open character having a minimum contiguous site area of two acres. The OS zoning district is consistent with and implements the Open Space land use designation of the General Plan." Section 17.26.030 of the Code specifies that public safety facilities uses meet the intent of the OS zone and are conditionally allowed uses in the OS zone.

Arroyo Seco Master Plans

The Arroyo Seco Master Plans are a set of documents defining the community vision for the Arroyo Seco Natural Park. The set is comprised of the HWPMP; the Central Arroyo Master Plan, the Lower Arroyo Master Plan; the Rose Bowl Use Plan; and the Arroyo Seco Design Guidelines (City of Pasadena 2020b). The Arroyo Seco Master Plans were developed by the combined efforts of the Planning and Development Department and the Department of Public Works. The implementing department for the completed Arroyo Seco Master Plans is the Department of Public Works. Area 3 of the proposed Project is located within the HWPMP area; this Master Plan is described below.

Hahamongna Watershed Park Master Plan

The HWPMP illustrates a vision for the 300-acres of open space that extends from Devil's Gate Dam north and into the Arroyo Seco Canyon, on the northwestern edge of the City. The HWPMP was adopted to establish a visionary framework for recreation, water resources, flood management, habitat restoration and cultural resources in this area. Additionally, the HWPMP has been completed in response to the policies and principles set forth in the City's General Plan. The Final HWPMP includes the following goals and objectives related to recreation and the proposed Project (City of Pasadena 2003):

Goal 3: Provide diverse recreation opportunities for the Pasadena community

Objectives:

- Balance the recreation needs for active, passive, and educational activities in HWP
- Develop a grading plan that allows habitat restoration and recreational activities to co-exist with flood management and water conservation.
- Maintain the historic recreational uses within HWP.

Goal 5: Enrich and promote the unique history and culture of Hahamongna Watershed Park

Objectives:

- Develop design guidelines to ensure aesthetic compatibility and quality construction for any improvements made with Hahamongna Watershed Park.

Goal 6: Provide a safe and secure park

Objectives:

- Develop guidelines and delegate agency responsibility for recreation, flood management, and water conservation liabilities.

4.7.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to recreation are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to recreation would occur if the Project would:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

b) Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment.

Through the analysis in the Initial Study (see Appendix A-1), it was determined that the proposed Project would not include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment. (i.e., Threshold b). Accordingly, this issue is not further analyzed in the EIR. Based on the remaining thresholds, a significant impact related to recreation would occur if the Project would:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

4.7.5 Environmental Impacts Analysis

Threshold 4.7a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Short-Term Construction Impacts

The proposed Project consists of two primary areas, as shown in Section 2, Figure 2-1, Local Vicinity and Regional Location. The two primary Project areas include Area 2, Diversion and Intake Replacement, and Area 3, Spreading Basin Improvements. These areas are connected by the North Arroyo Boulevard (i.e., Gabrielino Trail/Access Road), which serves as a public recreational trail and the access road for City of Pasadena and U.S. Forest Service (USFS) vehicles heading into the Arroyo Seco Canyon. The proposed Project involves construction activity and facility improvements in Areas 2 and 3, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. During the Project's construction activities, North Arroyo Boulevard (Gabrielino Trail/Access Road) would be made available for construction-related vehicles. North Arroyo Boulevard would provide vehicular access to the Behner Water Treatment Plant (WTP), the northernmost portion of Area 3 near the JPL Bridge, and northward along the Gabrielino Trail/Access Road to Area 2. Construction of the Project would result in temporary restricted access to portions of designated trails that could result in indirect and temporary impacts to existing recreation uses and could increase the use of other recreational facilities in the Project area.

Figure 4.7-3, Project Impacts to Designated Trails, shows the areas that may be subject to temporary trail closures due to Project construction activities, as well as areas of permanent trail realignment. During construction of the proposed Project, there may be times when portions of the Altadena Crest Trail, Gabrielino

Trail/Access Road, Arroyo Seco Trail, and the unnamed trails/maintenance roads would be partially or fully closed to the public due to construction activities.

- North Arroyo Boulevard, which is a gated maintenance road that leads from the intersection of Ventura Street and Windsor Road northward to the JPL Bridge, would be a primary corridor for construction truck traveling to and from Area 2, and may also be used for activities within Area 3. Portions of this roadway may be closed during construction to minimize the proximity of construction trucks and equipment movement with recreational users.
- The Gabrielino Trail/Access Road, which is the northward the extension of North Arroyo Boulevard, would be a primary corridor for construction equipment and haul trucks to access Area 2. Portions of this access road may be closed during construction to minimize the proximity of construction trucks and equipment movement with recreational users, as well as during construction on the roadway associated with Arroyo Seco Canyon Project (ASCP) improvements, as described further in Section 4.7.6 below.
- The Arroyo Seco Trail and unnamed trails located adjacent to the existing spreading basins would be temporarily closed during construction of the new basin configuration and would also permanently realigned around the perimeter of the new basins and along the realignment of Explorer Road, as discussed further below. The portions of the unnamed trails within the construction footprint in Area 3 would be fully closed during short-term construction activities, and would not reopen until the completion of construction in Area 3, as described further below under "Long-Term Operational Impacts".

While the trails would be kept open during construction to the extent possible, there would be days when construction equipment and haul trucks would be on and/or near the trails. Use of these trails may be less desirable due to temporary construction-related emissions, noise, dust, and traffic impacts. These temporary, indirect impacts could reduce the quality of the recreational experience for some visitors. However, numerous recreational facilities, including Hahamongna Watershed Park facilities, the Oak Grove Disc Golf Course, Loma Alta County Park, the Flint Wash Trail, Gould Canyon Trail, Arroyo Seco Trail/West Rim Trail, and Arroyo Seco Trail/East Rim Trail are in the vicinity of the proposed Project and would be available for use during the entirety of Project construction. Additionally, some portions of the Mountain View Trail, Altadena Crest Trail, and Gabrielino Trail/Access Road would remain open to the public during construction. Beyond the recreational uses in the immediate Project area, numerous recreational opportunities exist within Pasadena as well as surrounding jurisdictions, as illustrated in Figures 4.7-1 and 4.7-2 and as listed in Table 4.7-1.

Recreational users may choose to visit these other area parks, recreational facilities, or trails due to the temporary access restrictions or the indirect effects of construction-related activities. Due to the number of other recreational facilities and trails in the vicinity, it is anticipated that these visitors would be dispersed throughout the area and that no single park or facility would experience a substantial increase in use. Additionally, Project-related construction activity is anticipated to occur in Area 2 beginning in August 2021 and would last approximately 3 months, ending in October 2021. Construction in Area 3 would begin in March 2022 and would last approximately 9 months. This short duration of construction activity would not result in substantial disruption to recreational activities in the Project area. During this time, recreational access to the Arroyo Seco Trail/East Rim and Arroyo Seco Trail/West Rim, as well as the majority of the unnamed trails along the existing spreading basins, would remain open and would continue to provide connectivity around the Devil's Gate Reservoir.

Although Project construction would result in temporary restricted access to portions of existing recreational trails, the Project would not substantially increase use of other existing parks or recreation facilities such that substantial physical deterioration of these facilities will occur or be accelerated. Impacts to existing trails as a result of Project construction would be temporary, and upon completion of construction activities, all temporary fencing, flagging, signage, soil stockpiles, and/or mobile and stationary construction equipment would be removed from Areas 2 and 3. Although substantial impacts to recreational facilities are not anticipated; implementation of MM-REC-1 would ensure adequate notification to the public of trail closures due to short-term Project construction impacts. Therefore, impacts would be less than significant with mitigation incorporated.

Long-Term Operational Impacts

As described above, the proposed Project would not result in the construction of new residences or indirectly facilitate the development of residences that could result in an increase in area population. Therefore, operation of the Project would not result in an increase in the long-term use, or the physical deterioration, associated with the increased use of neighborhood or regional parks or other recreational facilities. However, due to the proposed Project, the currently unnamed trail system that traverses through the spreading basins would be permanently altered. As shown in Figure 4.7-4, the proposed Project would restore connections with the alignments of the temporarily impacted trail system in Area 3. The proposed Project would restore the local trails in a manner consistent with the adopted Hahamongna Watershed Park Master Plan (see Exhibit 2-12 "Hiking & Equestrian Trails"; page 2-53), and no long-term loss of trails or connectivity would occur. Therefore, the proposed Project is consistent with the Goals and Objectives of applicable planning documents, as outlined in Section 4.7.3 (City of Pasadena 2003).

As described in Section 2.2, Project Background, of this Draft EIR, elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP and complied with the California Environmental Quality Act (CEQA). As such, CUP No. 6222 and its related findings and conditions of approval, and the ASCP IS/MND remains intact for these components and is allowed to move forward without any additional environmental review pursuant to CEQA. Regarding Area 3, the components related to the parking lot and the access road are allowed to proceed without additional CEQA review. The alignment of the Arroyo Seco Trail, as identified on Figure 4.7-4, would be constructed at the time of the realignment of the Explorer Road, which has been previously approved through the ASCP IS/MND. The reconnection of the Altadena Crest Trail, as identified on Figure 4.7-4, would be configured at the same time as the construction of the proposed spreading basins within Area 3. Upon completion of the spreading basins, the trail connection would be restored between Area 3 and the existing trails to the south and across Devil's Gate Reservoir on the west.

Impacts to recreational uses are not anticipated during the ongoing maintenance of the diversion and intake structures in Area 2 or the cleaning of the spreading basins in Area 3. Maintenance will be confined to areas that have previously been associated with ASCP facilities and would not permanently alter any existing trails or access roads. Once construction activities are complete, all temporary restricted access to the trails within Area 3 as a result of Project construction would be lifted, and all realigned trails would be operational. There would be no long-term impacts to recreational facilities as a result of the proposed Project, and therefore, no mitigation is required.

4.7.6 Cumulative Impacts

Cumulative projects outlined in Section 3, Project Description of this Draft EIR would not result in the construction of new residences or facilitate the development of residences and, therefore, would not result in increased population or the associated increased demand for neighborhood or regional parks or other recreational facilities. However, the construction of some cumulative projects would likely be concurrent with the proposed Project, or be initiated upon Project completion, which could result in cumulative impacts to recreational facilities in the area.

Construction activities associated with the Devil's Gate Reservoir Sediment Removal project are ongoing, with completion scheduled for Fall 2023. Figure 4.7-5, Cumulative Impacts to Designated Trails, includes the areas of temporary trail closures for both the proposed Project and for the Devil's Gate Reservoir Sediment Removal project. Throughout sediment removal activities, portions of the Arroyo Seco Trail/East Rim, Arroyo Seco Trail/West Rim, and unnamed trails will be closed when sediment removal activities are under way and/or are near the trail. Flint Wash Trail, Gabrielino Trail, and Gould Canyon Trail remain open for use during sediment removal of this cumulative project. Additionally, the Oak Grove area of Hahamongna Watershed Park and the associated facilities including Oak Grove Disk Golf Course remain open during construction of the Devil's Gate Reservoir Sediment Removal Project and continue to provide active recreational facilities to the area (County of Los Angeles 2013). The Devil's Gate Reservoir Sediment Removal project is expected to overlap with construction of the proposed Project; and therefore, either concurrent or extended temporary closure of portions of the trails in the vicinity of Area 3 is anticipated, as identified in Figure 4.7-5. Although temporary closure to portions of trails in the area would result from concurrent construction of the proposed Project and the Devil's Gate Reservoir Sediment Removal project, the majority of the Arroyo Seco Trail/East Rim, Arroyo Seco Trail/West Rim, Mountain View Trail, Flint Wash Trail, Gould Canyon Trail, and several unnamed trails, as well as Oak Grove Area recreational facilities would remain open for use.

Projects under the cumulative Oak Grove Area Improvements project include improvements in the area of the existing Oak Grove field, and may include a new restroom, improvements to vehicular and pedestrian circulation/trails, rehabilitation of a drain, assessment of the disc golf course layout and improvements to the outdoor amphitheater. Other future improvements may include Trail Development, Berkshire Creek Area Improvements, Habitat Restoration, and Oak Grove Disc Golf Course Improvements. These planned improvements would enhance the existing recreational facilities within the Oak Grove Area, including trails. Construction of these CIP projects could occur as funding is available, as early as 2021, potentially concurrent with proposed Project construction activities. However, it is not expected that all CIP projects under the Oak Grove Area Improvements project would occur at any one time, thus not restricting access to all recreational facilities within the Oak Grove Area at once.

Construction of the LACFCD Pump back/Intake at Devil's Gate cumulative project is expected to start after completion of the proposed Project, and the Explorer Groundwater Well cumulative project could potentially be concurrent with the proposed Project, starting in 2022. However, both of these cumulative projects are not expected to result in significant impacts to recreational uses due to location and nature of the projects.

ASCP Area 1 construction, while relatively near Area 2, is anticipated to begin after 2023; and thus, after the completion of the proposed Project. Construction of Area 1 would likely result in the temporary closure of the Gabrielino Trail/Access Road, similar to the proposed Project, but would not result in impacts to Oak Grove Area recreational facilities, nor the Altadena Crest Trail, Arroyo Seco Trail, Flint Wash Trail, or Gould Canyon Trail. Additionally, the proposed Project's construction would be completed by this time, and trails within Area 3 would be open and operational.

Although construction of cumulative projects, in addition to the proposed Project, could temporarily limit access or result in construction-related emissions, noise, dust, visual, and traffic impacts; recreational users may choose to visit other parks, trails or recreation facilities in the area that would remain accessible during construction of cumulative projects. It is anticipated that visitors would disperse throughout the area during construction of cumulative projects, and that there would not be a substantial increase in use of any one park or facility. In addition to the trails and recreational facilities in the immediate Project area, parks including Charles White Park, Loma Alta County Park, Angeles National Forest, Olberz Park, and Memorial Park, among others, as illustrated in Figures 4.7-1 and 4.7-2 and as listed in Table 4.7-1, would be accessible during Project construction and construction of cumulative projects. Additionally, implementation of mitigation measure MM-REC-1 outlined below, would ensure that use of existing neighborhood and regional parks or other recreational facilities would not be increased in such a manner that substantial physical deterioration of the facility would occur or be accelerated. Therefore, as impacts to recreational uses as a result of the Project and cumulative project construction would be temporary, and surrounding recreational opportunities would remain accessible, and impacts would be less than cumulatively considerable.

4.7.7 Mitigation Measures

MM-REC-1 Prior to the closure of recreational trails for public use, the City of Pasadena shall post signs providing at least one week of advanced notice of the dates and times of planned trail closures at the following locations:

- Intersection of Ventura Street and Windsor Avenue
- Sunset Overlook
- Altadena Crest Trail (adjacent to the North Arroyo Boulevard)
- Arroyo Seco Trail
- West Rim Trail/East Rim Trail

In addition to the closure notice signage, the City shall provide the locations of nearby trails and recreational facilities in the surrounding area that would be open for public use at the times when the trails are closed. This information shall also be posted on the City's Parks, Recreation and Community Services website.

4.7.8 Level of Significance After Mitigation

With implementation of MM-REC-1, impacts to recreational facilities as a result of Project construction would be reduced to less than significant.

4.7.9 References

City of Pasadena. 2003. *Hahamongna Watershed Park Master Plan*. Adopted September 29, 2003. Accessed February 21, 2020. https://www.cityofpasadena.net/wp-content/uploads/sites/29/Hahamongna-Watershed-Park-Master-Plan.pdf.

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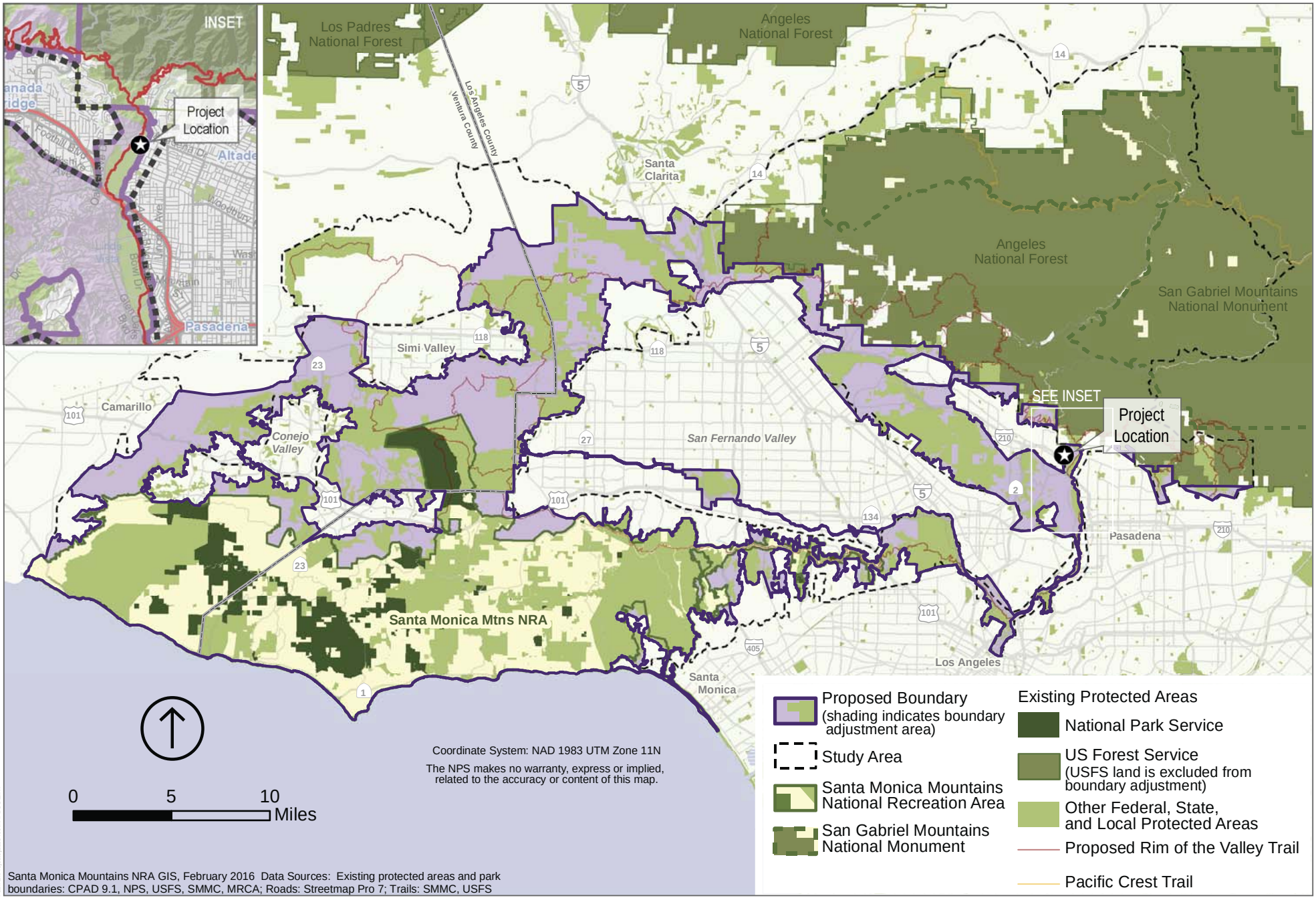
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SOURCE: National Park Service

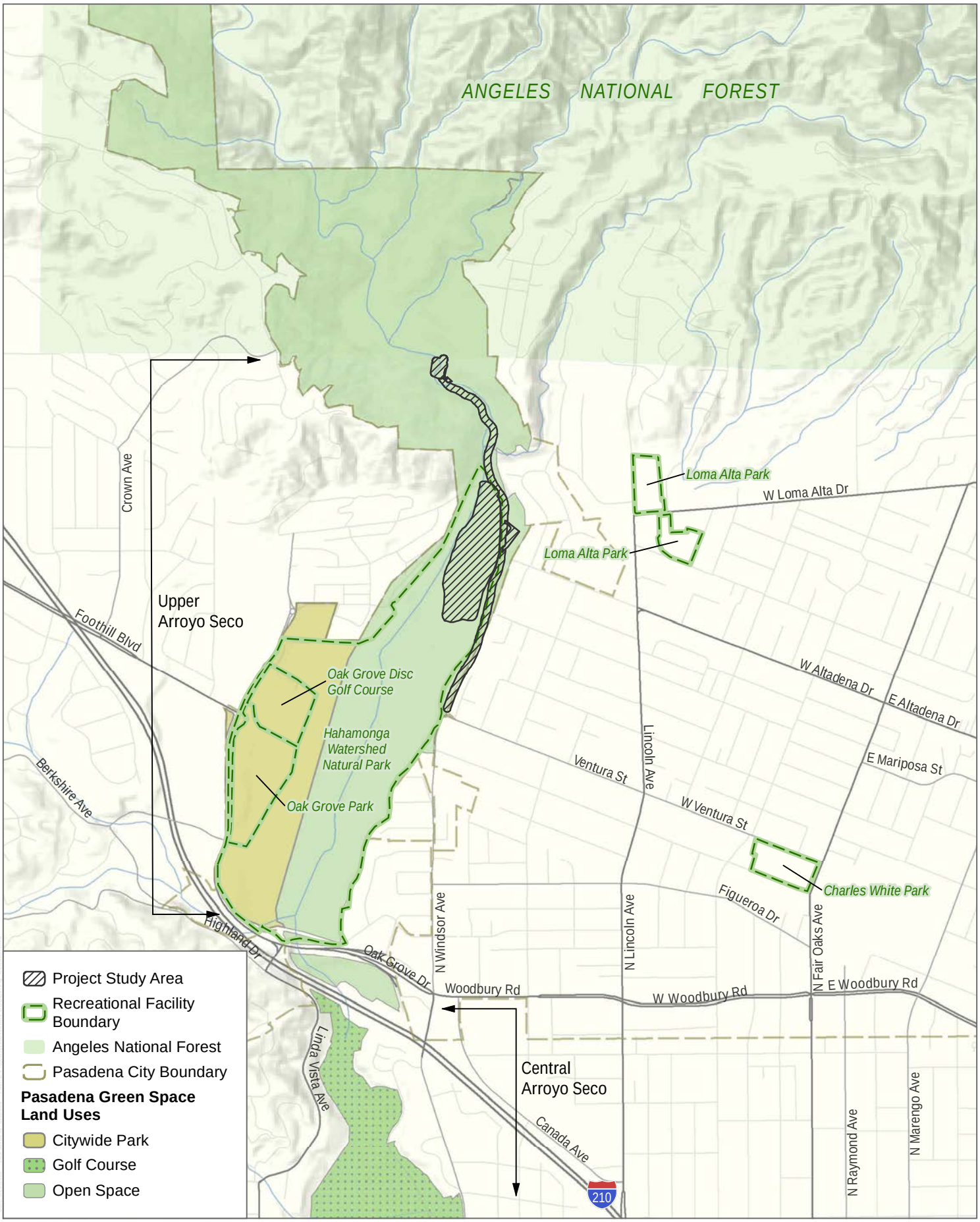
FIGURE 4.7-1

Recreational Areas and Proposed Boundary of the Rim of the Valley Corridor

Arroyo Seco Canyon Project Areas 2 and 3

DUDEK

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SOURCE: Esri, Open Street Map

FIGURE 4.7-2

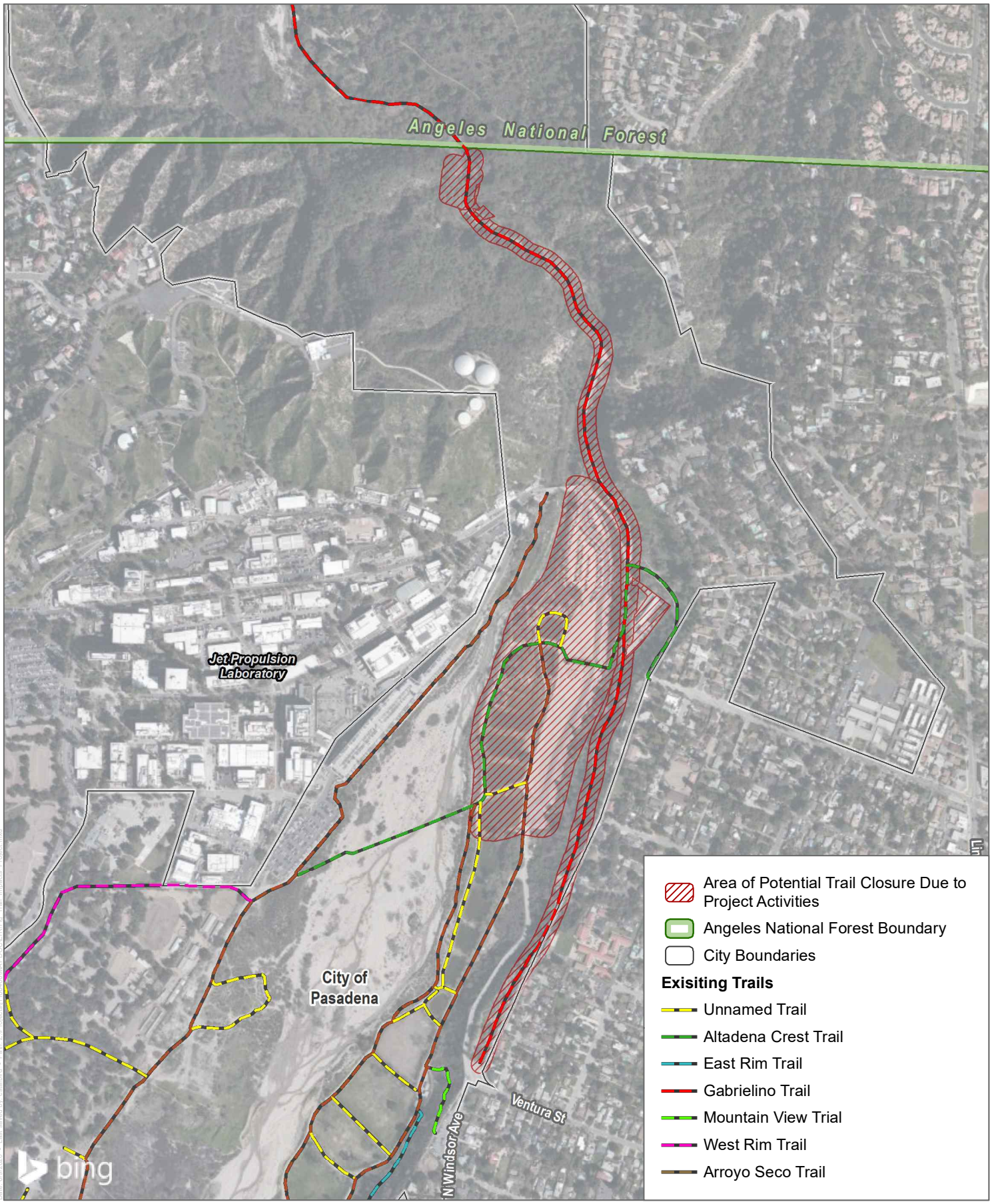
Recreational Facilities in the Project Vicinity

Arroyo Seco Canyon Project Areas 2 and 3

DUDEK

0 1,100 2,200 Feet

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SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 340 680 Feet

FIGURE 4.7-3

Project Impacts to Designated Trails

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

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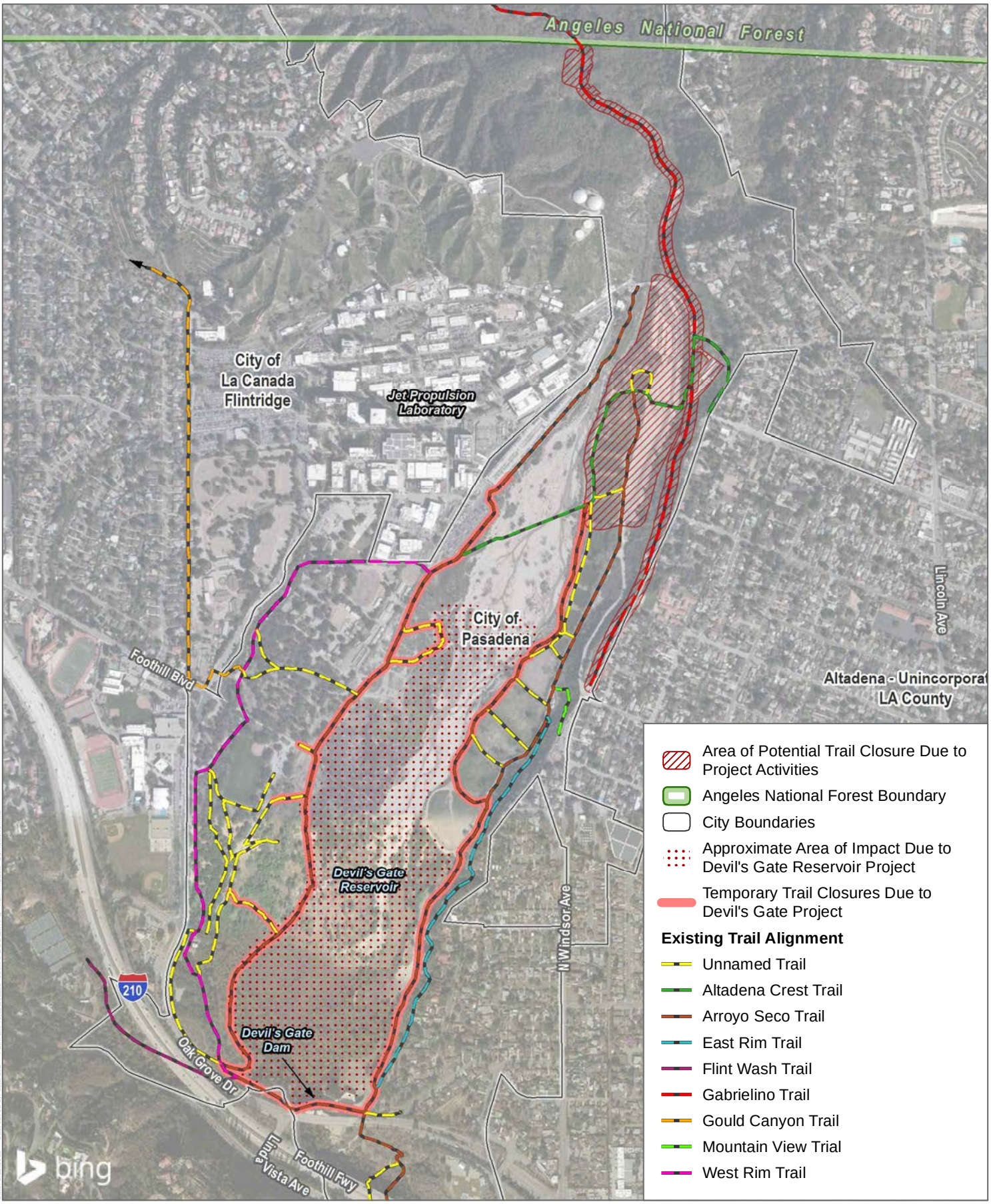
0 115 230 Feet

FIGURE 4.7-4

Post-Project Recreational Trails

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 487.5 975 Feet

FIGURE 4.7-5

Cumulative Impacts to Designated Trails

Arroyo Seco Canyon Project Areas 2 and 3

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4.8 Transportation

4.8.1 Methodology

This section describes the existing conditions of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project/proposed Project) site and vicinity, identifies associated regulatory requirements, evaluates potential environmental impacts, and identifies mitigation measures related to implementation of the proposed Project. The analysis of Project impacts related to transportation is based on a review of existing resources and applicable laws, regulations, and guidelines.

Comments received in response to the Notice of Preparation (NOP) for this Draft EIR included a comment from the California Department of Transportation (Caltrans) regarding their request to provide additional transportation impact analysis such as queuing analysis (to identify potential for traffic conflicts) at ramp locations where the Project-related construction activities would occur in combination with the ongoing sediment removal activities associated with the Devil's Gate Reservoir Project. A queuing analysis for the proposed Project's peak construction traffic along with construction traffic from other cumulative projects in the area, primarily Devil's Gate Reservoir Project was conducted. The queuing analysis is summarized in the Cumulative Impacts section and the traffic data and analysis worksheet are provided as follows:

Appendix H Transportation Technical Data and Analysis Worksheets, Dudek May 2020

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

4.8.2 Existing Conditions

Regional Access

Interstate-210 or Foothill Freeway

Interstate (I) 210 provides regional access to the proposed Project site. The Foothill Freeway starts at the Interstate (I) -5 in the northern portion of the San Fernando Valley and generally runs in a southeasterly and easterly direction near the southern base of the San Gabriel and San Bernardino Mountains to the I-10 in Redlands. The I-210 has eight travel lanes as it passes along the southern edge of Devil's Gate Dam and provides access to the Project site via its interchange with Arroyo Boulevard/Windsor Avenue. Per Caltrans estimates, the 2018 traffic volumes on the I-210 between the Berkshire Place and Arroyo Boulevard/Windsor Avenue exits during the AM peak hour included 13,300 vehicles, with a peak month volume of 128,000 vehicles per day and an annual average daily traffic volume of 125,000 vehicles per day.

Interstate (I)-605

I-605 provides regional access to the landfill site for the proposed Project. The freeway runs generally in a north-south direction and extends from I-210 in the north to I-405 to the south. It provides eight travel lanes, with four lanes in each direction and provides access to the landfill site via its interchange with Rivergrade

Road/Los Angeles Street. Per Caltrans estimates, the 2018 traffic volumes on the I-605 near Lower Azusa Road/Los Angeles Street exits during the AM peak hour included 13,800 vehicles, with a peak month volume of 194,000 vehicles per day and an annual average daily traffic volume of 190,000 vehicles per day.

Local Access

Los Angeles Street

Los Angeles Street provides local access to the landfill site (Vulcan Materials Company, Durbin Inert Debris Engineered Fill Site). Los Angeles Street is a four-lane roadway with a two-way-left-turn lane. The roadway generally is built with sidewalks on either side. The posted speed limit on Los Angeles Street is 45 miles per hour. The access to the landfill site is located on Los Angeles Street via an approximately 140 foot right turn lane, approximately 850 feet east of the I-605/Los Angeles Street northbound off ramp.

Windsor Avenue

Windsor Avenue provides local access to Arroyo Seco Canyon and the proposed Project site from the I-210 on- and off-ramps. Windsor Avenue is generally a north-south roadway between I-210 northbound ramps and its intersection with Ventura Street and Explorer Road. Windsor Avenue is functionally classified as Connector-Neighborhood in the City of Pasadena's Street Plan (City of Pasadena 2015a) and serves as a Collector street that is generally a two-lane roadway with intermittent two-way-left turn lane along this stretch that terminates at the Ventura Street/Explorer Road intersection. The average daily traffic (ADT) volumes on North Windsor Avenue near the Project site just south of Ventura Street was approximately 8,409 vehicles in the year 2017 on a weekday (County of Los Angeles 2020).

Oak Grove Drive

Oak Grove Drive is a four-lane road from west of Windsor Avenue to just north of the I-210 and passing along Devil's Gate Dam and the southwest edge of the reservoir, to Foothill Boulevard before turning north toward the JPL campus. Oak Grove Drive is functionally classified as Connector-City in the City of Pasadena's Street Plan (City of Pasadena 2015a).

Explorer Road

Explorer Road is two-lane roadway that leads to the JPL entrance from the Windsor Avenue/Ventura Street intersection and turns west across the Arroyo Seco (onto the JPL Bridge) and southwesterly onto the JPL campus. Explorer Road would provide access to construction activities in the Area 3.

North Arroyo Boulevard (Gabrielino Trail/Access Road)

North Arroyo Boulevard is a paved road that runs on top of the slope east of the former JPL Parking Lot and goes into the Arroyo Seco Canyon, crossing the Arroyo Seco at several locations as it heads into the Angeles National Forest (ANF). This trail is used by hikers, bicyclists, and equestrians going into Arroyo Seco Canyon; it is also used by City, County, and U. S. Forest Service (USFS) inspection and maintenance vehicles. This trail would be used for construction activities in the northernmost portion of Area 3 near the JPL Bridge and also Area 2.

Some of the existing vehicle trips on Windsor Avenue and Explorer Road in Area 3 are associated with recreational users of the Gabrielino Trail/Access Road, although most use is attributed to NASA JPL employees that formerly utilized the JPL East Parking Lot. After NASA's completion of a new parking structure on the JPL campus in 2016, they vacated the former parking lot (which was previously leased by the City to JPL), and removed the paving for the specific purpose of accommodating PWP's planned expansion of the spreading basins. The former JPL Parking Lot is currently unpaved, with the exception of the temporary alignment of Explorer Road. In addition, there are paved and unpaved access roads that are also used by recreational visitors and maintenance workers to access the spreading basins, reservoir, and dam.

Transit Services

The Los Angeles County Metropolitan Transportation Authority (Metro) provides regional bus and passenger train services in the County. Metro Bus routes 177 and 268 run along Oak Grove Avenue and into the JPL campus, south and west of Area 3. The Glendale Beeline Route 3 also runs from Downtown Glendale to JPL (Metro 2010). The Pasadena Transit provides local bus services within the City. Route 52 goes into the JPL campus four times daily on weekdays from Glenarm Street and Raymond Avenue intersection and terminates at Art Center N. Campus (City of Pasadena 2020).

4.8.3 Relevant Plans, Policies, and Ordinances

Federal

There is no applicable federal policy or program related to transportation for the proposed Project.

State/Regional

Senate Bill (SB) 743

A change to transportation analysis in CEQA environmental review occurred when Governor Jerry Brown signed Senate Bill (SB) 743 on September 27, 2013 into a law that required an update in the metric of transportation impact from Level of Service (LOS) and automobile delay to one that promotes the reduction of GHG emissions, the development of multimodal transportation networks, and a diversity of land uses for transit priority areas. On November 3, 2014, the City of Pasadena City Council adopted a resolution to replace the City's transportation performance measures with five new Transportation Performance Measures and new thresholds of significance to determine transportation and traffic impacts under CEQA. The new performance measures and CEQA thresholds are consistent with the City's adopted General Plan and Senate Bill (SB) 743 and include VMT per capita, vehicle trips (VT) per capita, proximity and quality of bicycle network, proximity and quality of transit network, and pedestrian accessibility. The new measures support the City's vision of creating a community where people can circulate without cars, which relies upon an integrated multimodal transportation system that provides choices and accessibility for everyone in the City.

The City established the Transportation Impact Analysis Current Practice and Guidelines (City of Pasadena 2015b) to implement the Transportation Performance Measures and for use in CEQA analysis. These guidelines identify separate approaches for three categories of projects—exempt projects, Category 1: Below Communitywide Significance and Category 2: Communitywide Significance. Per the Transportation Impact

Analysis Current Practice and Guidelines, Table 1: Thresholds for Determining Transportation Review of Projects, any non-residential project which is expected to generate fewer than 300 daily trips is considered exempt, is not expected to generate any impacts, and does not require a full traffic analysis. Also, the City does not require analysis of construction traffic. Therefore, no Project level analysis of CEQA impacts is required. However, an assessment of construction trip generation was conducted for Area 2 and Area 3, and consideration was given to construction traffic associated with the other cumulative projects including County's Devil's Gate Reservoir Project that would be occurring at the same time under cumulative conditions.

Local

General Plan Mobility Element, 2015

Pasadena's General Plan Mobility Element guides the continuing development of the transportation system to support planned growth. The Mobility Element sets forth goals and policies to improve overall transportation in Pasadena. The Mobility Element's objective is to promote a livable community where people can circulate without cars and non-auto travel modes are emphasized in order to recognize their role in improving the City's environment and quality of life. Consequently, performance measures related to the per capita length and number of trips associated with changes in land use have been adopted for evaluating the transportation system in lieu of levels of service measures. As discussed above, these new performance measures and CEQA thresholds are consistent with the City's adopted General Plan.

Supplements and Modifications to the Greenbook

The City's Department of Public Works (Department) has the responsibility for and control over the construction, modification, and maintenance of facilities within the public rights of way of the City of Pasadena. The Department established guidelines, monitors, inspects, and finally approves or rejects all such construction, including operations, materials, methods, and finished facilities. The Department adopted the Standard Specifications for Public Works Construction[1] (known as the Greenbook), which was supplemented and modified to meet the needs of the City. It is the responsibility of all contractors to comply with the requirements of the City's Greenbook Supplements and Modifications during construction activities.

4.8.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to transportation are based on Appendix H of the CEQA Guidelines. According to Appendix H of the CEQA Guidelines, a significant impact related to transportation would occur if the project would:

a) Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b).

[1] The Standards Specifications for Public Works Construction was written and promulgated by the Joint Cooperative Committee of the Southern California Chapter American Public Works Association and Southern California Districts Associated General Contractors of California.

c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).

d) Result in inadequate emergency access.

Through the analysis in the Initial Study (see Appendix A), it was determined that the proposed Project would not conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b); substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or, result in inadequate emergency access (i.e., Thresholds b, c, and d). Accordingly, these issue are not further analyzed in the EIR. Based on the remaining thresholds, a significant impact related to transportation would occur if the project would:

a) Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.

4.8.5 Environmental Impacts Analysis

Threshold 4.8a. Would the project conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?

The proposed Project would require construction activities that would involve the transport of workers to and from the Project site, as well as construction equipment and construction vehicles. The primary vehicular activity would occur during construction activities in Area 3, which would require the export of soils to create the redesigned spreading basins. Construction trucks hauling soils and debris generated by construction activities are anticipated to drive to and from Vulcan Materials Company landfill located at 13000 East Los Angeles Street in the City of Irwindale, which is approximately 18 miles from the Project site.

Haul trucks and equipment deliveries are expected to come to the Project site from I-210 at the Windsor Avenue westbound off-ramp and head north on Windsor Avenue to the intersection with Ventura Street. At this intersection is a fork in the road, one leading to Explorer Road into Area 3 and the other leading to the gated North Arroyo Boulevard, which passes adjacent to residential properties and the Behner WTP. North of the JPL Bridge, North Arroyo Boulevard (the Gabrielino Trail/Access Road) would be used for construction vehicles and equipment transport to and from Area 2. Explorer Road and potentially North Arroyo Boulevard would be used to access Area 3.

For the disposal of excavated soils, it is expected that haul trucks from the Project site would head eastbound on I-210 via eastbound ramps at Windsor Avenue; exit at the I-605 southbound off ramp at Lower Azusa Road/Los Angeles Street; head east towards the Vulcan Materials Company landfill. Trucks would come back from the landfill entering the northbound on-ramp on the I-605 at Los Angeles Street and head north; trucks would then go west on I-210 to Windsor Avenue to Explorer Road and then to the Project site.

Construction of the proposed Project would result in a temporary increase in local traffic on Windsor Avenue, I-210 freeway and other streets as a result of construction-related workforce traffic, material deliveries, and construction activities. The primary off-site impacts from the movement of construction trucks would include short-term and intermittent effects on traffic operations because of slower movements and larger turning radii of delivery and haul trucks compared to passenger vehicles. Occasional partial closures for the Gabrielino

Trail/Access Road would be required for construction truck and equipment access. However, Windsor Avenue would be open to traffic at all times during the construction period.

The Institute of Transportation Engineers' (ITE) Trip Generation Manual does not contain trip rates for construction-related activities associated with the proposed Project. Trip generation for construction projects is based on average or peak number of workers and trucks that would be required for the proposed construction activities. Construction traffic includes the number of workers and the amount of delivery (vendor) and haul truck traffic that would be generated to and from the site daily and during the AM and PM peak hours.

Area 2: Short-Term Construction Impacts

As discussed in Section 3.1 of this Draft EIR, construction activities in the Area 2 Diversion and Intake Replacement would include the demolition and removal of the existing weir and intake structure after the removal of sediment and debris that has accumulated behind the existing weir. The construction of Area 2 would last approximately 3 months from August 2021 through October 2021.

Per construction phasing and schedule for Area 2, approximately 7 workers, 1 delivery (vendor) truck, and 7 haul trucks would be required per day on average for construction-related activities during the 3-month period. However, during peak construction phase (i.e. during overlap of demolition and dewatering) which would last approximately 5 days, approximately 12 workers, 2 delivery (vendor) trucks, and 43 haul trucks would be required per day for construction-related activities. The construction activities would occur between 7:00 AM and 4:00 PM over the weekdays, Monday through Friday. All workers and trucks were assumed to make two daily trips (one inbound and one outbound) to the Project site. Although workers may not travel during the AM or the PM peak periods, to be conservative all workers were assumed to arrive during the AM peak hour and leave the site during the PM peak hour. Passenger Car Equivalency (PCE) factors were used to account for the Project's truck traffic and provide a more realistic measurement in terms of the impact of Project-related truck traffic. All truck trips were converted to PCE trips using a factor of 2.0 or 3.0. All truck trips were averaged over an 8-hour workday to estimate peak hour trips with 50% inbound and 50% outbound travel.

Construction trip generation estimates for Area 2 are shown in Table 4.8-1 below.

Table 4.8-1. Area 2 - Construction Trip Generation

Vehicle Type	Daily Quantity	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	*Out*	*Total*	*In*	*Out*	*Total*
Average (All Construction Phases)								
Workers[1]	7	14	7	0	7	0	7	7
Vendor Trucks[2]	1	2	1	0	1	0	1	1
Haul Trucks[3]	7	14	1	1	2	1	1	2
	Total Trips	**30**	**9**	**1**	**10**	**1**	**9**	**10**
Average (All Construction Phases with PCE)								
Workers (1 PCE)	7	14	7	0	7	0	7	7
Vendor Trucks (2 PCE)	1	4	2	0	2	0	2	2

Table 4.8-1. Area 2 - Construction Trip Generation

Vehicle Type	Daily Quantity	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	*Out*	*Total*	*In*	*Out*	*Total*
Haul Trucks (3 PCE)	7	42	3	3	6	3	3	6
Total Trips (with PCE)		**60**	**12**	**3**	**15**	**3**	**12**	**15**
Peak (Demolition and Dewatering)								
Workers[1]	12	24	12	0	12	0	12	12
Vendor Trucks[2]	2	4	1	0	1	0	1	1
Haul Trucks[3]	43	86	5	6	11	6	5	11
Total Trips		**114**	**18**	**6**	**24**	**6**	**18**	**24**
Peak (Demolition and Dewatering with PCE)								
Workers (1 PCE)	12	24	12	0	12	0	12	12
Vendor Trucks (2 PCE)	2	8	2	0	2	0	2	2
Haul Trucks (3 PCE)	43	257	15	18	33	18	15	33
Total Trips (with PCE)		**289**	**29**	**18**	**47**	**18**	**29**	**47**

Notes: PCE – Passenger Car Equivalent

1 Workers as assumed to utilize passenger cars and no carpooling is assumed. All of the workers were conservatively assumed to arrive and depart during the AM and PM peak hour.

2 A nominal number of vendor trucks are required for the Project, therefore one vendor truck was assumed to arrive and depart during the AM and PM peak hour, respectively.

3 Haul truck trips are distributed evenly over the duration of construction phase to estimate daily haul truck trips and across the 8-hour work shift to estimate AM and PM peak hour trips.

As shown in Table 4.8-1, on average, the Project would generate 30 daily trips, 10 trips during the AM peak hour (9 inbound and 1 outbound), and 10 trips during the PM peak hour (1 inbound and 9 outbound). During the peak construction phase, for a short period of time, the Project would generate 114 daily trips, 24 trips during the AM peak hour (18 inbound and 6 outbound), and 24 trips during the PM peak hour (6 inbound and 18 outbound).

With the application of PCE factors to truck trips, on average the Project would generate 60 total PCE daily trips, and 15 PCE trips during the AM peak hour (12 inbound and 3 outbound) and 15 PCE trips during the PM peak hour (3 inbound and 12 outbound). With the application of PCE factors to truck trips, during the peak, for a short period, the Project would generate 289 total PCE daily trips, and 47 PCE trips during the AM peak hour (29 inbound and 18 outbound) and 47 PCE trips during the PM peak hour (18 inbound and 29 outbound).

As shown in Table 4.8-1, the proposed Project would generate less than 500 ADT, and hence would not require a traffic impact analysis per County of Los Angeles Department of Public Works (LACDPW) Transportation Impact Analysis Report Guidelines (County of Los Angeles 2013). Similarly, the City of Pasadena does not require analysis of construction traffic and considers any non-residential project which is expected to generate fewer than 300 ADT exempt from conducting a transportation impact analysis. Therefore, no significant impacts to the roadway facilities due to short-term construction of Area 2 would occur.

Area 3: Short-Term Construction Impacts

Improvements in Area 3 include the reconfiguration and expansion of the spreading basins. The construction of Area 3 would last approximately 9 months from March 2022 through November 2022.

Per construction phasing and schedule for Area 3, approximately 6 workers, 1 delivery (vendor) truck, and 42 haul trucks would be required per day on an average for construction-related activities during the 9-month period. However, during the peak construction phase (i.e. during demolition), which would last approximately 10 days, approximately 5 workers, 1 delivery (vendor) trucks, and 237 haul trucks would be required per day for construction-related activities. The construction activities would occur between 7:00 AM and 4:00 PM over the weekdays, Monday through Friday. All workers and trucks were assumed to make two daily trips (one inbound and one outbound) to the Project site. Although workers may not travel during the AM or the PM peak periods, to be conservative all workers were assumed to arrive during the AM peak hour and leave the site during the PM peak hour. PCE factors were used to account for the Project's truck traffic and provide a more realistic measurement in terms of the impact of Project-related truck traffic. All truck trips were converted to PCE trips using a factor of 2.0 or 3.0. All truck trips were averaged over the 8-hour workday to estimate peak hour trips with 50% inbound and 50% outbound.

Construction trip generation estimates for Area 3 are shown in Table 4.8-2 below.

Table 4.8-2. Area 3 - Construction Trip Generation

Vehicle Type	Daily Quantity	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	*Out*	*Total*	*In*	*Out*	*Total*
Average (All Construction Phases)								
Workers[1]	6 workers	12	6	0	6	0	6	6
Vendor Trucks[2]	1 trucks	1	1	0	1	0	1	1
Haul Trucks[3]	42 trucks	84	5	6	11	6	5	11
Total Trips		**97**	**12**	**6**	**18**	**6**	**12**	**18**
Average (All Construction Phases with PCE)								
Workers (1 PCE)	6 workers	12	6	0	6	0	6	6
Vendor Trucks (2 PCE)	1 trucks	3	2	0	2	0	2	2
Haul Trucks (3 PCE)	42 trucks	252	15	18	33	18	15	33
Total Trips with PCE		**266**	**23**	**18**	**41**	**18**	**23**	**41**
Peak (Demolition)								
Workers[1]	5 workers	10	5	0	5	0	5	5
Vendor Trucks[2]	1 trucks	2	1	0	1	0	1	1
Haul Trucks[3]	237 trucks	474	30	30	60	30	30	60
Total Trips		**486**	**36**	**30**	**66**	**30**	**36**	**66**

Table 4.8-2. Area 3 - Construction Trip Generation

Vehicle Type	Daily Quantity	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	*Out*	*Total*	*In*	*Out*	*Total*
Peak (Demolition with PCE)								
Workers (1 PCE)	5 workers	10	5	0	5	0	5	5
Vendor Trucks (2 PCE)	1 truck	4	2	0	2	0	2	2
Haul Trucks (3 PCE)	237 trucks	1,422	90	90	180	90	90	180
Total Trips with PCE		**1,436**	**97**	**90**	**187**	**90**	**97**	**187**

Notes:

1 Workers as assumed to utilize passenger cars and no carpooling is assumed. All of the workers were conservatively assumed to arrive and depart during the AM and PM peak hour.

2 A nominal number of vendor trucks are required for the Project, therefore one vendor truck was assumed to arrive and depart during the AM and PM peak hour, respectively.

3 Haul truck trips are distributed evenly over the duration of construction phase to estimate daily haul truck trips and across the 8-hour work shift to estimate AM and PM peak hour trips.

As shown in Table 4.8-2, on an average, the Project would generate 97 daily trips, 18 trips during the AM peak hour (12 inbound and 6 outbound), and 18 trips during the PM peak hour (6 inbound and 12 outbound). During the peak construction phase, for a short period of time, the Project would generate 486 daily trips, 66 trips during the AM peak hour (36 inbound and 30 outbound), and 66 trips during the PM peak hour (30 inbound and 36 outbound).

With the application of PCE factors to truck trips, on average the Project would generate 266 total PCE daily trips, and 41 PCE trips during the AM peak hour (23 inbound and 18 outbound) and 41 PCE trips during the PM peak hour (18 inbound and 23 outbound). With the application of PCE factors to truck trips, during the peak, for a short period, the Project would generate 1,436 total PCE daily trips, and 187 PCE trips during the AM peak hour (97 inbound and 90 outbound) and 187 PCE trips during the PM peak hour (90 inbound and 97 outbound).

As shown in Table 4.8-2, under average conditions the proposed Project would generate less than 500 ADT, and hence would not require a traffic impact analysis per County of LACDPW Transportation Impact Analysis Report Guidelines (County of Los Angeles 2013). Similarly, the City of Pasadena does not require analysis of construction traffic and considers any non-residential project which is expected to generate fewer than 300 daily trips exempt from conducting a transportation impact analysis. The peak phase of Area 3 constructions would cause an increase in the average daily traffic greater than 500 ADT. Although this threshold is applicable to long-term operational activities and not applicable to construction traffic, it is possible that roadway facilities could be impacted during these approximately 10 days during construction in Area 3.

Additionally, the 2015 IS/MND included mitigation measures that have been incorporated into the Mitigation Monitoring and Reporting Program (MMRP) for the previously approved ASCP, as discussed in detail in Section 2.2, Project Background and in Table 2-1 in Section 2, Environmental Setting of this Draft EIR. MM-TRA-1 would reduce construction trips that could potentially increase congestion on freeways and arterial roadways during the peak hour; therefore, MM-TRA-1 (modified from the MMRP), would be implemented. During construction activities, the Contractor shall schedule the arrival and departure of the construction equipment

and trucks outside the AM peak hours of 7:30 AM to 8:30 AM and the PM peak hours of 4:30 PM to 5:30 PM. In addition, trucks transporting sediment and debris from the site shall travel to and from the site outside the AM and PM peak hours. MM-TRA-1 as modified is still appropriate for inclusion in the proposed Project and would reduce traffic congestion associated with the 500 ADT during the peak phase of construction in Area 3.

Long-Term Operational Impacts

No new employees are required for the long-term operation of the proposed Area 2 and Area 3. Future schedules of operation and maintenance activities would not substantively differ from the current maintenance routine and procedures required for the sedimentation basin. An estimated 100 truckloads or 200 truck trips of trucks carrying soil from the existing and proposed spreading basins would have to be disposed of off-site approximately every 5 years (approximately 20 trucks per year), which is reflective of current maintenance activities. As such no long-term operational impacts related to transportation are anticipated with the proposed Project.

Impacts to Transit, Bicycles and Pedestrian Facilities

There would be no impact on the use of transit since the proposed Project is not directly served by a public transportation system and would not likely encourage bicycle use or walking to the site by construction workers.

During construction of Area 2, however, there would be periods where sections of the trail would need to be partially or fully closed, mainly during excavations, construction of the new intake, trenching for the new intake service structure, and hauling in materials/equipment. The portion of Gabrielino Trail/Access Road along the construction zone may also need to be reduced in width for the duration of the construction period during work hours to allow for parked construction vehicles (e.g., pickup trucks).

Access to Area 2 (and the USFS Ranger Station in the ANF) would be made available during construction activities, but short-term partial closures may occur. Additionally, bicyclists, hikers, and users of the Gabrielino Trail/Access Road would be prohibited from using portions of the trail, as further described in Section 4.7, Recreation of this Draft EIR. Temporary closure of the Gabrielino Trail/Access Road and any other public roads (e.g. Explorer Road) that may be impacted during short-term construction activities would be executed in a manner that ensured compliance with applicable plans and policies addressing the circulation system, including roadway, bicycle, and pedestrian facilities.

The City will follow the Supplements and Modifications to the Greenbook regarding notifications to residents and businesses affected by the temporary closures of the Gabrielino Trail/Access Road (City of Pasadena 2006). Applicable mandatory measures from the Supplements and Modifications to the Greenbook that would be applied to construction of the proposed Project are generally summarized below to include, but not be limited to:

P-7-10.2 Storage of Equipment and Materials in Public Streets

> Requires that construction materials shall not be stored in streets, roads or highways overnight, and all materials or equipment not installed or used in construction shall be stored elsewhere, unless approved by the City Engineer.

P-7-10.3 Street Closure, Detours, Barricades

All streets without specific traffic requirements may be closed to through traffic from 7:00 AM to 5:00 PM if approved in writing by the Engineer. The contractor shall obtain the approval of the Engineer before any partial or total closure of any street. During a street closure, the following requirements shall apply:

A. Where long sections are encountered on a particular street, only that portion which can be repaved in one day shall be closed to through traffic unless otherwise directed by the City Engineer.
B. Both local and emergency access must be maintained at all times.
C. Street closure signing shall be provided and maintained on the closed street and at all intersecting streets within the closure limits. "ROAD CLOSED AHEAD" signs shall also be provided and maintained on each of the first intersecting streets on each end of the closed street. This signing shall conform to the requirements of these Specifications, the "WATCH" handbook, and the City Engineer. These signs shall be placed at locations approved by the City Engineer, for optimum visibility to traffic and in a non-hazardous location to pedestrians.

P-7-10.1.2 Notifications to Residents/Businesses

A project general information letter and sufficient copies thereof will be prepared by City staff for Contractor distribution to all residents, business establishments, and institutions fronting on or directly affected by the project. Distribution shall be accomplished in a manner acceptable to the Engineer and shall be completed at least 48 hours prior to the beginning of construction operations in the immediate vicinity. In addition to the above, the Contractor shall be fully responsible for such other notifications as may be required related to necessary closures of streets, alleys, driveways, etc., or to unavoidable access or parking restrictions. Such "additional notifications" shall be given in writing to all affected parties and premises at least five (5) working days prior to such closure or restriction. These notifications shall apply where the closures and access or parking restrictions required in the performance of any work under this contract preclude any resident, tenant, or property owner from utilizing the premises or conducting business thereon in a reasonable and customary manner.

P-7-10.1.3 Notification of Utilities

In order for the utilities to have continuous access to their facilities, the Contractor shall be required to notify the Underground Service Alert-South (U.S.A.) no less than two working days in advance of the construction work.

As such, implementation of the proposed Project would require notification of utility agencies with facilities in the area; the USFS Ranger Station; Pasadena Fire and Police Departments; and other emergency service providers. Although not required by the Greenbook, it is anticipated that the Gabrielino Trail/Access Road would be made passable at the end of each workday.

The 2015 IS/MND included mitigation measures that have been incorporated into the MMRP for the previously approved ASCP, as discussed in detail in Section 2.2, Project Background and in Table 2-1 in Section 2, Environmental Setting of this Draft EIR. MM-TRA-2 (modified from the MMRP) requires use of flagpersons and/or other safety procedures to be used as necessary to ensure the safety of recreational users along the Gabrielino Trail/Access Road during construction activities that could involve partial road closures.

4.8.6 Cumulative Impacts

As discussed, no long-term impacts to traffic would be generated by the proposed Project; therefore, there would be no long-term operational cumulative impacts.

Based on review of cumulative projects in the area, during construction of the proposed Project Areas 2 and 3, sediment removal activities at the Devil's Gate Reservoir and construction of the Explorer Groundwater Well would most likely be ongoing. Other cumulative projects in the area are either not likely to overlap with the construction of the proposed Project or no environmental documentation is available at this time.

To address the Caltrans comment letter dated December 6, 2019 regarding queuing at Caltrans ramp intersections, a queuing analysis at selected nearby ramp intersections was conducted to determine if the construction-related traffic of the proposed Project and its overlap with other cumulative projects (primarily, the Devil's Gate Reservoir Project) would significantly impact those Caltrans facilities under cumulative conditions. The I-210 ramps at Windsor Avenue and the segment of Windsor Avenue to Oak Grove Drive would be used by construction equipment and trucks for the Devil's Gate Reservoir sediment removal and the proposed Project throughout the work day and therefore, cumulative traffic impacts from the Project could potentially occur at those locations.

Based on the proposed haul route of the Project (from Project site to landfill site) and its overlap with haul routes of other cumulative projects in the area, the following intersections were selected for evaluation:

Intersection #1 I-210 westbound ramp/Windsor Avenue

Intersection #2 I-210 eastbound ramp/Arroyo Boulevard

Intersection #3 I-605 southbound ramp- Rivergrade Road/Lower Azusa Road

Intersection #4 I-605 northbound ramp- Rivergrade Road/Los Angeles Street

Figure 4.8-1, Proposed Haul Route and Study Intersections, illustrates the locations of the study area intersections and proposed haul route near the Project site and the Vulcan Materials Company landfill.

Due to the ongoing shelter in place orders from the COVID-19 situation, collection of new traffic counts was not recommended since it would not be representative of the typical traffic conditions in the area. Therefore, in consultation with Caltrans[2], the existing traffic counts for the above mentioned intersections for year 2019 were estimated using historic count data and applying appropriate traffic growth factors. Appendix H includes historic traffic counts (year 2014) for the above mentioned intersections and a compilation of ramp volumes from Caltrans Performance Measurement System (PeMS) data source (version 9.0.0) and the annual daily and peak hour traffic volumes published by Caltrans Division of Traffic Operations (Caltrans 2020). As shown In Table 1, in Appendix H to this Draft EIR, the peak hour ramp volumes from PeMS were available for a limited period and locations and further showed inconsistent variation during the AM and PM peak hours including

[2] Correspondence with Caltrans District 7, Emily Gibson and other Traffic Operations staff, via e-mail correspondence in March, 2020.

negative growth for certain ramps in the period between the years 2012 to 2019. The data from Division of Traffic Operations showed an increase in daily and peak hour ramp volumes during similar period, however the increase was in the range of 3%-13% per year. Therefore, due to these significant data inconsistencies, it was determined that the historical Caltrans data was not an appropriate method to obtain traffic growth factors for the study area intersections.

Instead, traffic growth factors in the "General Traffic Volume Growth Factors" for the respective Regional Statistical Area (RSA) #25 - Pasadena for intersections 1 and 2 and #26 - West Covina for intersections 3 and 4 in the Exhibit D-1 of the Los Angeles County Congestion Management Program (CMP) (Metro 2010) were used. The growth factors for the RSAs in the CMP were reviewed and found to be a better approximation of traffic growth compared to the Caltrans data. Since both the RSAs #25 (Pasadena) and #26 (West Covina), are adjacent to each other, the higher traffic growth factor of the two was applied to all the intersections to provide a conservative estimate. Therefore, a growth rate of 0.82% per year from year 2014-2019 and 0.40% per year from year 2019-2022 was utilized to estimate Existing Year 2019 and Cumulative Year 2022 baseline traffic volumes, respectively (see Appendix H). The AM and PM peak hour traffic volumes estimated using these growth rates was utilized for the queuing analysis of the intersections under Existing Year 2019 and Cumulative Year 2022 conditions. The queuing analysis was conducted using the Synchro 10/SimTraffic (version 10) software.

Table 4.8-3 provides a summary of the queuing analysis for the study area ramp intersections under Existing Year 2019 and Cumulative Year 2022 conditions, a future baseline condition without Project traffic or Devil's Gate Reservoir's construction traffic. As shown in the table, the following intersections have vehicle queues that exceed available storage lengths i.e. the length (in feet) available for vehicles to stack in a turn lane at an intersection. Note that off-ramp queues are evaluated by comparing these to 85% of the lane's storage capacity, per Caltrans District 7 requirements:

- **Intersection #1, I-210 westbound ramps/Windsor Avenue:** Vehicle queues on the single northbound left turn lane on Windsor Avenue would exceed its storage length of 110 feet in the PM peak hour of the Cumulative condition. There would be no queueing impacts to the off-ramp because AM and PM peak hour queues would meet Caltrans requirements.
- **Intersection #2, I-210 eastbound ramps/Arroyo Boulevard:** Vehicle queues on the dual southbound left turn lanes on Arroyo Boulevard would exceed their storage lengths. The combined storage length is 380 feet (two 190-foot lanes). The AM and PM peak hour queues in the Existing and Cumulative conditions exceed the dual left turn storage capacity. There would be no queueing impacts to the off-ramp because AM and PM peak hour queues would meet Caltrans requirements.
- **Intersection #3, I-605 southbound ramps – Rivergrade Road/Lower Azusa Road:** Vehicle queues on the single westbound left turn lane on Lower Azusa Road would exceed its storage length of 230 feet. The AM peak hour queues in the Existing and Cumulative conditions currently, and would, exceed the left turn storage capacity. There would be no queueing impacts to the off-ramp because AM and PM peak hour queues would meet Caltrans requirements.

Table 4.8-3. Queuing Analysis Summary for Existing Year 2019 and Cumulative Year 2022 Conditions

No.	Intersection	Movement	Storage Length (feet)	*Off-Ramp Storage Length at 85% Capacity*[1]	Existing Year 2019				Cumulative Year 2022			
					AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
					95th Percentile Queue[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*
1	***I-210 westbound ramps/Windsor Avenue***											
	I-210 westbound off-ramp	WBLTR[3]	1150	978	299	No	225	No	313	No	217	No
		WBR	560	476	267		172		286		171	
	Arroyo Boulevard	NBL	110	–	63	No	104	No	53	No	**112**	**Yes**
	Windsor Avenue	SBTR[4]	450	–	356	No	285	No	363	No	288	No
2	***I-210 eastbound ramps/Arroyo Boulevard***											
	I-210 eastbound off-ramp	EBL[3]	1330[3]	1131	246	No	277	No	267	No	268	No
		EBLR	550	468	298		318		312		319	
	Arroyo Boulevard	SBL	190	–	182	**Yes**	**192**	**Yes**	188	**Yes**	**197**	**Yes**
		SBLT	190	–	**226**		**221**		**218**		**228**	
		NBTR	120	–	39	No	38	No	34	No	42	No
3	***I-605 southbound ramps-Rivergrade Road/Lower Azusa Road***											
	I-605 southbound off ramp	SBLT[3]	1350	1148	223	No	449	No	234	No	422	No
		SBTR	680	578	246		406		266		371	
		SBR	195	166	220		279		226		261	
	Lower Azusa Road	EBT/R[4]	1770	–	181	No	215	No	205	No	217	No
		WBL	230	–	**264**	**Yes**	175	No	**267**	**Yes**	175	No

Table 4.8-3. Queuing Analysis Summary for Existing Year 2019 and Cumulative Year 2022 Conditions

No.	Intersection	Movement	Storage Length (feet)	*Off-Ramp Storage Length at 85% Capacity*[1]	Existing Year 2019				Cumulative Year 2022			
					AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
					95th Percentile Queue[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*
4	***I-605 northbound ramps-Rivergrade Road/Los Angeles Street***											
	I-605 northbound off ramp	NBLT[3]	1380	1173	667	No	946	No	608	No	896	No
		NBTR	910	774	594		921		550		890	
	Los Angeles Street	EBL	250	–	134	No	163	No	167	No	171	No
		WBTR[4]	1740	–	132		22		150		–[5]	

Source: Appendix H

WBLTR – Westbound left-through-right; WBR – Westbound right; NBL – Northbound left; SBTR – Southbound through-right; EBL- Eastbound right; EBLR- Eastbound left-right; SBL-Southbound left; SBLT = Southbound left-through; NBTR- Northbound through-right; SBTR- Southbound through-right; SBR-southbound right; EBTR- Eastbound through right; WBL – Westbound left; NBLT – Northbound left-through; EBL – Eastbound left; WBTR- Westbound through-right.

Notes:

1 Per Caltrans District 7, queuing impacts at freeway off-ramps are based on the queues that exceed 85% of the off-ramp's storage capacity.

2 Based on 95th percentile (design) queue length (in feet) in SimTraffic 10.

3 Approximate length of storage lane measured from intersection (stop bar) to freeway mainline (at gore point).

4 Storage length based on lane distance from intersection to adjacent, upstream intersection.

5 Queue not reported in SimTraffic, therefore queue is assumed to be zero feet.

Movement is utiized by Project traffic as part of the proposed haul route

Cumulative Projects Trip Generation

Dudek reviewed the Traffic Impact Study for the Devil's Gate Reservoir Sediment Removal and Management Project prepared by Hall & Foreman, Inc. dated October 18, 2013 and updated information regarding the project activities available on the County's website[3]. Based on the review of Devil's Gate project's hauling schedule, it is anticipated that approximately 95 trucks would be used to make a maximum of 425 daily trips over the period of April 2020 to November 2022. The Devil's Gate project would have varying haul routes and timing and would also utilize I-210 westbound ramps/Windsor Avenue and I-210 eastbound ramps/Arroyo Boulevard intersections from approximately 7:00 AM to 3:30 PM with some peak hour restrictions. However, to present a worst-case scenario under cumulative conditions, Devil's Gate truck traffic (approximately 50 inbound truck trips and 50 outbound truck trips) was added to the proposed Project's peak hour construction truck traffic (approximately 30 inbound truck trips and 30 outbound truck trips) when analyzing the potential queues at the I-210 ramps at Windsor Avenue and Arroyo Boulevard. The truck trips were converted to passenger car equivalent trips by utilizing a factor of 3 PCE. Therefore, Devil's Gate Project was estimated to generate 150 inbound PCE trips and 150 outbound trips during both AM and PM peak hours.

Since specific trip generation for other cumulative projects such as Explorer Groundwater Well was not available, to account for traffic from those projects and any background growth in the study area, a growth factor was applied to the estimated Existing Year 2019 peak hour traffic volumes for a period of 3 years to estimate Cumulative Year 2022 peak hour traffic volumes.

Assumptions for Queuing Analysis

In order to account for the maximum truck traffic that would occur with the overlap of construction activities of the proposed Project and cumulative projects (primarily Devil's' Gate Project) the following assumptions were used in the analysis:

1. The peak Project traffic would be generated from improvements in Area 3 which would last approximately 9 months from March 2022 through November 2022. The peak phase of construction of Area 3 would be during demolition activities which would occur for approximately 10 days. As mentioned above this phase would generate 90 inbound PCE trips and 90 outbound trips during both the AM and PM peak hours. The worker trips are nominal and could potentially use other routes in the study area. Therefore, only PCE trips representing truck trips were assigned to the appropriate movements at the ramp intersections for the haul route from the Project site to the landfill. It is assumed that the truck trips would be distributed evenly over the 8-hour period.
2. The Traffic Impact Analysis (TIA) for the Devil's Gate project analyzed multiple haul routes (approximately 26 routes) from the reservoir to eight different landfill sites spread across the County. Devil's Gate truck traffic could utilize ramps located along Berkshire Place or Windsor Avenue to access I-210. However, it is not possible to determine accurately which route and what percentage of the trucks removing sediment from Devil's Gate Reservoir would overlap with Area 3 peak construction

[3] Devil's Gate Reservoir Sediment Removal and Management Project website: https://pw.lacounty.gov/swe/devilsgate/docs/DevilsGateReservoirRestorationProjectPresentation-January2020.pdf

phase. Therefore, two most conservative scenarios of overlap between the truck traffic from the proposed Project and Devil's Gate project were considered for the queuing analysis:

a. **Scenario 1** – All haul trucks (150 inbound PCE trips and 150 PCE outbound trips) from Devil's Gate Project would be traveling west along I-210 via Windsor Avenue ramps.
b. **Scenario 2** – All haul trucks (150 inbound PCE trips and 150 PCE outbound trips) from Devil's Gate Project would be traveling east along I-210 via Arroyo Boulevard ramps.

3. The ramps at I-210 and Windsor Avenue and Arroyo Boulevard (Intersections 1 and 2) were analyzed with peak truck traffic from proposed Project from Area 3 and Devil's Gate project for the two scenarios explained above. However, the ramps at I-605 and Lower Azusa Road- Los Angeles Street (Intersections 3 and 4) near the landfill site were analyzed only with peak Project traffic from Area 3, since that specific Vulcan Material landfill site would not be utilized by the Devil's Gate project.

Summary of Queuing Analysis for Cumulative Conditions

Table 4.8-4 provides a summary of queuing analysis for the intersections under Cumulative Year 2022 conditions with Area 3 Project traffic and cumulative traffic including Devil's Gate project traffic for under Scenario 1 and Scenario 2 conditions. As shown in the table, the following intersections would have vehicle queues that exceed available storage lengths:

- **Intersection #1, I-210 westbound ramps/Windsor Avenue:** Vehicle queues on the single northbound left turn lane on Windsor Avenue are forecast to exceed its storage length of 110 feet in the PM peak hour of both Cumulative Scenarios 1 and 2. However, the proposed Project would not contribute traffic to this northbound left movement. Also, it should be noted that the off-ramp's AM and PM peak hour queues would continue to be within 85% of the off-ramp's storage capacity (per Caltrans District 7 requirements) under both Cumulative Scenarios 1 and 2.
- **Intersection #2, I-210 eastbound ramps/Arroyo Boulevard:** Vehicle queues on the dual southbound left turn lanes on Arroyo Boulevard would continue to exceed their storage lengths in both peak hours of both Cumulative Scenarios 1 and 2. The combined storage length is 380 feet (two 190-foot lanes). The AM and PM peak hour queues in both Cumulative Scenarios 1 and 2 are forecast to continue to exceed the dual left turn storage capacity. The proposed Project would contribute traffic to this southbound left turn movement and therefore would have a cumulative impact to this intersection. Also, it should be noted that the off-ramp's AM and PM peak hour queues would continue to be within 85% of the off-ramp's storage capacity (per Caltrans District 7 requirements) under both Cumulative Scenarios 1 and 2.
- **Intersection #3, I-605 southbound ramps** – Rivergrade Road/Lower Azusa Road: Vehicle queues on the single westbound left turn lane on Lower Azusa Road would continue to exceed its storage length of 230 feet in the AM peak hour under both Cumulative Scenario 1 and 2 conditions. However, the proposed Project would not contribute traffic to this westbound left movement. Also, it should be noted that the off-ramp's AM and PM peak hour queues would continue to be within 85% of the off-ramp's storage capacity (per Caltrans District 7 requirements) under both Cumulative Scenarios 1 and 2.

Table 4.8-4. Queuing Analysis Summary for Cumulative Year 2022 with Project Conditions

No.	Intersection	Movement	Storage Length (feet)	*Off-Ramp Storage Length at 85% Capacity [1]*	Cumulative (w Devil's Gate Scenario 1) plus Project (Area 3 Peak Traffic)				Cumulative (w Devil's Gate Scenario 2) plus Project (Area 3 Peak Traffic)			
					AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
					95th Percentile Queue[2]	*Exceeds Storage Length?*	*95th Percentile Queue[2]*	*Exceeds Storage Length?*	*95th Percentile Queue[2]*	*Exceeds Storage Length?*	*95th Percentile Queue[2]*	*Exceeds Storage Length?*
1	***I-210 westbound ramps/Windsor Avenue***											
	I-210 westbound off-ramp	WBLTR[3]	1150	978	343	No	268	No	373	No	310	No
		WBR	560	476	304		236		328		278	
	Arroyo Boulevard	NBL	110	--	65	No*	**135**	**Yes***	63	No*	**133**	**Yes***
	Windsor Avenue	SBTR[4]	450	--	320	No	363	No	359	No	318	No
2	***I-210 eastbound ramps/Arroyo Boulevard***											
	I-210 eastbound off-ramp	EBL[3]	1330	1131	307	No*	326	No*	249	No*	269	No
		EBLR	550	468	360		382		295		325	
	Arroyo Boulevard	SBL	190	--	**220**	**Yes**	**239**	**Yes**	**256**	**Yes**	**247**	**Yes**
		SBLT	190	--	**247**		**271**		**294**		**287**	
		NBTR	120	--	40	No*	35	No*	39	No*	32	No*
3	***I-605 southbound ramps-Rivergrade Road/Lower Azusa Road***											
	I-605 southbound off ramp	SBLT[3]	1350	1148	343	No	451	No	234	No	411	No
		SBTR	680	578	313		465		268		375	
		SBR	195	166	255		264		230		272	
	Lower Azusa Road	EBT/R[4]	1770	--	206	No*	214	No*	217	No*	216	No*
		WBL	230	--	**257**	**Yes***	181	No*	**259**	**Yes***	183	No*

Table 4.8-4. Queuing Analysis Summary for Cumulative Year 2022 with Project Conditions

No.	Intersection	Movement	Storage Length (feet)	*Off-Ramp Storage Length at 85% Capacity* [1]	Cumulative (w Devil's Gate Scenario 1) plus Project (Area 3 Peak Traffic)				Cumulative (w Devil's Gate Scenario 2) plus Project (Area 3 Peak Traffic)			
					AM Peak Hour		*PM Peak Hour*		*AM Peak Hour*		*PM Peak Hour*	
					95th Percentile Queue[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*	*95th Percentile Queue*[2]	*Exceeds Storage Length?*
4	*I-605 northbound ramps-Rivergrade Road/Los Angeles Street*											
	I-605 northbound off ramp	NBLT[3]	1380	1173	811	No*	926	No *	829	No*	920	No*
		NBTR	910	774	774		915		782		917	
	Los Angeles Street	EBL	250	--	223	No*	157	No*	214	No*	167	No*
		WBTR[4]	1740	--	198	No	21	No	170	No	20	No

Source: Appendix H

WBLTR – Westbound left-through-right; WBR – Westbound right; NBL – Northbound left; SBTR – Southbound through-right; EBL- Eastbound right; EBLR- Eastbound left-right; SBL- Southbound left; SBLT = Southbound left-through; NBTR- Northbound through-right; SBTR- Southbound through-right; SBR-southbound right; EBTR- Eastbound through right; WBL – Westbound left; NBLT – Northbound left-through; EBL – Eastbound left; WBTR- Westbound through-right.

Notes:

1 Per Caltrans District 7, queuing impacts at freeway off-ramps are based on the queues that exceed 85% of the off-ramp's storage capacity.

2 Based on 95th percentile (design) queue length (in feet) in SimTraffic 10.

3 Approximate length of storage lane measured from intersection (stop bar) to freeway mainline (at gore point).

4 Storage length based on lane distance from intersection to adjacent, upstream intersection.

* The Project would not add traffic to the movement.

Movement is utiized by Project traffic as part of the proposed haul route

Conclusion of Queuing Analysis for Cumulative Conditions

Based on the queuing analysis of cumulative conditions provided above, the proposed Project would have a potentially significant queuing impact at the I-210 eastbound ramps/Arroyo Boulevard intersection. Therefore, the project would contribute to a cumulatively significant impact to the Caltrans ramp intersection during short-term construction of Area 3. Therefore MM-CUML-1 is proposed, which requires that the City shall coordinate with the contractor for Devil's Gate Reservoir to avoid potential queuing impacts at the I-210 eastbound ramps/Arroyo Boulevard intersection during peak phase of Area 3 construction under cumulative conditions.

4.8.7 Mitigation Measures

MM TRA-1 During the peak phase of construction activities (i.e. during the demolition phase requiring haul truck trips) in Area 3, all Construction Contractors shall schedule the arrival and departure of the sediment export haul trucks to be outside the AM peak hours of 7:30 AM to 8:30 AM and the PM peak hours of 4:30 PM to 5:30 PM.

MM TRA-2 During construction activities in Areas 2 and 3, use of the North Arroyo Boulevard or Gabrielino Trail/Access Road by hikers, bicyclists and equestrians shall be limited or prohibited when temporary partial or full closures of the Gabrielino Trail/ Access Road, Explorer Road, hiking trails or maintenance roads is necessary. In addition to the requirements for notification set forth in the City's Supplements and Modifications to the Greenbook, flagpersons and/or other safety procedures shall be used as necessary to ensure the safety of recreational users.

MM TRA-3 Prior to the start of construction, the City and/or their Construction Contractor shall provide written notice to the USFS and residences at the Ranger Station of the anticipated construction schedule, stating that access may be temporarily obstructed on an intermittent basis and providing a schedule of anticipated closures. In order to ensure that emergency vehicles would not be obstructed at any time, any temporary obstructions to the Gabrielino Trail/Access Road that could hinder emergency vehicular access shall be mobile and able to be removed from the roadway immediately upon notice from emergency responders.

MM CUML-1 The City and/or their Construction Contractor shall coordinate with the Los Angeles County Department of Public Works and/or their contractor for the sediment removal activities at Devil's Gate Reservoir regarding the schedule of trucks to and from landfills that would require the use of Interstate 210 eastbound ramps/Arroyo Boulevard intersection. If it is determined that activities would overlap and Project traffic and cumulative traffic including the Devil's Gate project traffic would have vehicle queues at Caltrans facilities that exceed available storage lengths, then the City and/or their contractor shall implement construction vehicle/hauling restrictions that disallow the proposed Project's truck traffic during the AM and PM peak hours of 7:30 AM to 8:30 AM and 4:30 PM to 5:30 PM.

4.8.8 Level of Significance After Mitigation

With implementation of MM-TRA-1, MM-TRA-2, MM-TRA-3, and MM-CUML-1, short-term construction traffic impacts would be reduced to levels less than significant. There would be no impacts and no mitigation required for long-term operational transportation.

4.8.9 References

Caltrans (California Department of Transportation). 2020. Performance Measurement System (PeMS) [real-time map]. Accessed May 2020. http://pems.dot.ca.gov/.

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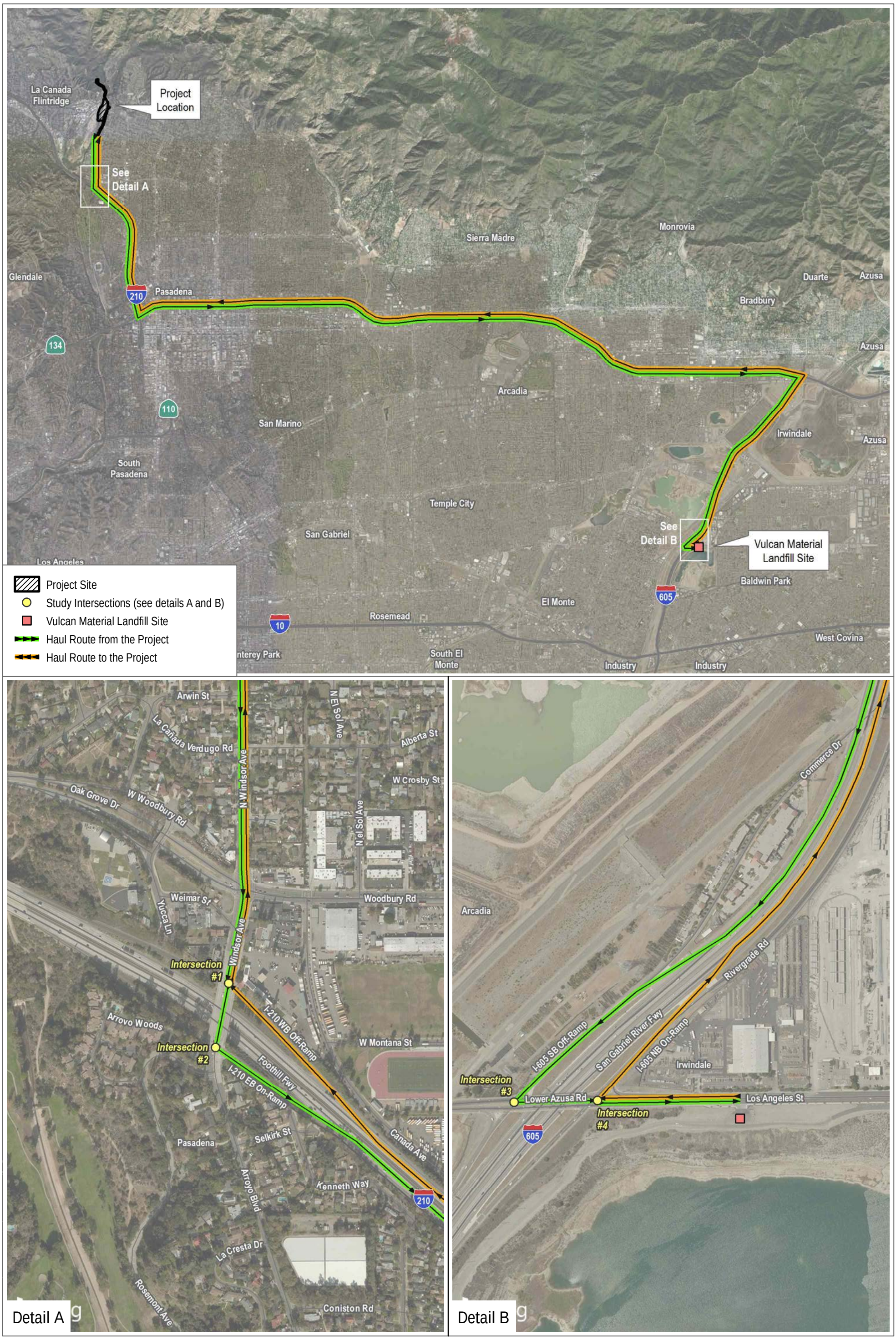
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SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 4,000 8,000 Feet

FIGURE 4.8-1

Proposed Haul Route and Study Intersections

Arroyo Seco Canyon Project Areas 2 and 3

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4.9 Tribal Cultural Resources

4.9.1 Methodology

This section describes the existing tribal cultural resource conditions of the project site and vicinity, identifies associated regulatory requirements, evaluates potential impacts, and identifies mitigation measures related to implementation of the proposed Arroyo Seco Canyon Project Areas 2 and 3 (Project or proposed Project). As such, analysis within this section identifies associated regulatory requirements, evaluates potential impacts to tribal cultural resources, and identifies mitigation measures related to implementation of the proposed Project. This analysis is based, in part, on a review of existing resources and applicable laws, regulations, and guidelines, as well as the following:

Appendix I- 1 Native American Heritage Commission Sacred Lands File Results for the Arroyo Seco Canyon Project Areas 2 and 3, dated October 7, 2019.

Appendix I- 2 Confidential AB-52 Consultation Documentation.

Appendix E-1 Cultural Resources Technical Report for the Arroyo Seco Canyon Project Areas 2 and 3, prepared by Dudek, dated April 2020.

The Cultural Resources Technical Report includes a review of the results of a South Central Coastal Information Center (SCCIC) records search, a search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF), and tribal consultation completed by the lead agency, the City of Pasadena, pursuant to California Assembly Bill (AB) 52. Communication from the NAHC and Tribal entities in response to the Notice of Preparation (NOP) included instructions for complying with Assembly Bill 52 (tribal consultation processes), and recommendations for cultural resources assessments. These concerns are addressed and summarized in this section. A copy of the tribal responses received by the City are included in Confidential Appendix I-2.

Comments received in response to the Notice of Preparation (NOP) are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, the Appendices to the Initial Study are included in Appendix A-2, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

4.9.2 Existing Conditions

South Central Coast Information Center Records Search

As previously discussed, in Section 4.3 for this DEIR for Cultural Resources, Dudek conducted a CHRIS records search at the SCCIC on October 3, 2019. No prehistoric or historic-era archaeological resources were identified within the Project site as a result. The records search identified 35 previously conducted cultural resources technical investigations within the 0.5-mile radius records search area. Of these, six overlap and one is adjacent to the Project site. Additionally, the SCCIC records indicate that 14 previously recorded cultural resources exist within the surrounding 0.5-mile search radius. One built environment resource, P-19-189942, overlaps the Project site and consists of the Hahamongna Watershed Park and associated recreational facilities. Two consist of prehistoric archaeological resources, including P-19-000342, the purported village site located approximately 686 meters

(2,250 feet) north of the Project site, and an isolated granitic discoidal recovered from a disturbed context within fill material. One multi-component resource consisting of multiple loci of sparse prehistoric lithic scatters, as well as a historic-era domestic refuse scatter and purported historic-era burial from the late 1800s is located approximately 914 meters (3,000 feet) northeast of the Project site.

Native American Coordination

Sacred Lands File Search and Tribal Outreach

Dudek contacted the NAHC on September 16, 2019 to request a search of the SLF. Results of the SLF (received October 7, 2019) were positive. The NAHC recommended contacting the Gabrieleño Band of Mission Indians – Kizh Nation for specific information regarding the positive findings. The NAHC also provided contact information for an additional four Native American individuals and/or tribal organizations who may have direct knowledge of cultural resources in or near the Project site; however, the additional four Native American individuals and/or tribal organizations have not, as of the submission of this Draft EIR, contacted the City requesting that the lead agency (City) provide notification to the tribe of projects in the tribe's area of traditional and cultural affiliation. In compliance with Assembly Bill (AB) 52, the City has contacted tribal representatives that have requested to be notified of projects in Pasadena. These efforts are summarized in the following section.

Assembly Bill 52

A project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource (TCR) is a project that may have a significant effect on the environment (PRC Section 21084.2). Under AB 52, a TCR must have tangible, geographically defined properties that can be impacted by project implementation. The proposed project is subject to compliance with AB 52.

The City sent notification of the proposed Project, pursuant to AB 52 on November 7, 2019, to all California Native American tribal representatives that have requested to be notified of projects within the City. The notification letter included a Project map and description inquiring if the tribe entities would like to request formal consultation in order to discuss the Project and the potential to impact any TCRs. AB 52 allows tribes 30 days after receiving notification to request consultation. If a response is not received within the allotted 30 days, it is assumed that consultation is declined. To date, one response to the City's notification letters has been received and one formal consultation has been requested. In a letter from Andrew Salas, Chairperson of the Gabrieleño Band of Mission Indians – Kizh Nation (Tribe) received by the City on November 15, 2019, Mr. Salas stated that the Project site is located within the Tribe's ancestral territory and that formal consultation was requested of the City by the Tribe.

Formal consultation was conducted over the phone on April 2, 2020 with three representatives from the City and two representatives from the Tribe present. After a description of the Project, history of water improvements and the nature of soils in the Project area were provided by the City, the Tribal representatives presented their knowledge of cultural resources in the area as well as their concerns regarding what the Tribe believes to be potential impacts to unknown cultural resources as a result of the proposed Project. The Tribal representatives stated that they request monitoring of soils during ground disturbing activities and that the Tribe is not requesting any Project alternatives or avoidance. The City contacted the Tribe via email on April 29, 2020 and provided proposed mitigation language developed based on the Tribe's input during the April 2, 2020 consultation. Within the email, the City stated that the consultation process will be considered complete absent of further communication to the contrary from the Tribe on or before May 15, 2020. On May 12, 2020, the Tribe emailed the

City and provided further language and documentation supporting their request for mitigation measures stating, "we have provided to the Lead Agency substantial evidence that the proposed project may have a significant impact on our TCRs." The Tribe attached to the email specific mitigation language approved by their Tribal Government and requested the mitigation measures be incorporated into the EIR. Table 4.9-1 summarizes the results of the AB 52 process for the proposed Project. Complete documentation of the AB-52 process can be found in Appendix I-1 and Confidential Appendix I-2.

Table 4.9-1 Assembly Bill 52 Native American Tribal Outreach Results

Native American Tribal Representatives	Method of Notification/Date	Response Received
Andrew Salas, Chairperson Gabrieleño Band of Mission Indians – Kizh Nation	Certified Mail; November 7, 2019	Tribe requested formal consultation, via email, regarding the proposed Project on November 15, 2019. Consultation meeting between the City and the Tribe occurred on April 2, 2020. The Tribe requested monitoring of ground disturbance during the April 2, 2020 consultation meeting. The City contacted the Tribe via email on April 29, 2020 and provided proposed mitigation language. On May 12, 2020 the Tribe emailed the City and provided further language supporting their request for mitigation measures as well as specific mitigation language approved by their Tribal Government. In response to the Tribe's request, the City revised the mitigation language to be consistent with the Tribe's requested mitigation measures via email on June 8, 2020. The Tribe responded to this email on the same day and proposed a different revised measure. This revised language is set forth in MM-TCR-1 and MM-TCR-2 of this Draft EIR. This email signifies the conclusion of the consultation pursuant to AB-52.
Sam Dunlap Gabrielino – Tongva Tribe	Certified Mail; November 7, 2019	No response received

4.9.3 Relevant Plans, Policies, and Ordinances

Federal

No federal requirements related to TCRs are applicable to the proposed Project.

State/Regional

California Register of Historical Resources

In California, the term "historical resource" includes but is not limited to "any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural

annals of California" (California Public Resources Code Section 5020.1(j)). In 1992, the California legislature established the CRHR "to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (California Public Resources Code Section 5024.1(a)). The criteria for listing resources on the CRHR were expressly developed to be in accordance with previously established criteria developed for listing in the NRHP, enumerated below. According to California Public Resources Code Section 5024.1(c)(1–4), a resource is considered historically significant if it (i) retains "substantial integrity," and (ii) meets at least one of the following criteria:

(1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

(2) Is associated with the lives of persons important in our past.

(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

(4) Has yielded, or may be likely to yield, information important in prehistory or history.

In order to understand the historic importance of a resource, sufficient time must have passed to obtain a scholarly perspective on the events or individuals associated with the resource. A resource less than 50 years old may be considered for listing in the CRHR if it can be demonstrated that sufficient time has passed to understand its historical importance (see 14 CCR 4852(d)(2)).

The CRHR protects cultural resources by requiring evaluations of the significance of prehistoric and historic resources. The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing in the NRHP are automatically listed in the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys.

California Environmental Quality Act

As described further below, the following CEQA statutes and CEQA Guidelines are of relevance to the analysis of archaeological, historic, and tribal cultural resources:

- California Public Resources Code Section 21083.2(g) defines "unique archaeological resource."
- California Public Resources Code Section 21084.1 and CEQA Guidelines Section 15064.5(a) define "historical resources." In addition, CEQA Guidelines Section 15064.5(b) defines the phrase "substantial adverse change in the significance of an historical resource." It also defines the circumstances when a project would materially impair the significance of an historical resource.
- California Public Resources Code Section 21074(a) defines "tribal cultural resources."
- California Public Resources Code Section 5097.98 and CEQA Guidelines Section 15064.5(e) set forth standards and steps to be employed following the accidental discovery of human remains in any location other than a dedicated ceremony.
- California Public Resources Code Sections 21083.2(b)-(c) and CEQA Guidelines Section 15126.4 provide information regarding the mitigation framework for archaeological and historic resources, including examples of preservation-in-place mitigation measures; preservation-in-place is the

preferred manner of mitigating impacts to significant archaeological sites because it maintains the relationship between artifacts and the archaeological context and may also help avoid conflict with religious or cultural values of groups associated with the archaeological site(s).

More specifically, under CEQA, a project may have a significant effect on the environment if it may cause "a substantial adverse change in the significance of an historical resource" (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(b).) If a site is either listed or eligible for listing in the CRHR, or if it is included in a local register of historic resources or identified as significant in a historical resources survey (meeting the requirements of California Public Resources Code Section 5024.1(q)), it is a "historical resource" and is presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)). The lead agency is not precluded from determining that a resource is a historical resource even if it does not fall within this presumption (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)).

A "substantial adverse change in the significance of an historical resource" reflecting a significant effect under CEQA means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines Section 15064.5(b)(1); California Public Resources Code Section 5020.1(q)). In turn, CEQA Guidelines section 15064.5(b)(2) states the significance of an historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or
2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

Pursuant to these sections, the CEQA inquiry begins with evaluating whether a project site contains any "historical resources," then evaluates whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource's historical significance is materially impaired.

If it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (California Public Resources Code Section 21083.2[a], [b], and [c]).

California Public Resources Code Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

Impacts to non-unique archaeological resources are generally not considered a significant environmental impact (California Public Resources Code section 21083.2(a); CEQA Guidelines Section 15064.5(c)(4)). However, if a non-unique archaeological resource qualifies as tribal cultural resource (California Public Resources Code Section 21074(c), 21083.2(h)), further consideration of significant impacts is required. CEQA Guidelines Section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. As described below, these procedures are detailed in California Public Resources Code Section 5097.98.

California State Assembly Bill 52

AB 52 of 2014 amended PRC Section 5097.94 and added PRC Sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3. AB 52 established that TCRs must be considered under CEQA and also provided for additional Native American consultation requirements for the lead agency. Section 21074 describes a TCR as a site, feature, place, cultural landscape, sacred place, or object that is considered of cultural value to a California Native American tribe and that is either:

- On or determined to be eligible for the California Register of Historical Resources or a local historic register; or
- A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1.

AB 52 formalizes the lead agency–tribal consultation process, requiring the lead agency to initiate consultation with California Native American groups that are traditionally and culturally affiliated with the project site, including tribes that may not be federally recognized. Lead agencies are required to begin consultation prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report.

Section 1 (a)(9) of AB 52 establishes that "a substantial adverse change to a TCR has a significant effect on the environment." Effects on TCRs should be considered under CEQA. Section 6 of AB 52 adds Section 21080.3.2 to the PRC, which states that parties may propose mitigation measures "capable of avoiding or substantially lessening potential significant impacts to a TCR or alternatives that would avoid significant impacts to a tribal cultural resource." Further, if a California Native American tribe requests consultation regarding project alternatives, mitigation measures, or significant effects to TCRs, the consultation shall include those topics (PRC Section 21080.3.2(a)). The environmental document and the mitigation monitoring and reporting program (where applicable) shall include any mitigation measures that are adopted through the approval of the environmental document (PRC Section 21082.3(a)).

California Health and Safety Code Section 7050.5

California law protects Native American burials, skeletal remains, and associated grave goods, regardless of their antiquity, and provides for the sensitive treatment and disposition of those remains. California Health and Safety Code Section 7050.5 requires that if human remains are discovered in any place other than a dedicated cemetery, no further disturbance or excavation of the site or nearby area reasonably suspected to

contain human remains can occur until the county coroner has examined the remains (Health and Safety Code Section 7050.5(b)). PRC Section 5097.98 also outlines the process to be followed in the event that remains are discovered. If the coroner determines or has reason to believe the remains are those of a Native American, the coroner must contact the NAHC within 24 hours (Health and Safety Code Section 7050.5(c)). The NAHC will notify the "most likely descendant." With the permission of the landowner, the most likely descendant may inspect the site of discovery. The inspection must be completed within 48 hours of notification of the most likely descendant by the NAHC. The most likely descendant may recommend means of treating or disposing of, with appropriate dignity, the human remains and items associated with Native Americans.

Local

Hahamongna Watershed Park Master Plan

The Arroyo Seco Master Plans are a set of documents defining the community vision for the Arroyo Seco Natural Park. The set is comprised of four separate planning documents: the Lower Arroyo Master plan, Central Arroyo Master Plan, Hahamongna Watershed Park Master Plan, and Design Guidelines. The Hahamongna Watershed Park Master Plan is relevant to this report. The Hahamongna Watershed Park Master Plan illustrates a vision for the 300-acres of open space that extends from Devil's Gate Dam north and into the Arroyo Seco Canyon, on the northwestern edge of the City (City of Pasadena 2003). The Master Plan was adopted to establish a framework for recreation, water resources, flood management, habitat restoration, and cultural resources in this area. Applicable goals and objectives from this Master Plan related to tribal cultural resources are listed below.

Goal 5: Enrich and promote the unique history and culture of Hahamongna Watershed Park.

Objectives:

- Develop HWP as a "living laboratory" for local schools and environmental education programs.
- Preserve and encourage Native American use of HWP as a cultural resource.
- Develop passive viewing areas with unique vantage points.

4.9.4 Thresholds of Significance

The significance criteria used to evaluate the Project impacts related to tribal cultural resources are based on Appendix G of the CEQA Guidelines. According to Appendix G of the CEQA Guidelines, a significant impact related to tribal cultural resources would occur if the project would:

> Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:
>
> a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or

b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

4.9.5 Environmental Impacts Analysis

Threshold 4.9a **Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:**

Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k).

Short-Term Construction Impacts

As described above and under Section 4.3, Cultural Resources, no archaeological resources were identified within the Project site as a result of the CHRIS records search or Native American outreach and three previously recorded prehistoric or historic-era archaeological resources that were identified within 0.5-mile of the Project. No previously recorded TCRs listed in the CRHR or a local register were identified within the Project site. During the AB 52 notification and consultation process, the consulting Tribe provided documentation for their belief that TCRs affiliated with the Tribe do exist within and surrounding the proposed Project site and stated, "we have provided to the Lead Agency substantial evidence that the proposed project may have a significant impact on our TCRs." A short-term impact to a TCR can be defined as an impact that would prevent potential use of or access to a tribal cultural resource, such as for ceremonial purposes. No TCRs have been identified on the Project site that meet this criteria of use. Therefore, there are no Project-related conditions that would cause a short-term impact, regardless of presence of any archaeological or tribal cultural resources. Therefore, short-term construction impacts related to a site, feature, place, cultural landscape, sacred place, or object with cultural value to a California Native American tribe, and that is listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources would be less than significant, and no mitigation is required.

Long-Term Operational Impacts

Based on the results of the archaeological records search, the NAHC Sacred Land Files search and AB 52 consultation impacts to tribal cultural resources would be less than significant. Therefore, no mitigation measures are required. However, in response to the AB 52 consultation, the City has developed mitigation measures to ensure the proper treatment of unknown Tribal Cultural Resources that could potentially be encountered during ground disturbing activities, as described under Threshold 4.9b.

Threshold 4.9b **Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:**

A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Short-Term Construction Impacts

Pursuant to AB 52, the City sent notification letters on November 7, 2019 to two tribes that have requested notification of Pasadena projects (see Table 4.9-1). As of the timing of the preparation of this Draft EIR, the Gabrieleño Band of Mission Indians – Kizh Nation is the only Native American individual or tribal organization to have responded to the City's notification letter dated November 7, 2019. Andrew Salas, Chairperson of the Gabrieleño Band of Mission Indians – Kizh Nation (Tribe) provided a response that was received by the City on November 15, 2019. Mr. Salas stated that the Project site is located within the Tribe's ancestral territory and that formal consultation was requested of the City by the Tribe. Formal consultation was conducted over the phone on April 2, 2020 with three representatives from the City and two representatives from the Tribe present. After a description of the Project, history of water improvements and the nature of soils in the Project area provided by the City, the Tribal representatives presented their knowledge of cultural resources in the area as well as their concerns regarding what the Tribe believes to be potential impacts to cultural resources as a result of the proposed Project. As stated under Threshold 4.9a above, no previously recorded TCRs listed in the CRHR or a local register were identified within the Project site. During the AB 52 notification and consultation process, the consulting Tribe provided documentation for their belief that TCRs affiliated with the Tribe do exist within and surrounding the proposed Project site and stated, "we have provided to the Lead Agency substantial evidence that the proposed project may have a significant impact on our TCRs."

The Tribal representatives stated that they request monitoring of soils during ground disturbing activities and that the Tribe is not requesting any Project alternatives or avoidance. The City contacted the Tribe via email on April 29, 2020 and provided proposed mitigation language developed based on the Tribe's input during the April 2, 2020 consultation. Within the email, the City stated that the consultation process will be considered complete absent of further communication to the contrary from the Tribe on or before May 15, 2020. On May 12, 2020, the Tribe emailed the City and provided further language and documentation supporting their request for mitigation measures stating, "we have provided to the Lead Agency substantial evidence that the proposed project may have a significant impact on our TCRs." The Tribe attached to the email specific mitigation language approved by their Tribal Government and requested the mitigation measures be incorporated into the Draft EIR.

Although no TCRs have been identified as present within the Project site as a result of the NAHC SLF and a review of the CRHR and local register, information gathered during tribal consultation demonstrates a potential for unknown subsurface TCRs to be impacted by the Project, which could result in a significant impact.

Therefore, mitigation measures have been included to provide for tribal monitoring of ground disturbing activities (MM-TCR-1), and inadvertent discovery of TCRs (MM-TCR-2). Implementation of MM-TCR-1 and MM-TCR-2 would ensure that potential short-term construction impacts related to an unknown site, feature, place, cultural landscape, sacred place, or object with cultural value to a California Native American tribe, would be reduced to a level less than significant.

Long-Term Operational Impacts

Long-term operational impacts are consistent with the short-term construction impacts and as such, no additional mitigation measures are required.

4.9.6 Cumulative Impacts

The cumulative impacts analysis on TCRs considers whether impacts of the proposed Project together with other projects identified within the vicinity of the Project site, when taken as a whole, substantially diminish the number of TCRs within the same or similar context. Sufficient evidence of existing TCRs within or surrounding the Project site has not been identified through various records searches or AB 52 consultation and as such, the Project site is not part of an existing or known grouping of TCRs that would be impacted as part of the cumulative impacts of other projects. The Devil's Gate Sediment Removal Project, as discussed in Section 3.5, Cumulative Impacts of this Draft EIR, is located to the south and west of the proposed Project site. Since the Devil's Gate project EIR was completed prior to the enactment of AB 52, no formal tribal consultation was conducted (Los Angeles County Department of Public Works 2014). However, the project EIR did include mitigation measures, including archaeological monitoring of native sediments, to address any potential impacts to known or unknown cultural resources. It is anticipated that TCRs that are potentially affected by related projects would also be subject to the same requirements of CEQA and AB 52 as the proposed Project and any impacts would be mitigated, as applicable. These determinations would be made on a case-by-case basis, and the effects of cumulative development on TCRs would be mitigated to the extent feasible in accordance with CEQA and other applicable legal requirements. Therefore, the proposed Project would not cumulatively contribute to a significant impact associated with TCRs and impacts would be less than significant.

4.9.7 Mitigation Measures

MM-TCR-1 Prior to commencement of any ground-disturbing activities, the City of Pasadena shall retain a Native American Monitor approved by the Gabrieleño Band of Mission Indians-Kizh Nation – the tribe that consulted on this project pursuant to Assembly Bill AB 52 (the "Tribe" or the "Consulting Tribe"). The Tribal monitor shall only be present on the Project site during the construction phases that involve ground-disturbing activities. Ground disturbing activities may include, but may not be limited to, pavement removal, potholing or auguring, grubbing, tree removals, boring, grading, excavation, drilling, and trenching within the Project area. The Tribal Monitor shall complete daily monitoring logs that provide descriptions of the day's activities, including construction activities, locations, soil, and any cultural materials identified. The on-site monitoring shall end when all ground-disturbing activities on the Project site are completed, or when the Tribal Representatives and Tribal Monitor have indicated that all upcoming ground disturbing activities at the Project site have little to no potential for impacting

Tribal Cultural Resources. Upon discovery of any Tribal Cultural Resources, construction activities shall cease in the immediate vicinity of the find (not less than the surrounding 100 feet) until the find can be assessed. All Tribal Cultural Resources unearthed by Project activities shall be evaluated by the qualified archaeologist (as required in MM-CUL-4) and the Tribal Monitor approved by the Consulting Tribe. If the resources are Native American in origin, the Consulting Tribe will retain it/them in the form and/or manner the Tribe deems appropriate, for educational, cultural and/or historic purposes.

MM-TCR-2 If human remains and/or grave goods are discovered or recognized at the Project Site, all ground disturbance shall immediately cease, and the county coroner shall be notified per Public Resources Code Section 5097.98, and Health & Safety Code Section 7050.5. Human remains and grave/burial goods shall be treated alike per California Public Resources Code section 5097.98(d)(1) and (2). Work may continue on other parts of the Project site while evaluation and, if necessary, mitigation takes place (CEQA Guidelines Section 15064.5[f]). If a non-Native American resource is determined by the qualified archaeologist to constitute a "historical resource" or "unique archaeological resource," time allotment and funding sufficient to allow for implementation of avoidance measures, or appropriate mitigation, must be available. The treatment plan established for the resources shall be in accordance with CEQA Guidelines Section 15064.5(f) for historical resources and PRC Sections 21083.2(b) for unique archaeological resources. Preservation in place (i.e., avoidance) is the preferred manner of treatment. If preservation in place is not feasible, treatment may include implementation of archaeological data recovery excavations to remove the resource along with subsequent laboratory processing and analysis. Any historic archaeological material that is not Native American in origin shall be curated at a public, non-profit institution with a research interest in the materials, such as the Natural History Museum of Los Angeles County or the Fowler Museum, if such an institution agrees to accept the material. If no institution accepts the archaeological material, it shall be offered to a local school or historical society in the area for educational purposes.

4.9.8 Level of Significance After Mitigation

With adherence to MM-TCR-1 and MM-TCR-2, the potential for impacts to TCRs as a result of the proposed Project would be less than significant.

4.9.9 References

City of Pasadena. 2003. *Hahamongna Watershed Park Master Plan*. Adopted September 29, 2003. Accessed February 21, 2020. https://www.cityofpasadena.net/wp-content/uploads/sites/29/Hahamongna-Watershed-Park-Master-Plan.pdf.

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5 MANDATORY CEQA TOPICS

This Section discusses other issues for which the California Environmental Quality Act (CEQA) requires analysis in addition to the specific issue areas discussed in Chapter 4, Environmental Analysis. These additional issues include (1) significant effects that cannot be avoided, (2) significant irreversible environmental changes that would be caused by the proposed Project should it be implemented, and (3) growth-inducing impacts.

5.1 Significant Unavoidable Environmental Effects

Section 15126.2(c) of the CEQA Guidelines requires an Environmental Impact Report (EIR) to identify significant environmental effects that cannot be avoided if the project is implemented (14 CCR 15000 et seq.). As discussed in Sections 4.1 through 4.9 of this Draft EIR, implementation of the proposed Project would result in potentially significant impacts to Biological Resources, Cultural Resources, Noise, Recreation, Transportation, and Tribal Cultural Resources. All of the proposed Project's environmental impacts to these environmental topics would be mitigated to less-than-significant levels with the incorporation of mitigation measures, with the exception of impacts to historic resources (Section 4.3, Cultural Resources).

As discussed in Section 4.3, there are no plans for the future rehabilitation or replacement of the historic Bridge No. 3 at the time of the preparation of this Draft EIR. Because the timing of the ultimate rehabilitation or replacement of Bridge No. 3 is unknown, it is unknown whether the new permanent bridge would be constructed in such a manner that would allow for its preservation as a historical resource. As such, it is reasonably foreseeable that implementation of the proposed Project, which would retain the temporary bridge structure until funding is available for the design and construction of a new permanent bridge: (1) would allow for the continued deterioration of the existing Bridge No. 3, and (2) would not guarantee its future rehabilitation or replacement in accordance with the U.S. Department of the Interior Standards for the Treatment of Historic Properties. Therefore, even with implementation of mitigation measures, the Project-related impacts to cultural resources would be significant and unavoidable.

Section 15128 of the CEQA Guidelines states that an EIR shall contain a statement briefly indicating the reasons that various possible significant effects of a project were determined not to be significant and were therefore not discussed in detail in the EIR, and that such a statement may be contained in an attached copy of an Initial Study. A copy of the Notice of Preparation (NOP) and Initial Study for the Arroyo Seco Canyon Project Areas 2 and 3 (proposed Project) is included in Appendix A-1 of this Draft EIR, and the appendices to the Initial Study are included in Appendix A-2. Table 5-1 identifies the following: (1) the significance conclusions in the Initial Study for each environmental topic, (2) which topics were determined to not require additional analysis in the Draft EIR, (3) which topics were brought forward into the Draft EIR for further analysis, and (4) the significance conclusions of the Draft EIR. Refer to the Initial Study for the analysis that supports the conclusions included in Table 5-1.

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
Aesthetics ***Except as provided in Public Resources Code Section 21099, would the project:***		
a) Have a substantial adverse effect on a scenic vista?	Less Than Significant Impact	Refer to Initial Study
b) Substantially damage scenic resources including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	No Impact	
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	Less Than Significant Impact	
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	No Impact	
Agriculture and Forestry Resources ***Would the project:***		
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	No Impact	Refer to Initial Study
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	No Impact	
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	No Impact	
d) Result in the loss of forest land or conversion of forest land to non-forest use?	No Impact	
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	No Impact	

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
Air Quality ***Would the project:***		
a) Conflict with or obstruct implementation of the applicable air quality plan?	Potentially Significant: See Section 4.1	Less Than Significant Impact
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?		
c) Expose sensitive receptors to substantial pollutant concentrations?		
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?		
Biological Resources ***Would the project:***		
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	Potentially Significant: See Section 4.2	Less Than Significant Impact With Mitigation Incorporated
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?		
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?		
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?		
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?		
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	No Impact	Refer to Initial Study

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
Cultural Resources ***Would the project:***		
a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	Potentially Significant: See Section 4.3	Significant and Unavoidable Impact
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?		Less Than Significant Impact With Mitigation Incorporated
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	Less Than Significant Impact	Refer to Initial Study
Energy ***Would the project:***		
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	Less Than Significant Impact	Refer to Initial Study
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	No Impact	
Geology and Soils ***Would the project:***		
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:	Less Than Significant Impact	Refer to Initial Study
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.		
ii) Strong seismic ground shaking?		
iii) Seismic-related ground failure, including liquefaction?		
iv) Landslides?		
b) Result in substantial soil erosion or the loss of topsoil?		
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?		

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?		
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	No Impact	
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?1	Potentially Significant: See Section 4.3	Less Than Significant Impact With Mitigation Incorporated
Greenhouse Gas Emissions ***Would the project:***		
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	Less Than Significant Impact: See Section 4.4	Less Than Significant Impact
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?		
Hazards and Hazardous Materials ***Would the project:***		
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	Less Than Significant Impact	Refer to Initial Study
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?		
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?		
d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?		
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	No Impact	
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	Less Than	

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	Significant Impact	
Hydrology and Water Quality ***Would the project:***		
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	Less Than Significant Impact	Refer to Initial Study
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?		Less Than Significant Impact
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:	Potentially Significant Impact: See Section 4.5	Less Than Significant Impact
i. result in substantial erosion or siltation on or off site;		
ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site;		
iii. create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or		
iv. impede or redirect flood flows?		
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	No Impact	Refer to Initial Study
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	Less Than Significant Impact	
Land Use and Planning ***Would the project:***		
a) Physically divide an established community?	No Impact	Refer to Initial Study
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	Less Than Significant Impact	

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
Mineral Resources ***Would the project:***		
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	Less Than Significant Impact	Refer to Initial Study
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?		
Noise ***Would the project result in:***		
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	Potentially Significant Impact: See Section 4.6	Less Than Significant Impact With Mitigation Incorporated
b) Generation of excessive groundborne vibration or groundborne noise levels?		Less Than Significant Impact
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	No Impact	Refer to Initial Study
Population and Housing ***Would the project:***		
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	No Impact	Refer to Initial Study
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?		
Public Services		
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:	No Impact	Refer to Initial Study
Fire protection?		
Police protection?		

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
Schools?		
Parks?		
Other public facilities?		
Recreation		
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	Potentially Significant Impact: See Section 4.7	Less Than Significant Impact With Mitigation Incorporated
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	No Impact	Refer to Initial Study
Transportation ***Would the project:***		
a) Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?	Potentially Significant Impact: See Section 4.8	Less Than Significant Impact With Mitigation Incorporated
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	Less Than Significant Impact	Refer to Initial Study
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?		
d) Result in inadequate emergency access?		

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
Tribal Cultural Resources ***Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:***		
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	Potentially Significant Impact: See Section 4.9	Less Than Significant Impact With Mitigation Incorporated
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?		
Utilities and Service Systems ***Would the project:***		
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	Less Than Significant Impact	Refer to Initial Study
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?		
c) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	No Impact	
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	Less Than Significant Impact	
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?		

Table 5-1. Initial Study Conclusion Summary

CEQA Threshold	Initial Study Conclusion	Draft EIR Conclusion
Wildfire ***If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:***		
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	Less Than Significant Impact	Refer to Initial Study
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?		
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	No Impact	
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	Less Than Significant Impact	

Source: Appendix A-1.

5.2 Significant Irreversible Changes

CEQA Guidelines Section 15126.2(d) requires the evaluation of (14 CCR 15000 et seq.):

> Uses of nonrenewable resources during the initial and continued phases of the project [that] may be irreversible since a large commitment of such resources makes removal or non-use thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as a highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified.

Renewable resources are those that are generally unlimited in supply, such as solar, hydro, or wind energy, and those that can be readily replenished, such as biomass materials that can be grown (e.g. wood products, agricultural commodities). As such, the vast majority of materials used to construct and operate projects are considered to be non-renewable, or those with a finite supply that cannot be readily replenished. Such non-renewable resources include, but are not limited to, fossil fuels, natural gas, metals (e.g. steel, copper, aluminum), plastics, and cement.

Construction Materials Use

Fossil fuel would be used during construction activities in Area 2 and 3 and would include gasoline/diesel for construction equipment, material deliveries, demolition waste disposal, and construction crew travel. No natural gas is required. Petroleum consumed by construction equipment, transport of construction materials, and worker trips would be the primary energy resource expended over the course of construction activities. Construction workers would likely travel to and from the Project area in gasoline- or diesel-powered vehicles. Construction is expected to require approximately one year. However, once construction activities cease, petroleum use from off-road equipment and transportation vehicles would not differ from the operations at the Project site in the current existing condition. Because of the short-term nature of construction and relatively small scale of the construction activities required for the Project, the petroleum consumption would be negligible when compared to California's daily total use of approximately 1.8 million barrels of petroleum. Project impacts related to consumption of nonrenewable resources are considered to be less than significant because the Project would not use unusual or wasteful amounts of energy or construction materials.

In addition to fossil fuel use, a variety of resource materials would be used during the construction process, including steel, wood, concrete, electrical wiring, and fabricated materials. Upon completion of the construction activities, the commitment of such materials is considered irreversible because it is unlikely that the facilities would ever be decommissioned, and if they were decommissioned in the future, it is unlikely that the materials would be reused. Construction and demolition (C&D) waste is required to be diverted from landfills by the CALGreen Code, which requires a minimum 50 percent of diversion; however, for the purposes of this analysis, the use of such resources is considered a permanent and irreversible use.

Construction materials used in Area 2 include the concrete, metal, and rocks for the diversion and intake structure as well as the engineered roughened channel. Additionally, concrete, cinderblocks, roofing materials, and electrical components and wiring would be used for the intake service building, which would house the electrical and hydraulic controls for the diversion structure. Construction materials used in Area 3 would include pipes and valves, as well as engineered fill materials (e.g. sands and gravel) to construct the bermed walls of the spreading basins.

These construction materials would likely be committed to other similar projects in the region if not used for this Project. Resources used for the Project would be typical of similar water infrastructure projects in the region and would require a relatively minimal amount of resources when compared to land use development projects with habitable structures. Therefore, although irretrievable commitments of resources would result from the proposed Project, such changes would be less than significant.

Irreversible changes may occur from environmental damage, such as spill or release of hazardous materials due to failure of human-made structures, or accidental fire resulting from mechanical or electrical failure. While there are many other types of accidents possible, those listed above represent the key sources for irreversible damage that can be associated with water infrastructure projects. As discussed in the Initial Study, construction activities would utilize hazardous materials on a short-term basis, and compliance with existing federal, state, and local regulations regarding hazardous material use, storage, disposal, and transport would prevent risks to public health and safety. Construction wastes that meet hazardous waste criteria would be stored, manifested, transported, and disposed of in accordance with the California Code of Regulations (Title 22) and to the satisfaction of the Los Angeles County Fire Department, which serves as the local Certified Unified Program Agency (CUPA). Therefore, with compliance with applicable state and local regulations, the proposed Project would not result in irreversible damage from environmental accidents associated with the Project.

Operational Use of Resources

Once operational, the Area 2 components would consume more energy on a daily basis than is currently consumed, given the addition of the intake service building that would house the electrical and hydraulic controls for the diversion structure. Electric power for the operation of the diversion structure and control equipment enclosure would be supplied by an existing power line at the Screen Building (southeast of the intake structure). A portion of the energy used would be provided by non-renewable sources, which would be an irreversible commitment of such resources.

The Pasadena Water and Power would service the Project, and the design of the proposed Project are all subject to regulations that are working to reduce the amount of non-renewable resources from development projects. The electrical demand associated with the Area 2 activities is a minor energy consumer compared to other local and regional users that have long-term operations.

No new employees are required for the long-term operation or maintenance of the Project components in Area 2. No operational changes would occur, and may be potentially reduced with the automation of the weir to control flows in the intake. Similarly, PWP's future schedule of maintenance activities would not substantively differ from the current maintenance routine and procedures. City personnel would continue to provide maintenance of the diversion and intake structures as occurs under the existing conditions. Similarly, no new employees are required for the long-term operation or maintenance of the Project components in Area 3. PWP typically scrapes and tills the existing spreading basins about once per year, which is anticipated to generally reflect the proposed ongoing maintenance schedule. An estimated 100 truckloads of soil from the existing and proposed spreading basins would have to be disposed of off-site approximately every 5 years (approximately 20 trucks per year), which is reflective of current maintenance activities. Therefore, the long-term use of non-renewable fossil fuel resources would not be substantively different than in the current condition, and impacts would be less than significant. Therefore, the operation of the proposed Project would not be considered a significant irreversible environmental effect or cause irreversible environmental damage.

5.3 Growth-Inducing Impacts

Section 15126.2(e) of the CEQA Guidelines defines growth-inducement as the ways in which a project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. A project can induce growth by removing obstacles to population growth (e.g. a major expansion of a wastewater treatment plant); providing new transportation infrastructure that reaches previously undeveloped areas; building infrastructure sized beyond the needs to serve the existing region; or otherwise attracting growth to the project area that is not assumed in a General Plan or the regional growth projections. Growth-inducing impacts could be significant if they increase the population or require the construction of new regional-serving facilities that could cause significant environmental effects; and/or facilitate other activities that could significantly affect the environment, either individually or cumulatively.

The proposed Project would not directly foster economic or population growth. The Project does not involve the construction of any habitable structures that could support any occupiable land uses; no commercial or residential activity would result from Project implementation. As discussed above, no new employees would be required for the long-term operation and maintenance of the proposed Project.

The proposed Project would not indirectly foster economic or population growth, or otherwise remove a barrier to growth. The Project would allow for the additional recharge of an average 1,000 acre-feet/yr into the groundwater basin, which would supplement the PWP's local water supplies. The proposed Project would facilitate the efficient use of water in the Arroyo Seco by allowing for the increased utilization of the City's surface water rights and reducing reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD). Importantly, PWP is able to pump between 60 to 80 of the water that is infiltrated through the spreading basins, which would result in a net augmentation of groundwater in storage as a benefit to the basin. The proposed Project would not change the sustainable yield of the groundwater basin or otherwise alter the anticipated water supply projections set forth in the City's Urban Water Management Plan (UWMP). Therefore, the Project would not increase the available water supply such that population growth could be indirectly induced. Because there would be no direct or indirect impact related to fostering economic or population growth, or otherwise remove a barrier to growth, there would be no cumulative impacts related to growth-inducing impacts.

Additionally, the Project would not propose any physical or regulatory changes that would remove a restriction to or encourage population growth in the Project area, such as regulatory changes including General Plan Amendments encouraging population growth, specific plan amendments, zone reclassifications, sewer or water annexations; Local Agency Formation Commission annexation; or other similar actions. The Project is intended to increase water supply reliability and water system resiliency through an increase in local water supplies and would not encourage housing growth or result in growth-inducing impacts.

5.4 References

14 CCR 15000–15387 and Appendices A–N. Guidelines for Implementation of the California Environmental Quality Act, as amended.

California Public Resources Code, Sections 21000–21177. California Environmental Quality Act (CEQA), as amended.

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6 ALTERNATIVES

This section of the Draft EIR describes and evaluates alternatives to the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3 (Project). This section implements the requirements set forth in the CEQA Guidelines (14 CCR 15000 et seq.), and identifies the Environmentally Superior Project Alternative, as required by California Environmental Quality Act (CEQA) Guidelines Section 15126.6(e)(2).

6.1 Introduction

Pursuant to Section 15126.6(a) of the CEQA Guidelines, an Environmental Impact Report (EIR) "shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to a project. Rather it must consider a reasonable range of potentially feasible alternatives that will foster informed decision making and public participation."

Pursuant to Section 15126.6(b) of the CEQA Guidelines, an alternatives discussion must focus on "alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly."

Pursuant to Section 15126.6(c) of the CEQA Guidelines, "the range of potential alternatives to the proposed Project shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects. The EIR should briefly describe the rationale for selecting the alternatives to be discussed. The EIR should also identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process and briefly explain the reasons underlying the lead agency's determination."

The inclusion of an alternative in an EIR does not constitute definitive evidence that the alternative is in fact "feasible." The final decision regarding the feasibility of alternatives lies with the decision maker(s) for a given project, who must make the necessary findings addressing the potential feasibility of an alternative, including whether it meets most of the basic project objectives or reduces the severity of significant environmental effects pursuant to CEQA (California Public Resources Code, Section 21081; see also 14 CCR 15091).

This Draft EIR includes the analysis of three alternatives to the proposed Project:

- Alternative A- No Project/No Action
- Alternative B- Redesigned Spreading Basins in Area 3
- Alternative C- Historic Bridge Rehabilitation

6.2 Project Overview and Objectives

As described in Section 3, Project Description, the City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco for direct use or for spreading into its existing spreading basins for groundwater pumping credits from the Raymond Basin. Of the total amount of water that is infiltrated into the groundwater through the existing spreading basins, PWP has the right to pump between 60 and 80% of that amount for beneficial use in the City's water supply. According to PWP, the current spreading basins reach an

equilibrium during recharge events of 18 cfs, meaning that sustained diversions equaling 18 cfs would fill the basins to capacity, with water percolating at generally the same rate as entering the basins; however, higher flows beyond 18 cfs would not be able to be infiltrated due to capacity constraints (Carollo Engineers 2013). However, improvements in the diversion weir and intake structure in Area 2 and the expansion of the spreading basins in Area 3 would allow for diversion of PWP's right to up to 25 cfs during high storm flow events, which would allow for the diversion, spreading and infiltration of approximately 1,035 acre feet per year (acre-ft/yr) of additional diverted flows into the spreading basins beyond the current condition.

These proposed increased diversions would result in a measurable increase beyond existing conditions only during larger wet-weather flows. There would be little to no difference in the amount of diversions between the current condition and the proposed Project during the drier periods of the year, as discussed in detail in Section 4.5, Hydrology and Water Quality. In summary, the proposed Project would increase diversion of flows from the Arroyo Seco almost exclusively during wet winter months when high stream flows occur because the new diversion/intake structure would be able to better manage the higher flows without damaging the infrastructure.

The Project Objectives include the following:

Objective 1: Fully divert and utilize the City's 25 cubic feet per second surface water rights while operating in a manner objectively consistent with the Raymond Basin Judgment.

Objective 2: Increase the capacity and functionality of the spreading basins to increase PWP's ability to recharge the groundwater basin, as envisioned by the 2011 Water Integrated Resources Plan with its recommendation to maximize the value of the groundwater basin and non-potable supplies.

Objective 3: Provide opportunities for increased aquatic biological functions within the Arroyo Seco by: (1) protecting aquatic animals from passing into the conveyance system, and (2) reducing existing impediments to fish passage at the diversion weir structure.

Objective 4: Increase PWP's ability to rely upon local water for its potable water supply to reduce reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD).

6.3 Alternatives Considered But Not Carried Forward

CEQA Guidelines Section 15126.6(c) recommends that an EIR identify alternatives that were considered for analysis but rejected as infeasible and briefly explain the reasons for their rejection. According to the CEQA Guidelines, among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts. With regard to feasibility, Section 15126.6(f)(1) states, "among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plan or regulatory limitations, jurisdictional boundaries, and whether the applicant can reasonably acquire, control, or otherwise have access to the alternative site." Two alternatives for the Project were considered, but ultimately rejected from further analysis in the Draft EIR, consistent with Section 15126.6(c) of the CEQA Guidelines. A description of the potential alternatives considered, but not carried forward, and the rationale for rejection is provided below.

- Reduced Diversion with In-Stream Spreading
- Consolidated Facility Below JPL Bridge

6.3.1 Reduced Diversion with In-Stream Spreading

As discussed in Section 1, Introduction of this Draft EIR, an Initial Study and Notice of Preparation (NOP) for the proposed Project were distributed on November 4, 2019, to federal, State, regional, and local agencies and interested parties for a 30-day review period to solicit comments and to inform agencies and the public of the proposed Project. The 30-day Initial Study/NOP public review period ended December 6, 2019. The City received nine comment letters in response to the Initial Study/NOP. Comments received in response to the NOP are summarized in Table 1, Notice of Preparation and Scoping Comment Letters Summary, included in Section 1, Introduction of this Draft EIR. A copy of the NOP and Initial Study is included in Appendix A-1, and the comment letters received in response to the NOP are included in Appendix A-3 of this Draft EIR.

Several of the letters received during the NOP public review period suggested that the proposed Project not be implemented in favor of an alternative approach that involves in-stream spreading and percolation. The "Public Comment on Initial Study for Arroyo Seco Canyon Project" submitted on December 4, 2019 (see comment letter included in Appendix A-3), provides a thorough articulation of this proposed alternative, which was similarly suggested by several comment letters. The alternative suggested in the December 4, 2019 comment letter is excerpted and summarized as follows:

1. Measure percolation capacity of the stream from the USGS gauging station down to the dam. RBMB *[Raymond Basin Management Board]* then allows PWP to claim credit for the full percolation of water in the "natural stream channel" before it hits the dam. Flows not absorbed by the stream up to PWP's surface water right (25 cfs) are diverted into the existing spreading basins. E.g. if the stream can absorb 15 cfs before water hits the dam, PWP diverts the remaining 10 cfs into the existing spreading basins.
2. If there is an issue with "natural stream channels" not leading to "existing or new spreading grounds", calculate the percolation rate for the natural stream up to the last of the spreading ponds, Johnson Field. All flows in the natural stream channel up to Johnson Field provide for PWP pumping credit. Most of the year flows, if left in the stream, will not reach Johnson Field.
3. Use the Prop 84 funds to construct new "spreading grounds" that allow for maximization of the high percolation provided by the stream. This includes engaging LACFD to ensure they maximize the percolation capacity of the stream under their clean-out project.
4. If "the law" proves inflexible, challenge the ongoing use of a 75 year old document that dictates an out-dated mechanism of water conservation — science and public attitudes have moved on. The environment and our fragile water supply require better. It is unreasonable to believe that the stakeholders in our local aquifer are not interested in replenishing the same as efficiently as possible.

In summary, this proposed alternative set forth in the NOP comment letter was for the City to consider either: (1) leaving the flows in the "natural stream" and allowing them to be naturally absorbed within the stream, with the City taking credit for up to the calculated natural stream percolation capacity, and diverting the remainder into the spreading basins to achieve the 25 cfs; or (2) installing a low berm facility within the Arroyo Seco near Johnson Field that would "spread" the flows within the stream bed and slow water to allow percolation.

The City took the suggested alternative into consideration, analyzing its feasibility from legal, administrative and technical standpoints. It appears that the suggestion for this alternative comes from the language in the Raymond Basin Judgment, which is attached in Appendix A-2 of this Draft EIR. In relevant part, the Judgment reads:

> "(1) The water shall be spread for percolation into the underground in the existing water conservation facilities of the Los Angeles County Flood Control District, or in such additional spreading grounds as the parties may acquire or construct, or in any natural stream channels leading to such existing or future spreading grounds, provided that all such spreading locations shall be located within the Monk Hill Basin or Pasadena Subarea hydrologic subdivisions of the Western Unit of the Raymond Basin Area."

Regarding the potential "natural stream" approach, it is important to note that the "natural stream channels" noted above are only those "leading to such existing or future spreading grounds", and do not include the existing natural stream in isolation. The Judgment distinguishes between water taken for pumping credit, and water taken directly from the stream as follows:

> "(8) The right to divert for spreading and recapture is an alternative, in whole or in part, to the right to make direct use of such diversions, and does not preclude the direct use of such water, provided that the total amount of water diverted, either for spreading or direct use, does not exceed the respective rights of the parties set forth above."

In other words, in the absence of direct use of the water (i.e. diversion into a treatment plant rather than infiltration into the groundwater basin), the only way for the City to earn pumping credit is by diversion from the natural stream, and for that diverted water to end up in spreading grounds. As such, leaving the flows in the "natural stream" is not an option set forth in the Raymond Basin Judgment and is therefore infeasible.

This scenario would require a re-negotiation of the adjudicated agreement, as there is no ability in the Judgment for the City to take pumping credit for water left in the stream. This interpretation and conclusion has been determined by the PWP as well as the City Attorney. This is similarly concluded by the Flood *Hazard, Sediment Management, and Water Feature Analyses, Hahamongna Watershed Park*, prepared by Phillip Williams & Associates (PWA), which is referenced several times in the comment letter. As stated in that report, leaving the flows in the "natural stream" would require a "significant adjustment to the adjudication of water rights for the City of Pasadena," and "should be understood that any recommended significant changes to the way the City uses this water right and gains groundwater credit may necessitate a re-negotiation of the City's original adjudicated agreement, which could be a lengthy and difficult process" (PWA 2000). The Raymond Basin and its producers are governed by a stipulated Judgment. The process for changing any of the components of the Judgment would require legal action beginning with a petition to the Court. All parties to the Judgment would have an opportunity to remark, including on any other aspects of the Judgment. For these reasons, the City has been consistent in its rejection of this potential alternative in the past, and therefore has eliminated it as a potential alternative to the proposed Project.

Much of the rationale for the alternative project set forth in the NOP comment letter is based on findings from the PWA report. However, it should be noted that PWA's stated objective was to preliminarily examine the feasibility of implementing and maintaining a recreational water feature in the Hahamongna Watershed Park, and they acknowledged "conflicting resource management objectives" such as those of the City's for groundwater recharge.

While the report suggests that restoring natural flows to the park would increase groundwater recharge, it does not address the practical matter of implementing the recommendations for water supply.

In addition to the administrative and legal challenges to implementing the alternative project set forth in the NOP comment letter, there are practical/technical challenges as follows:

1. Even in the hypothetical scenario in which the Judgment is amended to allow pumping credit for water not diverted from a stream, the alternative project would require measurement of the stream's percolation capacity in order calculate the corresponding pumping credits the City should receive. Hydraulic conductivity, (i.e., percolation), is a soil property that can be quantified for a general soil type, or tested for a specific soil location, but its true value will vary spatially as well as over time. Additionally, percolation potential varies with the channel discharge (PWA 2000), (i.e. percolation decreases with lower stream flows and vice versa). Because of these variables, any quantification of percolation in the natural stream would, therefore, only be an estimate for a specific stream flow, and therefore not accurate enough to be defensible in terms of the requirements of the Judgment.

   In contrast, the proposed Project would measure the volume of water diverted for groundwater recharge through a flow metering device. Also, the proponent suggests that the boundaries for the alternative project would be the natural stream from the USGS gauging station to the dam. It is assumed that this reach is suggested because of the current ability to measure stream flows at the gauging station. However, the boundaries of the Monk Hill sub-basin do not extend this far north. Therefore, a measurement of surface flows as they enter the northern boundary of the sub-basin would require a new gauging station at this location, or another estimate for flows.

   The alternative project approach also does not account for other sources of water, including surface run-off and discharge from storm drains that contribute to the stream flows and either percolate in the natural stream or collect behind Devil's Gate Dam. In other words, these other waters are either consuming fully or in part the streambed's capacity for natural recharge. So, while these flows could be estimated (although there are no measuring devices on the several storm drain outlets) they would need to be discounted from the stream's estimated percolation capacity to ascertain the remaining capacity for percolating the City's water rights. The Raymond Basin Judgment does not include provisions for the City to take credit for stormwater flows percolating in the basin. With so many variables, and the inability to obtain any actual measurements, "measuring the percolation capacity of the stream" to claim credit for water "spread in the natural stream" would be a guess at best, and therefore not accurate enough to be defensible in terms of the requirements of the Judgment. Additionally, leaving flows in the natural stream reduces overall recharge of the basin under the conditions that the Project seeks to benefit from. Under the alternative project, stream flows that are not diverted to spreading basins "compete" for the stream's limited capacity for natural percolation and would displace flows from other sources that would otherwise percolate into the groundwater basin via the streambed. Flows that are not able to percolate in the streambed collect in the Devil's Gate Reservoir. As the water level in the reservoir rises, the Los Angeles County Flood Control District (LACFCD) follows a dam operation plan to release water. By not diverting to spreading basins this outflow would increase and overall recharge of the basin would be diminished.
2. Since the percolation capacity of the natural streambed is variable, excess flows up to the City's 25 cfs water right that are diverted into the spreading grounds would also vary. However, there is no feasible way to control the diversion and limit the flows so that the aggregate recharge does not exceed 25 cfs without a new diversion and intake structure in the stream. It is not uncommon to insert a

barrier in a channel for the purpose of diverting water elsewhere, but this type of operation requires infrastructure that would seem contrary to the goals of the alternative project. The Project's diversion and intake structure in Area 2 is further example of the infrastructure that is required for controlling flows left in the stream and diverted to spreading basins, although its goal is to first allow for intake of the stream flows with flows in excess of the City's water rights remaining in the stream.

3. The LACFCD's Devil's Gate Reservoir Sediment Removal and Management Project will remove 1.7 million cubic yards (MCY) of sediment for flood control. The amount of sediment to be removed includes 1.3 MCY brought into Devil's Gate Reservoir by storms following the 2009 Station Fire, and helps LACFCD prepare for a future major debris storm event. While percolation rates may be higher initially following the sediment removal project, the LACFCD has questioned an actual long-term increase in percolation rates to groundwater from ponding behind Devil's Gate Dam based on their experience from managing other reservoirs and deep pit spreading basins (PWA 2000). In line with this experience and as part of their mission to conserve as much stormwater as practicable, LACFCD has developed a concept for conserving the water behind the dam by diverting it elsewhere for spreading (and not by retaining it behind the dam). The LACFCD has built dams and spreading ground facilities to store and conserve stormwater throughout Los Angeles County. This common practice of spreading stormwater has typically allowed over 270,000 AFY of recharge into various groundwater basins. The LACFCD's analysis of 63 years of historical records shows that Devil's Gate Reservoir has an average annual outflow of 6,900 acre-feet which passes through the dam and is currently wasted to the ocean. The LACFCD conservation concept for Devil's Gate Dam would redirect a portion of the outflow to spreading basins. Therefore, it is unreasonable to expect that engagement with LACFCD would "ensure they maximize the percolation capacity of the stream under their clean-out project"; LACFCD is already thinking of how best to conserve water and their answer is through spreading. Also, for the record, Proposition 84 funds that were once available to the City to partially fund the Project, had to be forfeited as a result of the lawsuit.
4. Regarding the potential "seasonal low-berm near Johnson Fields" approach, the intent set forth in the NOP comment letter would be to "spread" the flows and slow the water to allow percolation within the Arroyo Seco stream bed. A seasonal berm at the lower end of Johnson Field, or anywhere before the Devil's Gate Dam, would be considered a new "spreading ground," allowing PWP to claim credit for all natural flows up to that berm. However, this potential scenario is also infeasible for the following reasons.

   It is not clear that such a seasonal berm would be considered a "spreading basin" in a manner that would satisfy the Raymond Basin Judgment. The construction of a "seasonal" berm would not provide for a permanent facility that could reliably serve to capture PWP's 25 cfs. The highly dynamic alluvial soils within the Arroyo Seco and Devil's Gate Reservoir are subject to sedimentation and scour activity as the active channel alignment migrates across the alluvial fan area and where sediment is regularly changing the channel capacity. The combination of flash flood conditions and high volumes of sediment create a highly dynamic flow condition that could cause extensive damage to development located within the alluvial fan flood inundation zones. The evaluation of a permanent structure within the stream bed of the Arroyo Seco is discussed under 6.3.3 below.

   Importantly, such a berm would be within the limits of the LACFCD Devil's Gate Sediment Removal Project's Phase I Restoration area as well as within the limits of the 42-acre Annual Maintenance Area that is subject to regular sediment removal/maintenance, as identified in Figure 3-5, Cumulative Projects, in Section 3, Project Description of this Draft EIR. As shown, the land between the alluvial streambed of the Arroyo Seco and the western edge of the spreading basins within

Area 3 have been revegetated as a part of the LACFCD's required restoration efforts from approximately Basin 2 to Basin 12. As of January 2020, the LACFCD has conducted weed abatement, installed irrigation facilities, and has seeded the area and planted a combination of container plants and coast live oak acorns (LACFCD 2020).

This potential alternative would require construction of facilities within the stream, where infrastructure currently does not exist, and where the LACFCD has jurisdiction to conduct their flood control operations associated with Devil's Gate Dam. Similar to the proposed Project, the alternative would be subject to the California Fish and Game Code, including the requirement to not prevent or impede the passing of fish. Further, this alternative would have potentially significant biological impacts greater than the proposed Project given the construction within the streambed that it would necessitate. For these reasons, the City has eliminated it as a potential alternative to the proposed Project.

Additionally, the proposed Project's only unavoidably significant environmental impact is related to impacts to the historic Bridge No. 3, and these potential alternative scenarios would have the same impacts as the proposed Project thereon.

6.3.2 Consolidated Facility Below JPL Bridge

A version of this potential alternative was preliminarily evaluated in the Upper Arroyo Seco Watershed Integrated Spreading Grounds Concept Report prepared by CDM Smith in 2012. A portion of the alternative considered in 2012 included restoration of Area 1, which as discussed in Section 2, Environmental Setting of this Draft EIR, has been approved to proceed through the 2015 Initial Study/Mitigated Negative Declaration and associated Settlement Agreement. Therefore, this potential alternative considers implementation of most of the remaining portions of 2012 design recommendation.

This potential alternative includes relocating the diversion capabilities of the diversion weir and intake structure within Area 2 and the sedimentation function of the former settlement ponds in Area 1 to a consolidated facility downstream of the JPL Bridge. The potential location of this combined facility is illustrated on Figure 6-1, Consolidated Facility Below JPL Bridge, and is at the site of the former "breakaway" dam used by the LACFCD when they operated the spreading basins for water conservation. The consolidated facility would include a diversion structure and a sediment forebay to simplify sediment management and maintenance activities by replacing scattered diversion and sedimentation facilities, presently located within the Arroyo Seco Canyon and accessed by canyon roads, which are difficult to navigate and maintain, to a consolidated facility downstream of the mouth of the canyon (CDM Smith 2012).

This potential alternative would demolish the existing facilities in Area 2 and abandon the conveyance system, and would restore that portion of the Arroyo Seco. Stream flows would be captured behind the new consolidated diversion dam located just downstream of the JPL Bridge adjacent to Area 3 and diverted into the expanded spreading basins, as set forth in the proposed Project. The impoundment area created by the dam would be much larger than the pooling of water at the intake in Area 2 of the Project, where grading would be limited to the immediate area of the diversion.

Although this alternative would satisfy the proposed Project Objectives, this alternative does not avoid any significant environmental impacts of the proposed Project and would increase the environmental impacts in comparison to the proposed Project. This potential alternative would create a new engineered facility within the Arroyo Seco where none currently exists, rather than replacement in-kind of an existing facility within largely the same footprint as the current facility (i.e. proposed Project Area 2).

Impacts related to the recreational setting would be substantial due to the creation of a new structure within the Arroyo Seco at a location that would be much more visible to recreational users than the proposed replacement of the existing structure in Area 2. New permanent impacts would result to the topics of biological resources, cultural and tribal cultural resources, geology and soils, and hydrology due to the creation of a new structure that requires permanent alterations to a previously undisturbed area. A new dam at this location would also have the potential to disturb the downstream alluvial and sediment transport dynamics because the facility would retain sediment behind its fixed crest. The accumulation of sediment would have to be routinely addressed in order to maintain the intended diversion capacity, presumably by removing the sediment from the streambed, thereby altering the natural morphology of the stream. In comparison, the proposed Project with its operable weir concept would have the advantage of managing sediment and minimizing effects on the channel morphology. All environmental topics would have increased impacts, rather than reduced environmental impacts, with is contrary to the intent of an alternatives analysis pursuant to Section 15126.6(a) of the CEQA Guidelines.

Additionally, creation of a new dam structure that would span the width of the Arroyo Seco would involve a more complex set of regulatory permitting requirements, not only for the construction but for the routine maintenance that would be required for operation of the project. A new permanent engineered structure would require permanent vegetation removal and annual maintenance requirements in the streambed, including the removal of sediment in the water impoundment area; whereas, the proposed Project would not require additional permitting for routine maintenance. The permitting requirements for the potential alternative would include but not be limited to application to and permitting by the U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and Regional Water Quality Control Board (RWQCB), and possibly by the California Department of Water Resources (DWR), Division of Safety of Dams (DSOD), if the structure would be more than 6 feet tall and impound 50 acre-feet or more of water. DSOD oversight, for example, would require detailed design review and approval in conformance with the agency's standards, and subsequent periodic inspections, fees and permissions for work within their jurisdiction. Likewise, CDFW's permission and the payment of fees would be required beyond initial construction for on-going maintenance, likely imposing restrictions on timeframes for the work, and the allowable scope of work in the streambed. The new structure would also need to incorporate a fish screen facility, as required for the proposed Project, and considerations for future fish passage. For these reasons, this alternative was considered but not carried forward for further analysis. Additionally, the proposed Project's only unavoidably significant environmental impact is related to impacts to the historic Bridge No. 3, and this potential alternative scenario would have the same impacts as the proposed Project thereon.

6.4 Alternatives to the Proposed Project

This section discusses the alternatives to the Project, including the No Project Alternative, under consideration. However, the range of alternatives analyzed is limited, as discussed above, based upon the Project site's location and purpose. The No Project/No Action Alternative, which is a required element of an EIR pursuant to Section 15126.6(e) of the CEQA Guidelines, examines the environmental effects that would occur if the Project were not to proceed and no development activities were to occur. The other alternatives are discussed as part of the "reasonable range of alternatives" selected by the City, as Lead Agency, that would attain most of the basic objectives of the Project, would be potentially feasible to implement, and would avoid or substantially lessen one or more of the significant effects of the Project. Accordingly, the following alternatives to the Project were selected for consideration in this Draft EIR:

- Alternative A- No Project/No Action

- Alternative B- Redesigned Spreading Basins in Area 3
- Alternative C- Historic Bridge Rehabilitation

Pursuant to Section 15126.6(d) of the CEQA Guidelines, each alternative is evaluated in sufficient detail to determine whether the overall environmental impacts would be less than, similar to, or greater than the corresponding impacts of the Project. Each alternative is also evaluated to determine whether the Project objectives would be substantially attained.

6.4.1 Alternative A – No Project/No Action

Under Alternative A, the proposed Project would not be implemented as discussed in Section 3 of this Draft EIR. The Areas 2 and 3 of the Project site would remain unchanged, and no development activity would occur. Operations and maintenance activities would continue to occur into the future, as in the current condition.

Ability to Meet Project Objectives

Objective 1: Fully divert and utilize the City's 25 cubic feet per second surface water rights while operating in a manner objectively consistent with the Raymond Basin Judgment.).

Alternative A would partially satisfy this Project Objective. Alternative A would maintain the current condition in which the existing facilities in Area 2 are damaged, regularly clogged with sediment, and incapable of efficiently diverting the City's full surface water rights. Similarly, with no expansion of the existing spreading basins in Area 3, the 18 cfs capacity for spreading and infiltration would remain unchanged. However, the current system does operate in compliance with the Raymond Basin Judgment and would continue to do so in the No Project/No Action Alternative.

Objective 2: Increase the capacity and functionality of the spreading basins to increase PWP's ability to recharge the groundwater basin, as envisioned by the 2011 Water Integrated Resources Plan with its recommendation to maximize the value of the groundwater basin and non-potable supplies.

Alternative A would not satisfy this Project Objective. Alternative A would not expand the existing spreading basins in Area 3, and the 18 cfs capacity for spreading and infiltration would remain unchanged. This would be inconsistent with the Water System and Resources Plan's objective for enhancing local water supplies for sustainable and reliable water service.

Objective 3: Provide opportunities for increased aquatic biological functions within the Arroyo Seco by: (1) protecting aquatic animals from passing into the conveyance system, and (2) reducing existing impediments to fish passage at the diversion weir structure.

Alternative A would not satisfy this Project Objective. Alternative A would maintain the current damaged condition of the existing facilities in Area 2. These existing facilities do not contain any fish screen mechanism or ability to protect future fish populations from being stranded in the conveyance system and spreading basins. Additionally, the existing diversion dam is a barrier to both upstream and downstream fish migration.

Objective 4: Increase PWP's ability to rely upon local water for its potable water supply to reduce reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD).

Alternative A would not satisfy this Project Objective. Alternative A would not allow for the local water supplies to be augmented and the City would not be able to off-set the use of imported MWD water with the additional local water supply.

Comparison of the Effects of Alternative A to the Project

Air Quality

Short-Term Impacts: Alternative A would not alter the existing condition of the Project site or require any construction activities, and, therefore, would not result in any construction emissions associated with construction worker and construction truck traffic, or the use of heavy-duty construction equipment. As such, construction-related regional and localized air quality impacts would not occur. Even though no significant impacts would result and no mitigation was required for the proposed Project, because Alternative A would result in no short-term impacts to air quality, impacts under Alternative A would be ***less than*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative A, operations and operational emissions would remain in the current condition. The proposed Project would not generate any additional air emissions of criteria pollutants when compared to the current condition. Therefore, operational impacts on air quality under this alternative would be ***the same as*** those anticipated from the proposed Project.

Biological Resources

Short-Term Impacts: Under Alternative A, the Project site would remain in its existing condition and potential temporary impacts to biological resources would not occur. Implementation of the proposed Project would result in significant direct and indirect temporary impacts to biological resources prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant under the proposed Project. Because Alternative A would result in no impacts to biological resources, short-term impacts under Alternative A would be ***less than*** anticipated under the Project. None of the mitigation measures set forth in Section 4.2, Biological Resources, would be required under Alternative A.

Long-Term Impacts: Under Alternative A, the Project site would remain in its existing condition and the potential benefits of the proposed Project related to implementation of fish protections would not occur. Under current conditions, there is no potential for future fish migration because of the fixed barrier at the diversion/weir structure, and there is no screening for fish protection to prevent future fish populations from entering the conveyance system and being stranded in the spreading basins. Additionally, there is no capacity for managing sediment and minimizing the effects on the channel morphology. In contrast, the proposed Project would minimize the drop to the downstream channel and provide a roughened channel for future fish passage (if present), would provide screens for future fish protection, and would reduce the structure's effects on hydraulic and sediment transport in the stream. Implementation of the proposed Project would result in significant direct and indirect permanent impacts to biological resources prior to mitigation; however, all Project-related impacts

would be mitigated to levels less than significant under the proposed Project and the proposed Project would be beneficial for future fish populations within the Arroyo Seco.

Because Alternative A would be more impactful to biological resources, specifically due to the potential to sustain future fish populations when compared to the benefits of the proposed Project, long-term impacts under Alternative A would be ***greater than*** anticipated under the Project. None of the mitigation measures set forth in Section 4.2, Biological Resources, would be required under Alternative A.

Cultural Resources

Short-Term Impacts: Alternative A would not impact culturally significant resources because no ground disturbance would occur on the Project site. The Project site would remain as is and potential construction impacts (including ground-disturbing activities such as grading or other earthwork) that could risk potential disturbance of previously unknown resources, would not occur. However, Alternative A would be similar to the proposed Project regarding the historic Bridge No. 3. As discussed in Section 4.3, there are no plans for the future rehabilitation or replacement of the historic Bridge No. 3 at the time of the preparation of this Draft EIR. The timing of the ultimate rehabilitation or replacement of Bridge No. 3 is unknown, and it is unknown whether the new permanent bridge would be constructed in such a manner that would allow for its preservation as a historical resource. As such, it is reasonably foreseeable that implementation of the proposed Project as well as Alternative A (No Project/No Action), which would retain the bridge overlay structure until funding is available for the design and construction of a new permanent bridge: (1) would allow for the continued deterioration of the existing Bridge No. 3, and (2) would not guarantee its future rehabilitation or replacement in accordance with the U.S. Department of the Interior Standards for the Treatment of Historic Properties. Therefore, even with implementation of mitigation measures, the Project-related impacts to cultural resources would be significant and unavoidable. Both the No Project Alternative and the proposed Project would keep the existing structural bridge overlay on top of Bridge No. 3 into the foreseeable future, and short-term impacts to historic resources would be ***the same as*** the proposed Project. For archaeological and paleontological resources, impacts under this alternative would be ***less than*** those anticipated from the proposed Project. None of the mitigation measures set forth in Section 4.3, Cultural Resources, related to archaeological or paleontological resources would be required under Alternative A.

Long-Term Impacts: Under Alternative A, operations would remain in the current condition, and would not have any long-term impacts on archaeological or paleontological resources. However, due to potential significant impacts to historic Bridge No. 3 under both Alternative A and the proposed Project, even after the inclusion of mitigation measures, impacts on historic resources (a subset of "cultural resources") under this alternative would remain because the bridge overlay structure is anticipated to remain in place for the foreseeable future. Therefore, impacts to historic resources under Alternative A would be ***the same as*** those anticipated from the proposed Project.

Greenhouse Gas Emissions

Short-Term Impacts: Alternative A would not alter the existing condition of the Project site or require any construction activities, and, therefore, would not generate any short-term construction-related GHG emissions, nor result in an increase in construction-related energy use. Even though no significant impacts would result and no mitigation was required for the proposed Project, because Alternative A

would result in no short-term impacts to greenhouse gas emission, impacts under Alternative A would be ***less than*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative A, operations and operational emissions would remain the same as in the current condition. Under the proposed Project, operational conditions would be similar to that of existing conditions, with the exception of the new intake service building, which would be constructed in Area 2 to house the electrical controls for the diversion structure. However, the proposed Project would further reduce City's reliance upon purchased imported water supplies from the Metropolitan Water District of Southern California (MWD). The City is a member agency of MWD, which serves wholesale treated water to the City imported from the Colorado River Aqueduct and the State Water Project (SWP). Because the Project would increase the supply of local groundwater in replacement of imported water, there would be a reduction in electricity associated with the water source. For imported water, electricity is needed to supply and transport the water from sources in other parts of California, which is a very energy-intensive process to pump the water across the State through topographical elevation changes. However, for local groundwater, electricity is only needed for pumping. Accordingly, electricity associated with supply of water from MWD is avoided as a result of replacing the some of the City's reliance on imported water source with local groundwater supplies. Under Alternative A, the Project site would remain in its existing condition and the potential benefits of the proposed Project related to reductions in greenhouse gas emissions would not occur. No significant impacts would result and no mitigation was required for the proposed Project. Although Alternative A would have no long-term impact on GHG emissions, impacts under Alternative A would be ***greater than*** those anticipated from the proposed Project.

Hydrology and Water Quality

Short-Term Impacts: Alternative A would not alter the existing condition of the Project site or require any construction activities, and, therefore, would not generate any short-term construction-related hydrology or water quality impacts, including no need for temporary diversion coffer dams or other activities that could generate construction-related pollutants. Even though no significant impacts would result and no mitigation was required for the proposed Project, because Alternative A would result in no short-term impacts to hydrology and water quality, impacts under Alternative A would be ***less than*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative A, the operational state would remain the same as in existing conditions and no additional diversions from the Arroyo Seco would occur. Even though no significant impacts would result and no mitigation was required for the proposed Project, because Alternative A would result in no long-term impacts to hydrology or water quality, impacts under Alternative A would be ***less than*** those anticipated from the proposed Project.

Noise

Short-Term Impacts: Alternative A would not involve construction that could result in noise from the temporary use of heavy-duty construction equipment or generation of construction traffic, including worker and haul truck trips to the Project site. Because Alternative A would result in no long-term impacts to noise, impacts under Alternative A would be ***less than*** those anticipated from

the proposed Project. None of the mitigation measures set forth in Section 4.6, Noise, would be required under Alternative A.

Long-Term Impacts: Under Alternative A, the operational state would remain the same as in existing conditions. Under the proposed Project, there would be no new sources of operational noise. Therefore, operational impacts on noise under this alternative would be ***the same as*** those anticipated from the proposed Project.

Recreation

Short-Term Impacts: Alternative A would not require temporary closure of portions of surrounding trails due to construction activities. Because Alternative A would not affect recreational activities or facilities in the Arroyo Seco, short-term impacts to recreation under this alternative would be ***less than*** those anticipated from the proposed Project. None of the mitigation measures set forth in Section 4.7, Recreation, would be required under Alternative A.

Long-Term Impacts: Alternative A would not result in permanent changes to recreational activities or the use of trails within the Arroyo Seco. However, upon completion of the proposed Project, all temporarily impacted trail connections would be restored and there would be no long-term impacts to recreation. Therefore, long-term impacts to recreation under this alternative would be ***the same as*** those anticipated from the proposed Project.

Transportation

Short-Term Impacts: Alternative A would not generate short-term traffic or transportation impacts because no construction would occur. Because Alternative A would not generate construction traffic in the Arroyo Seco, short-term impacts to transportation under this alternative would be ***less than*** those anticipated from the proposed Project. None of the mitigation measures set forth in Section 4.8, Transportation, would be required under Alternative A.

Long-Term Impacts: Under Alternative A, the operational state would remain the same as in existing conditions. Under the proposed Project, there would be no new sources of operational traffic. Therefore, operational impacts on transportation under this alternative would be ***the same as*** those anticipated from the proposed Project.

Tribal Cultural Resources

Short-Term Impacts: Alternative A would not impact culturally significant tribal cultural resources because there would be no ground-disturbing activities. Because this alternative would not affect tribal resources in the Arroyo Seco, short-term impacts under this alternative would be ***less than*** those anticipated from the proposed Project. None of the mitigation measures set forth in Section 4.9, Tribal Cultural Resources, would be required under Alternative A.

Long-Term Impacts: Under Alternative A, operations would remain in the current condition, and would not have any long-term impacts on tribal cultural resources. The proposed Project, once in operation, would not involve additional ground-disturbing activities that could impact potential unknown tribal cultural resources. Therefore, operational impacts on tribal cultural resources under this alternative would be ***the same as*** those anticipated from the proposed Project.

6.4.2 Alternative B – Redesigned Spreading Basins in Area 3

Under Alternative B, all activities proposed within Area 2 would continue to be implemented, as set forth in the proposed Project. The alternative design of Area 3 would mimic the primary design objectives and operational characteristics of the Project, including: use of a settling basin to facilitate removal of debris and sediment from water prior to conveyance to the spreading basins, use of a concrete flume to meter flow into the infiltration basins, and use of stepped basins with gravity flow interconnection pipes. Figure 6-2A, Alternative B, Redesigned Spreading Basins and Figure 6-2B, Alternative B, Landscaping Palette depict a conceptual design for Alternative B.

The infiltration capacity of the alternative would maintain the full 25 cfs capacity, utilizing a total of 5 infiltration basins with a total basin bottom square footage of approximately 4.5 acres. This alternative would relocate some of the parking stalls from the future recreational parking lot located just south of the JPL Bridge to the eastern edge of Area 3 near the Explorer Well site to provide for the altered configuration of the spreading basin design. The relocated parking stalls would be intermittent angled along the Explorer Road.

The objective of Alternative B would be to provide an improved design with more appeal for recreational users by eliminating the rectangular shapes of the existing condition, as well as the proposed Project design, through use of curvilinear basin features that more closely resemble natural channel and stream functions. The recreational amenities would be further improved through the use of native, drought-tolerant landscape plantings around the basins, as shown in Figure 6-2B. The Alternative B basin layout and landscaping would have the added benefit of enhancing the proposed trail network for pedestrians and equestrian usage, with incorporation of educational kiosks, benches, interpretive signage, and shade structures adjacent to the spreading basins along the proposed pedestrian trails/maintenance roads. Alternative B would replace the enclosed concrete sedimentation basin (Basin A) with an open settlement pond. Alternative B would also include a slight realignment of Explorer Road to reflect the more curvilinear contours of the spreading basins and to allow for the future Explorer Well site to be east of the recreational trail amenities. Relocating the well site to the east would make it less prominent when viewing the area from the Gabrielino Trail above.

Ability to Meet Project Objectives

Objective 1: Fully divert and utilize the City's 25 cubic feet per second surface water rights while operating in a manner objectively consistent with the Raymond Basin Judgment.

Alternative B would satisfy this Project Objective. Alternative B would be designed to include the same capacity as the proposed Project, thereby allowing for the same anticipated spreading and infiltration into the Raymond Basin as the proposed Project. This Alternative would not alter the City's ability to operate in compliance with the Raymond Basin Agreement and the 1984 Judgment.

Objective 2: Increase the capacity and functionality of the spreading basins to increase PWP's ability to recharge the groundwater basin, as envisioned by the 2011 Water Integrated Resources Plan with its recommendation to maximize the value of the groundwater basin and non-potable supplies.

Alternative B would satisfy this Project Objective. Alternative B would be designed to include the same capacity as the proposed Project, thereby allowing for the same anticipated spreading and infiltration into the Raymond Basin as the proposed Project, which is consistent with the Water System and Resources Plan.

Objective 3: Provide opportunities for increased aquatic biological functions within the Arroyo Seco by: (1) protecting aquatic animals from passing into the conveyance system, and (2) reducing existing impediments to fish passage at the diversion weir structure.

Alternative B would satisfy this Project Objective. Alternative B does not involve any changes to the proposed facilities in Area 2. Therefore, the design of Area 2 would continue to include: (1) a fish screen to prevent future fish from entering the intake, and (2) an engineered roughened channel downstream of the new diversion structure and operable weir to allow return passage upstream should fish pass during periods of high flows.

Objective 4: Increase PWP's ability to rely upon local water for its potable water supply to reduce reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD).

Alternative B would satisfy this Project Objective. Alternative B would allow for the local water supplies to be augmented and the City would be able to off-set the use of imported MWD water with the additional local water supply.

Comparison of the Effects of Alternative B to the Project

Air Quality

Construction: The design of Alternative B is anticipated to require a similar amount of earthwork because the spreading basins would be within the same construction footprint and would be designed to obtain the same spreading capacity. It is possible that less export of sediment would be required due to the jetties (earthen projections) into the spreading basins that facilitate the more organic and curvilinear design. However, for the purposes of comparison to the proposed Project, it is anticipated that construction-related impacts on air quality under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Operation: Neither the proposed Project nor Alternative B would generate any additional air emissions of criteria pollutants when compared to the current condition. Therefore, operational impacts on air quality under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Biological Resources

Short-Term Impacts: Under Alternative B, the components in Area 3 would be implemented within the same construction footprint and would not result in any additional impacts to biological resources that were not already considered and analyzed in this Draft EIR. Implementation of the proposed Project would result in significant direct and indirect temporary impacts to biological resources prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All of the mitigation measures set forth in Section 4.2, Biological Resources, would still be required under Alternative B. Therefore, short-term impacts on biological resources under Alternative B would be ***the same as*** those anticipated under the Project.

Long-Term Impacts: Under Alternative B, the operational conditions would be similar to that of the proposed Project. Implementation of the proposed Project would result in significant direct and indirect permanent impacts to biological resources prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All mitigation measures set forth in Section 4.2, Biological Resources, would still be required under Alternative B. Therefore, long-term operational impacts on biological resources under Alternative B would be ***the same as*** those anticipated under the Project.

However, Alternative B includes various landscape plantings, including native vegetation plants, trees, and seed mixes, which would contribute to the biological resources and habitat in the area. Therefore, long-term benefits to biological resources of Alternative B would not occur under the Project.

Cultural Resources

Short-Term Impacts: Under Alternative B, the components in Area 3 would be implemented within the same construction footprint and would not result in any additional impacts to cultural resources that were not already considered and analyzed in this Draft EIR. Implementation of the proposed Project would result in significant impacts to cultural resources prior to mitigation. All Project-related impacts would be mitigated to levels less than significant, with the exception of impacts to the historic Bridge No. 3, which would remain significant and unavoidable. All of the mitigation measures set forth in Section 4.3, Cultural Resources, would still be required under Alternative B. Therefore, impacts on cultural resources (i.e. historic, archaeological and paleontological resources) under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative B, the operational state would be similar to that of the proposed Project. The proposed Project, once in operation, does not propose any long-term operational earthwork that could disturb or cause a substantial adverse change in the significance of a cultural resource. All of the mitigation measures set forth in Section 4.3, Cultural Resources, would still be required under Alternative B, and the significant unavoidable impact associated with the proposed Project would also result from implementation of Alternative B. Therefore, operational impacts to cultural resources (i.e. historic, archaeological and paleontological resources) under this Alternative B would be ***the same as*** those anticipated from the proposed Project.

Greenhouse Gas Emissions

Short-Term Impacts: The design of the Alternative B is anticipated to require a similar amount of earthwork because the spreading basins would be within the same construction footprint and would be designed to obtain the same spreading capacity. It is possible that less export of sediment would be required due to the jetties (earthen projections) into the spreading basins that facilitate the more organic and curvilinear design. However, for the purposes of comparison to the proposed Project, it is anticipated that construction-related impacts on greenhouse gas emissions under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative B, operations and operational emissions would be the same as under the proposed Project. Therefore, operational impacts on greenhouse gas emissions under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Hydrology and Water Quality

Short-Term Impacts: Alternative B would require a similar amount of construction activities as the proposed Project, and would be located within the same impact areas as the proposed Project. Under Alternative B, short-term construction-related earthmoving and operation of heavy construction equipment would be required in comparable intensity and duration as the proposed Project, and the same regulatory requirements for construction-related best management practices for sediment and pollution control would be required to address potential hydrology or water quality impacts, including the need for a temporary diversion coffer dam and coverage under appropriate National Pollutant Discharge Elimination System (NPDES) permits to maintain water quality standards. Neither the proposed Project nor Alternative B would require mitigation for short-term impacts to hydrology or water quality. Therefore, construction impacts on hydrology or water quality under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Operations under Alternative B would be the same as under the proposed Project conditions (i.e. diverting up to 25 cfs for storm flows <100 cfs), which would add approximately 1,035 acre-ft/yr of diverted flows into the spreading basins. The new spreading basin design under Alternative B would accommodate the proposed diversion of 25 cfs. At infiltration rates currently observed in the existing spreading basins (2.7 ft/day), approximately 18 acres of effective recharge area in the Project basins would be required to maximize the utilization of PWP's surface water rights. At higher percolation rates, such as those observed during the Geotechnical Feasibility Study (Converse 2013), less basin acreage would be required to accommodate the full 25 cfs. In addition to the approximately 13 acres of spreading basins that currently exist in the Arroyo Seco, both the proposed Project and Alternative B would construct approximately 4.5 acres of spreading, which includes replacement of 1.6 existing acres and expansion of 3 new acres. This total, 16 acres, would be large enough to percolate approximately 22 cfs at a percolation rate of 2.7 ft/day. A percolation rate of 3.1 ft/day would be required to accommodate the full 25 cfs within this 16 acres of spreading basins, which is anticipated to be achievable under both the proposed Project and Alternative B. Therefore, operational impacts on hydrology and water quality under this alternative would be ***the same as*** those anticipated from the proposed Project.

Noise

Short-Term Impacts: The design of the Alternative B is anticipated to require a similar amount of earthwork because the spreading basins would be within the same construction footprint and would be designed to obtain the same spreading capacity. It is possible that less export of sediment would be required due to the jetties (earthen projections) into the spreading basins that facilitate the more organic and curvilinear design. All of the mitigation measures set forth in Section 4.6, Noise, would still be required under Alternative B. For the purposes of comparison to the proposed Project, it is anticipated that construction-related noise impacts under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Neither the proposed Project nor Alternative B would generate any additional sources of long-term noise when compared to the current condition. Therefore, operational impacts on noise under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Recreation

Short-Term Impacts: Alternative B would require a similar amount of construction activities as the proposed Project and would be located within the same impact areas as the proposed Project. Under Alternative B, short-term construction-related heavy construction equipment and haul trucks would be required in comparable intensity and duration as the proposed Project and would require use of the Gabrielino Trail/Access Road. Similarly, during construction, trail closures around the spreading basins would be required. All of the mitigation measures set forth in Section 4.7, Recreation, would still be required under Alternative B. Therefore, impacts on recreation under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative B, the operational conditions would be similar to that of the proposed Project because trail connectivity in Area 3 would be re-established through the spreading basins under Alternative B. Implementation of the proposed Project would result in less than significant impacts to recreation. Therefore, long-term operational impacts on recreation under Alternative B would be ***the same as*** those anticipated under the Project.

However, Alternative B includes various landscape plantings, including native vegetation plants, trees, and seed mixes, which would contribute to the biological resources and habitat in the area. Alternative B would incorporate a network of trails through the spreading basins and would incorporate interpretive overlooks within the basins, including benches, interpretive signage, and/or shade structures to enhance the recreational experience. As shown on Figure 6-2a, Alternative B includes a broader network of trails and recreational amenities that also connect to the Altadena Crest Trail and allow for improved connectivity from the east to the west sides of the spreading basins. Additionally, native vegetation plantings would enhance the recreational experience for pedestrians, bicyclists, and equestrians through Area 3. These proposed amenities would expand recreational opportunities beyond the proposed Project, which consist of one trail connection to the Altadena Crest Trail as shown in Figure 4.7-4 in Section 4.7, Recreation of this Draft EIR. The long-term benefits to recreation from Alternative B would not occur under the Project.

Transportation

Short-Term Impacts: Alternative B would require a similar amount of construction activities as the proposed Project and would be located within the same impact areas as the proposed Project. Under Alternative B, short-term construction-related earthmoving and operation of heavy construction equipment would be required in comparable intensity and duration as the proposed Project and would require a similar number of workers commuting to and from the worksite. All of the mitigation measures set forth in Section 4.8, Transportation, would be required under Alternative B. Therefore, construction impacts related to transportation under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Neither the proposed Project nor Alternative B would generate any additional sources of long-term traffic when compared to the current condition. Therefore, operational impacts on transportation under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Tribal Cultural Resources

Short-Term Impacts: Under Alternative B, the components in Area 3 would be implemented within the same construction footprint and would not result in any additional impacts to tribal cultural resources that were not already considered and analyzed in this Draft EIR. Implementation of the proposed Project would result in significant impacts to cultural resources prior to mitigation. All of the mitigation measures set forth in Section 4.9, Tribal Cultural Resources, would still be required under Alternative B. Therefore, short-term impacts on tribal cultural resources under Alternative B would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative B, the operational state would be similar to that of the proposed Project. The proposed Project, once in operation, does not propose any long-term operational earthwork that could disturb or cause a substantial adverse change in the significance of an unknown tribal cultural resource. Therefore, operational impacts to tribal cultural resources under this alternative would be ***the same as*** those anticipated from the proposed Project.

Utilities and Service Systems (see Initial Study)

Short-Term Impacts: The topic of Utilities and Service Systems was scoped out of the Draft EIR through the Initial Study (see Appendix A-1). However, Alternative B includes various landscape plantings, including native wetland vegetation plants, trees, and seed mixes, which would contribute to the biological diversity in the area and would require irrigation water until established. The proposed vegetation would require an additional approximately 1.4 acre-feet per year of temporary water use until the vegetation is established, which is anticipated to require approximately 3 to 5 years. Irrigation would be designed in compliance with the City's guidelines and standards for landscape planting and irrigation plans and the State's Model Water Efficient Landscape Ordinance. This temporary use of water for landscape irrigation would not negatively impact the City's ability to maintain sufficient water supplies during normal, dry, and multiple dry years. Under the proposed Project, there would be no landscaping and, therefore, no temporary irrigation required. Therefore, short-term impacts related to utilities and service systems (i.e. water supplies) would be ***greater than*** those anticipated from the proposed Project, but would remain less than significant.

Long-Term Impacts: Under Alternative B, the operational state would be similar to that of the proposed Project. The proposed Project, once in operation, does not require the use of any potable water supplies. Therefore, operational impacts to utilities and service systems under this alternative would be ***the same as*** those anticipated from the proposed Project.

6.4.3 Alternative C – Historic Bridge Preservation

Under Alternative C, all activities proposed within Areas 2 and 3 would continue to be implemented, as set forth in the proposed Project. Alternative C also includes the implementation of the recommendations of the Arroyo Seco Bridge (B3) Assessment Deterioration Comparison prepared by TJC Associates Inc. in 2018 (TJC 2018) as they relate to the reconstruction or replacement of primary structural features on historic Bridge No. 3, which is located within the Project's study area along the Gabrielino Trail/Access Road. The location of Bridge No. 3 is identified on Figure 2-4A within Section 2, Environmental Setting, of this Draft EIR. Alternative C would remove the bridge overlay deck on historic Bridge No. 3 and repair or replace the structural elements of the bridge in accordance with the U.S. Department of the Interior Standards for the Treatment of Historic Properties.

All of the primary structural elements of the bridge--specifically, the joists below the bridge deck, the heavy timber support element at mid-span, the A-frame trusses on the east and west sides of the bridge, and the steel elements of the bridge--are deteriorated and subject to fail, and would be replaced under Alternative C. The heavy timber mid-span member that is the primary structural element of the bridge appear to have significant bearing failure under the supported members. If the mid-span support continues to deteriorate and fail, catastrophic failure of the bridge will occur; therefore, replacement of the heavy timber mid-span support beam(s) would be a priority. Replacement of the center support member would require temporary supports to be placed in the Arroyo Seco to relieve the load on the beam while the deteriorated beam was replaced. Additionally, portions or all of the joists would be removed.

Ability to Meet Project Objectives

Objective 1: Fully divert and utilize the City's 25 cubic feet per second surface water rights while operating in a manner objectively consistent with the Raymond Basin Judgment.

Alternative C would satisfy this Project Objective. Alternative C would be designed to include the same capacity as the proposed Project, thereby allowing for the same anticipated spreading and infiltration into the Raymond Basin as the proposed Project. This Alternative would not alter the City's ability to operate in compliance with the Raymond Basin Agreement and the 1984 Judgment.

Objective 2: Increase the capacity and functionality of the spreading basins to increase PWP's ability to recharge the groundwater basin, as envisioned by the 2011 Water Integrated Resources Plan with its recommendation to maximize the value of the groundwater basin and non-potable supplies.

Alternative C would satisfy this Project Objective. Alternative C would be designed to include the same capacity as the proposed Project, thereby allowing for the same anticipated spreading and infiltration into the Raymond Basin as the proposed Project, which is consistent with the Water System and Resources Plan.

Objective 3: Provide opportunities for increased aquatic biological functions within the Arroyo Seco by: (1) protecting aquatic animals from passing into the conveyance system, and (2) reducing existing impediments to fish passage at the diversion weir structure.

Alternative C would satisfy this Project Objective. Alternative C does not involve any changes to the proposed facilities in Area 2 or Area 3. Therefore, the design of Area 2 would continue to include: (1) a fish screen to prevent future fish from entering the intake, and (2) an engineered roughened channel downstream of the new diversion structure and operable weir to allow return passage upstream should fish pass during periods of high flows.

Objective 4: Increase PWP's ability to rely upon local water for its potable water supply to reduce reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD).

Alternative C would satisfy this Project Objective. Alternative C would allow for the local water supplies to be augmented and the City would be able to off-set the use of imported MWD water with the additional local water supply.

Comparison of the Effects of Alternative C to the Project

Air Quality

Short-Term Impact: Alternative C would require additional short-term construction activities to remove the existing bridge overlay deck and to repair or replace components of the historic Bridge No. 3. Additional equipment would be required, although no substantial grading or earthwork would be anticipated to replace the existing structure. As shown in Table 4.2-7 in Section 4.1, Air Quality, the estimated maximum daily construction emissions of criteria air pollutants would be well below the thresholds of significance.

The addition of equipment required to conduct bridge rehabilitation would not be expected to increase emissions such that thresholds would be exceeded due to the relatively minimal amount of emissions when compared to the significance thresholds (see Table 4.2-7 in Section 4.1, Air Quality). Additionally, construction activity overlap is unlikely given that the bridge structure would be required to remain intact for the transport of construction equipment and materials until the completion of construction, and additional bridge-related construction activities would not occur simultaneously on the peak day with other Project components. Therefore, short-term construction impacts on air quality under Alternative C would be ***slightly greater than*** those anticipated from the proposed Project, but would be less than significant.

Long-Term Impact: Neither the proposed Project nor Alternative C would generate any additional air emissions of criteria pollutants when compared to the current condition. Therefore, operational impacts on air quality under Alternative C would be ***the same as*** those anticipated from the proposed Project.

Biological Resources

Short-Term Impact: Under Alternative C, in addition to the impacts assessed in Section 4.2, Biological Resources for the proposed Project, additional short-term impacts within the Arroyo Seco streambed would occur to allow for construction of bridge components, equipment access, and equipment staging. This would result in additional impacts to vegetation communities beneath and adjacent to Bridge No. 3. This would also result in additional impacts to agency jurisdictional resources to be covered under the regulatory permits, including the USACE, CDFW, and RWQCB. Implementation of the proposed Project would result in significant direct and indirect temporary impacts to biological resources prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All of the mitigation measures set forth in Section 4.2, Biological Resources, would still be required under Alternative C. Therefore, impacts on biological resources under Alternative C would be ***slightly greater than*** anticipated under the Project, but would be less than significant after mitigation.

Long-Term Impact: Under Alternative C, the operational state would be similar to that of the proposed Project. The proposed Project, once in operation, does not propose any long-term earthwork or other new operational and maintenance activities beyond the current condition that could disturb or cause a substantial adverse change in the significance of biological resources. All of the mitigation measures set forth in Section 4.2, Biological Resources, would still be required under Alternative C. Therefore, impacts on biological resources under Alternative C would be ***the same as*** anticipated under the Project.

Cultural Resources

Short-Term Impact: Under Alternative C, in addition to the impacts assessed in Section 4.3, Cultural Resources for the proposed Project, additional temporary and/or permanent impacts within the Arroyo Seco streambed would occur to allow for construction of bridge components, equipment access, and equipment staging. This could result in additional impacts to previously unknown archaeological and paleontological resources. Implementation of the proposed Project would result in significant impacts to cultural resources (i.e. archaeological resources) and paleontological resources prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All of the mitigation measures set forth in Section 4.3, Cultural Resources, would still be required under Alternative C. Therefore, impacts on archaeological and paleontological resources under Alternative C would be ***slightly greater than*** anticipated under the Project, but would be less than significant after mitigation. Short-term impacts to historic resources would be ***the same as*** the proposed Project.

Long-Term Impacts: Under Alternative C, the operational state would be similar to that of the proposed Project. The proposed Project, once in operation, does not propose any long-term operational earthwork that could disturb or cause a substantial adverse change in the significance of an unknown cultural resource. Therefore, operational impacts to cultural resources under this alternative would be ***the same as*** those anticipated from the proposed Project.

However, Alternative C would eliminate the significant and unavoidable impact associated with the proposed Project. The historic Bridge No. 3 would be restored in accordance with the U.S. Department of the Interior Standards for the Treatment of Historic Properties, which would mitigate potential impacts to less than significant. Therefore, Alternative C would ***eliminate the significant unavoidable impact*** anticipated under the proposed Project and impacts to historic resources would be less than significant.

Greenhouse Gas Emissions

Short-Term Impacts: Alternative C would require additional short-term construction activities to remove the existing bridge overlay deck and to repair or replace components of the historic Bridge No. 3. Additional equipment would be required, although no substantial grading or earthwork would be anticipated to replace the existing structure. As shown in Table 4.4-2, Climate Action Plan Consistency Checklist in Section 4.2, Greenhouse Gas Emissions, the Project is consistent with the City's Climate Action Plan (CAP) and would therefore not interfere with implementation of GHG reduction goals for 2030 or 2050 identified in Senate Bill (SB) 32 and Executive Order S-3-05. It is assumed that replacement of the Bridge No. 3 would also be consistent with the CAP. Therefore, short-term construction impacts on greenhouse gas emissions under Alternative C would be ***the same as*** those anticipated from the proposed Project.

Long-Term Impacts: Under Alternative C, operations and operational emissions would be the same as under the proposed Project. Therefore, operational impacts on greenhouse gas emissions under Alternative C would be ***the same as*** those anticipated from the proposed Project.

Hydrology and Water Quality

Short-Term Impacts: Under Alternative C, in addition to the impacts assessed in Section 4.5, Hydrology and Water Quality for the proposed Project, additional temporary and/or permanent impacts within the Arroyo Seco stream bed would occur to allow for construction of bridge components, equipment access, and equipment staging. Additional short-term construction-related earthmoving and operation of heavy construction equipment would be required within the Arroyo Seco stream bed, and the same regulatory requirements for construction-related best management practices for sediment and pollution control would be required to address potential hydrology or water quality impacts. An additional temporary diversion coffer dam may be required, including coverage of impacts under appropriate National Pollutant Discharge Elimination System (NPDES) permits to maintain water quality standards. Therefore, impacts on hydrology and water quality under Alternative C would be ***slightly greater than*** anticipated under the Project, but would be less than significant.

Long-Term Impacts: Under Alternative C, the operational components of the proposed Project that involve the diversion, spreading and infiltration of flows from the Arroyo Seco would be unchanged. Operation of a bridge at the same location as an existing bridge would not result in any additional long-term impacts to hydrology or water quality. Therefore, operational impacts on hydrology and water quality under Alternative C would be ***the same as*** those anticipated from the proposed Project.

Noise

Short-Term Impacts: Alternative C would require additional short-term construction activities to remove the existing bridge overlay deck and to repair or replace components of the historic Bridge No. 3. Additional equipment would be required, although no substantial grading or earthwork would be anticipated to replace the existing structure. The addition of equipment required to conduct bridge rehabilitation would not be expected to increase noise such that thresholds would be further exceeded, even if they were to occur simultaneously during other construction activity within Area 2. Such overlap is unlikely given that the bridge structure would be required to remain intact for the transport of construction equipment and materials until the completion of construction. Implementation of the proposed Project would result in significant temporary impacts to noise prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All of the mitigation measures set forth in Section 4.6, Noise, would still be required under Alternative C. Therefore, short-term construction impacts on noise under Alternative C would be ***slightly greater than*** those anticipated from the proposed Project, but would be less than significant after mitigation.

Long-Term Impacts: Neither the proposed Project nor Alternative C would generate any additional sources of long-term noise when compared to the current condition. Therefore, operational impacts on noise under Alternative C would be ***the same as*** those anticipated from the proposed Project.

Recreation

Short-Term Impacts: Alternative C would require additional short-term construction activities to remove the existing bridge overlay deck and to repair or replace components of the historic Bridge No. 3, which would require extended closure of the Gabrielino Trail/Access Road during bridge replacement. It is unlikely that construction in Area 2 and the bridge construction would occur at the same time given that the bridge structure would be required to remain intact for the transport of construction equipment and materials

until the completion of construction. Therefore, trail closures would likely be extended under Alternative C. Implementation of the proposed Project would result in significant temporary impacts to recreation prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All of the mitigation measures set forth in Section 4.7, Recreation, would still be required under Alternative C. Therefore, short-term construction impacts on recreation under Alternative C would be ***slightly greater than*** those anticipated from the proposed Project, but would be less than significant after mitigation.

Long-Term Impacts: Upon completion of the repair or replacement of historic Bridge No. 3, Alternative C would have no impacts on long-term recreational activities or facilities. Therefore, operational impacts on recreation under Alternative C would be ***the same as*** those anticipated from the proposed Project.

Transportation

Short-Term Impacts: Alternative C would require additional short-term construction activities to remove the existing bridge overlay deck and to repair or replace components of the historic Bridge No. 3, which would require additional workers and equipment transport to the Area 2. It is unlikely that construction in Area 2 and the bridge construction would occur at the same time given that the bridge structure would be required to remain intact for the transport of construction equipment and materials until the completion of construction, therefore, the peak day of traffic activity would be unlikely to change. Implementation of the proposed Project would result in significant temporary impacts to transportation prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All of the mitigation measures set forth in Section 4.8, Transportation, would still be required under Alternative C. Therefore, short-term construction impacts on transportation under Alternative C would be ***slightly greater than*** those anticipated from the proposed Project, but would be less than significant after mitigation.

Long-Term Impacts: Neither the proposed Project nor Alternative C would generate any additional sources of long-term traffic when compared to the current condition. Therefore, operational impacts on transportation under Alternative C would be ***the same as*** those anticipated from the proposed Project.

Tribal Cultural Resources

Short-Term Impacts. Under Alternative C, additional temporary and/or permanent impacts within the Arroyo Seco stream bed would occur to allow for construction of bridge components, equipment access, and equipment staging. This could result in additional impacts to previously unknown tribal cultural resources. Implementation of the proposed Project would result in significant impacts to tribal cultural resources prior to mitigation; however, all Project-related impacts would be mitigated to levels less than significant. All of the mitigation measures set forth in Section 4.9, Tribal Cultural Resources, would still be required under Alternative C. Therefore, impacts on tribal cultural resources under Alternative C would be ***slightly greater than*** anticipated under the Project, but would be less than significant after mitigation.

Long-Term Impacts. Under Alternative C, the operational state would be similar to that of the proposed Project. The proposed Project, once in operation, does not propose any long-term operational earthwork that could disturb or cause a substantial adverse change in the significance of an unknown tribal cultural resource. Therefore, operational impacts to tribal cultural resources under this alternative would be ***the same as*** those anticipated from the proposed Project.

Wildfire (see Initial Study)

Short-Term Impacts. The topic of Wildfire was scoped out of the Draft EIR through the Initial Study (see Appendix A-1). Reconstruction of the existing bridge under Alternative C would not result in increased impacts related to wildfire. Therefore, wildfire impacts under Alternative C would be ***the same as*** anticipated under the Project.

Long-Term Impacts. Replacement of the historic Bridge No. 3 to the U.S. Department of the Interior Standards for the Treatment of Historic Properties is not currently planned, designed, or funded. Because there are no plans for the future reconstruction/replacement of the Bridge No. 3 at the time of the preparation of this Draft EIR, it is anticipated that the existing Bridge No. 3 may continue to deteriorate, and although not anticipated at this point, may even be removed to protect public safety. Further, restoration of the wooden-timber bridge would not be as protective of public safety as retaining the bridge overlay deck, which is designed to accommodate heavy loads. The temporary structural overlay bridge spanning the length of Bridge No. 3 was constructed in 2017 to accommodate the loading from heavy equipment needed during construction of the Arroyo Seco Canyon Project.

Decreased precipitation and droughts that are anticipated to be exacerbated by climate change may result in increased numbers of wildfires through drier natural landscapes in close proximity to communities nearby the ANF. Given the history of wildfires in the region, and specifically within the San Gabriel Mountains and Arroyo Seco subwatershed that leads to the Project site, PWP will keep in place the current overlay bridge and will not repair or rehabilitate the historic Bridge No. 3, because the current overlay bridge can accommodate firefighting equipment and large fire trucks into the Arroyo Seco Canyon and the ANF. It is anticipated that the historic Bridge will continue to deteriorate, and as a result PWP will need to remove dangerous elements of the historic Bridge (rotting timbers failed joists, for example) and even partially or fully demolished to protect public safety as it continues to deteriorate. Reconstruction of a narrow and wooden bridge structure would not facilitate the City's objective to create climate change resilient infrastructure. This concept is especially important given the location of Bridge No. 3 at the interface with the ANF and within the Very High Fire Hazard Severity Zone. Furthermore, a concrete and steel bridge to the north of Bridge No. 3 was constructed in 2008 to replace another A-frame bridge (Bridge No. 4) after it collapsed. Its utility for accommodating firefighting equipment in the long term is limited if Bridge No. 3 does not have the same load-bearing capacity.

In summary, under Alternative C, the re-creation of a timber bridge structure would not provide the protections related to wildfire preparedness to the extent that the proposed Project would allow for the possible future construction of an all-weather concrete bridge. Therefore, operational impacts to wildfire under this alternative would be ***greater than*** those anticipated from the proposed Project, but would be less than significant.

6.5 Summary of Alternatives to the Proposed Project

Pursuant to the CEQA Guidelines stated above, as well as the Project objectives, a range of alternatives to the Project are considered and evaluated in this Draft EIR. To summarize these Project alternatives, as suggested in CEQA Section 15126.6(d), a matrix was prepared to summarize and compare the impacts of each Project alternative (see Table 6-1).

Table 6-1. Comparison of Project and Alternatives Impacts

Environmental Issue Area	Proposed Project	Alternative A - No Project		Alternative B - Redesigned Spreading Basins in Area 3		Alternative C - Historic Bridge Preservation	
		Short-Term Temporary	*Long-Term Permanent*	*Short-Term Temporary*	*Long-Term Permanent*	*Short-Term Temporary*	*Long-Term Permanent*
Air Quality	LTS	▼	–	–	–	▲	–
Biological Resources	LTS-MM	▼	▲	–	– / +	▲	–
Cultural Resources (historic)	LTS-MM and SU (historic)	▼	–	–	–	▲	–
		–	–	–	–	–	▼
Greenhouse Gas Emissions	LTS	▼	▲	–	–	–	–
Hydrology and Water Quality	LTS	▼	▼	–	–	▲	–
Noise	LTS-MM	▼	–	–	–	▲	–
Recreation	LTS-MM	▼	–	–	– / +	▲	–
Transportation	LTS-MM	▼	–	–	–	▲	–
Tribal Cultural Resources	LTS-MM	▼	–	–	–	▲	–
Utilities and Service Systems (water supply)	(Initial Study)	N/A	N/A	▲	–	N/A	N/A
Wildfire	(Initial Study)	N/A	N/A	N/A	N/A	–	▲
Meets Most Project Objectives?	Yes	No		Yes		Yes	

– Alternative is likely to result in similar impacts when compared to Project.

▼ Alternative is likely to result in reduced impacts when compared to Project.

▲ Alternative is likely to result in greater impacts when compared to Project.

\+ Alternative is likely to result in greater environmental benefits when compared to Project.

LTS = less than significant impact; LTS-MM= less than significant impact with mitigation; SU = significant, unavoidable impact

6.6 Environmentally Superior Alternative

Table 6-1 above compares the environmental impacts of each alternative to those of the proposed Project. As shown, Alternative A would result in reduced environmental impacts to almost all environmental topics in the short-term because construction activity would not occur. Alternative A would also result in reductions to impacts associated with long-term Hydrology. However, Alternative A would not avoid or reduce the Project's significant impact on historical resources. Additionally, the proposed Project would result in benefits to the topics of Biological Resources and Greenhouse Gas Emissions that would not occur under Alternative A, such that maintaining the current condition would be more impactful to the environment in the long-term to these two topics. Therefore, Alternative A would not be the environmentally superior alternative.

Alternative B would result in similar short-term construction-related impacts when compared to the proposed Project for all environmental topics with the exception of a temporary increase in water supply for landscaping irrigation. For long-term operational impacts, all environmental factors would have similar impacts under Alternative B to the proposed Project. However, Alternative B would result in benefits to the environment that would not occur under the proposed Project. Alternative B would develop curvilinear grading contours at the spreading basins to facilitate a more naturalized appearance consistent with a park setting, improved recreational amenities, such as connective trails and interpretive signage, and natural native landscaping to enhance the recreational experience. Alternative B would not increase any new long-term environmental impacts and would increase long-term benefits to Biological Resources and Recreation. However, Alternative B would not eliminate the significant unavoidable impact to cultural resources.

Alternative C would result in slightly increased short-term construction impacts to most environmental topics. For long-term impacts, Alternative C would not provide the protections related to wildfire preparedness as it pertains to the City's ability to accommodate firefighting equipment into and out of the Arroyo Seco Canyon and the ANF and would result in increased long-term wildfire risks when compared to the proposed Project. However, this Alternative would eliminate the significant unavoidable impact related to historic resources and would be considered to be the environmentally superior alternative to the proposed Project.

In summary, Alternative C, Historic Bridge Preservation in Area 3, is considered the environmentally superior alternative.

6.7 References

14 CCR 15000–15387 and Appendices A–N. Guidelines for Implementation of the California Environmental Quality Act, as amended.

California Public Resources Code, Sections 21000–21177. California Environmental Quality Act (CEQA), as amended.

Carollo Engineers. 2013. *Final Conceptual Design Report – Arroyo Seco Canyon Project*. September 2013. Pasadena, California: Carollo Engineers.

CDM Smith. 2012. *Upper Arroyo Seco Watershed Integrated Spreading Grounds Concept Report*. January 12, 2012.

City of Pasadena. 2017. "Climate Vulnerability Assessment." Appendix C in *City of Pasadena Climate Action Plan*.

LACFCD (Los Angeles County Flood Control District). 2020. "Devil's Gate Reservoir Restoration Project" [PowerPoint slides]. Prepared by Brittany Barker, Los Angeles County Department of Public Works. https://pw.lacounty.gov/swe/devilsgate/docs/DevilsGateReservoirRestorationProjectPresentation-January2020.pdf.

PWA (Phillip Williams & Associates). 2000. *Flood Hazard, Sediment Management, and Water Feature Analyses, Hahamongna Watershed Park, Pasadena, Ca*.

TJC (TJC and Associates Inc.) 2018. *Arroyo Seco Bridge (B3) Assessment Deterioration Comparison*. TJCAA Project No. 114096. Prepared for Pasadena Water and Power. March 16, 2018.



SOURCE: Esri, Digital Globe 2019

DUDEK

0 125 250 Feet

FIGURE 6-1

Consolidated Facility Below JPL Bridge

Arroyo Seco Canyon Project Areas 2 and 3

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SCALE: 1"=60' @ 24" X 36"

0' 30' 60' 120'

BASIN AREA CALCULATIONS:

BASIN NO.	ACREAGE
1	1.12
2	0.72
3	0.68
4	1.06
5	0.89
TOTAL	4.47

NOTE: THE AREAS INDICATED FOR THE BASINS (ACREAGES) DO NOT INCLUDE THE ISLANDS.

SITE IMPROVEMENT LEGEND:

- BASIN BOTTOM - NATIVE SOIL, UNVEGETATED
- BASIN CIRCULATION FLOW LINE
- BASIN INLET/OUTLET PIPELINE
- PEDESTRIAN TRAIL/ MAINTENANCE ROAD
- FUTURE INTERPRETIVE OVERLOOK (BENCH, INTERPRETIVE SIGNAGE, AND SHADE STRUCTURE)
- CONNECTIONS TO ALTADENA CREST TRAIL

PLANTING LEGEND:

- BASIN ISLAND WETLAND CONTAINER PLANTING, SEE TABLE 1, SHEET L-2
- BASIN SIDE SLOPE WETLAND CONTAINER PLANTING, SEE TABLE 2, SHEET L-2
- SEED MIX A - BASIN ISLAND AND SIDE SLOPE WETLAND, SEE TABLE 3, SHEET L-2
- SEED MIX B - TRANSITIONAL UPLAND, SEE TABLE 4, SHEET L-2

SEE SHEET L-2 FOR PLANT LISTS, SEED MIXES, PLANTING NOTES, AND IRRIGATION CONCEPT SUMMARY.

SOURCE: DUDEK 2020

FIGURE 6-2A

Alternative B, Redesigned Spreading Basins

Arroyo Seco Canyon Project Areas 2 and 3

DUDEK

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PLANT LISTS:

TABLE 1. BASIN ISLAND VEGETATION
CONTAINER PLANT PALETTE

SYMBOL	BOTANICAL NAME	COMMON NAME	APPROXIMATE PERCENT COMPOSITION	SIZE	APPROX. SPACING (FEET ON CENTER)
	TREES AND SHRUBS				
	ARTEMISIA DOUGLASIANA	DOUGLAS MUGWORT	25%	1 GAL.	4 FT.
	BACCHARIS SALICIFOLIA	MULEFAT	30%	1 GAL.	8 FT.
	IVA HAYESSIANA	HAYES IVA	20%	1 GAL.	5 FT.
	JUNCUS ACUTUS	SPINY RUSH	15%	1 GAL.	3 FT.
	SALIX EXIGUIA (SALIX HINDSIANA)	SANDBAR WILLOW	10%	DEEP 1 GAL.	12 FT.
		TOTALS	**100%**		

ALL CONTAINER PLANT PROPAGULES SHALL HAVE ORIGINATED FROM LOCAL CISMONTANE SOUTHERN CALIFORNIA SOURCES.

TABLE 2. BASIN SIDE SLOPE VEGETATION
CONTAINER PLANT PALETTE

SYMBOL	BOTANICAL NAME	COMMON NAME	APPROXIMATE PERCENT COMPOSITION	SIZE	APPROX. SPACING (FEET ON CENTER)
	TREES AND SHRUBS				
	ARTEMISIA DOUGLASIANA	DOUGLAS MUGWORT	20%	1 GAL.	4 FT.
	BACCHARIS SALICIFOLIA	MULEFAT	25%	1 GAL.	8 FT.
	IVA HAYESSIANA	HAYES IVA	20%	1 GAL.	5 FT.
	POPULUS FREMONTII	FREMONT COTTONWOOD	5%	DEEP 1 GAL.	12 FT.
	SALIX EXIGUIA (SALIX HINDSIANA)	SANDBAR WILLOW	15%	DEEP 1 GAL.	12 FT.
	SALIX LASIOLEPIS	ARROYO WILLOW	10%	DEEP 1 GAL.	15 FT.
	SAMBUCUS MEXICANA	MEXICAN ELDERBERRY	5%	DEEP 1 GAL.	30 FT.
		TOTALS	**100%**		

ALL CONTAINER PLANT PROPAGULES SHALL HAVE ORIGINATED FROM LOCAL CISMONTANE SOUTHERN CALIFORNIA SOURCES.

PLANTING NOTES:

1. LANDSCAPE PLANTINGS AND IRRIGATION HAVE BEEN DESIGNED IN COMPLIANCE WITH THE CITY OF PASADENA GUIDELINES AND STANDARDS FOR LANDSCAPE PLANTING AND IRRIGATION PLANS AND THE STATE'S MODEL WATER EFFICIENT LANDSCAPE ORDINANCE.
2. ALL UPLAND PLANING AND SEEDING AREAS WILL BE TOP-DRESSED WITH WALK-ON-FIR BARK MULCH AND WILL BE IRRIGATED FOR 3 TO 5 YEARS BY WAY OF A WATER EFFICIENT ABOVE-GROUND TEMPORARY IRRIGATION SYSTEM.
3. ALL DISTURBED AREAS WILL BE SEEDED WITH AN EROSION CONTROL MIX FOLLOWING CONSTRUCTION.
4. DETAILED PLANTING AND IRRIGATION PLANS ARE ANTICIPATED TO BE ON 22" X 34" SHEETS AT A SCALE OF 1" = 20'.

IRRIGATION CONCEPT SUMMARY:

PLANTINGS ARE COMPRISED OF SOUTHERN CALIFORNIA NATIVES OR CULTIVARS OF NATIVES THAT ARE EXPECTED TO SURVIVE WITH MINIMAL SUPPLEMENTAL IRRIGATION ONCE ESTABLISHED. THE IRRIGATION SYSTEM WILL BE A TEMPORARY ABOVE-GROUND IRRIGATION SYSTEM INSTALLED TO HELP ESTABLISH THE PLANT MATERIALS. SUPPLEMENTAL WATER WILL BE PROVIDED DURING THE DRY SEASON FOR THREE TO FIVE YEARS UNTIL PLANT ROOT SYSTEMS ARE SUFFICIENT TO SUPPORT PLANTS WITHOUT REGULAR WATER. TO WEAN PLANTS FROM SUPPLEMENTAL WATER BY THE END OF YEAR 3, IRRIGATION WILL BE SCALED BACK AFTER THE FIRST YEAR FOLLOWING CONSTRUCTION. ONCE ESTABLISHED, PLANTINGS WILL ONLY BE WATERED DURING EXCEPTIONALLY HOT AND DRY WEATHER AS NEEDED FOR PLANT SURVIVAL. THE IRRIGATION SYSTEM WILL BE REMOVED ONCE THE PLANTINGS ARE DEEMED SELF-SUSTAINABLE.

SEED MIXES:

TABLE 3. BASIN ISLANDS AND SIDE SLOPE VEGETATION
SEED MIX A

SYMBOL	BOTANICAL NAME	COMMON NAME	MINIMUM PERCENT LIVE SEED	RATE (LBS./ACRE)
	EPILOBIUM CANUM SSP. *LATIFOLIUM (ZAUSCHNERIA CALIFORNICA)*	CAIFORNIA FUCSHIA	27	6
	LEYMUS TRITICOIDES	CREEPING WILDRYE	80	4
	LOTUS SCOPARIUS	DEERWEED	85	4
	MIMULUS GUTTATUS	SEEP MONKEYFLOWER	10	8
	MULENBERGIA RIGENS	DEER GRASS	60	6
	PLANTAGO ERECTA	DOT-SEED PLANTAIN	85	4
	PLANTAGO INSULARIS	WHOLLY PLANTAIN	90	2
		TOTAL LBS./ACRE		**34**

ALL SEED SPECIES SHALL HAVE BEEN COLLECTED FROM LOCAL CISMONTANE SOUTHERN CALIFORNIA SOURCES.

TABLE 4. TRANSITIONAL UPLAND VEGETATION
SEED MIX B

SYMBOL	BOTANICAL NAME	COMMON NAME	MINIMUM PERCENT LIVE SEED	RATE (LBS./ACRE)
	ARTEMISIA CALIFORNICA	CALIF. SAGEBRUSH	10	8
	CASTILEJA EXSERTA	OWL'S CLOVER	25	3
	ENCELIA FARINOSA	BRITTLE BUSH	30	3
	ERIOGONUM FASCICULATUM	CALIF. BUCKWHEAT	10	6
	ESCHSCHOLZIA CALIFORNICA	CALIF. POPPY	85	3
	LASTHENIA CALIFORNICA	CALIF. GOLDFIELDS	50	2
	LEYMUS CONDENSATUS	GIANT WILDRYE	70	2
	LOTUS SCOPARIUS	DEERWEED	85	2
	LUPINUS SUCCULENTUS	ARROYO LUPINE	90	2
	NASSELLA LEPIDA	FOOTHILL NEEDLEGRASS	65	3
	NASSELLA PULCHRA	PURPLE NEEDLE GRASS	75	2
	PLANTAGO ERECTA	DOT-SEED PLANTAIN	85	2
	PLANTAGO INSULARIS	WHOLLY PLANTAIN	90	2
	SALVIA APIANA	WHITE SAGE	25	4
	SISYRINCHIUM BELLUM	BLUE-EYED GRASS	80	2
	VULPIA MYUROS	RATTAIL FESCUE	85	2
		TOTAL LBS./ACRE		**48**

ALL SEED SPECIES SHALL HAVE BEEN COLLECTED FROM LOCAL CISMONTANE SOUTHERN CALIFORNIA SOURCES.

HYDROSEED SLURRY MIX COMPONENTS:

- SEEDS AT LBS/ACRE AS INDICATED IN SEED MIXES ABOVE
- 2,500 POUNDS/ACRE VIRGIN WOOD CELLULOSE FIBER MULCH W/ GREEN MARKER DYE
- ECOLOGY CONTROLS M-BINDER SEED TACKIFIER (OR APPROVED EQUAL) @ 80 POUNDS/ACRE. (TO BE INCLUDED IN SLURRY MIX FOR INSTALLATIONS FROM NOVEMBER THROUGH MARCH OF ANY GIVEN YEAR.)
- FERTILIZERS: 6-20-20 –XB AT 200 LBS/ACRE

Z:\Projects\118400MAP\DOC\EIR\

SOURCE: DUDEK 2020

FIGURE 6-2B

Alternative B, Landscaping Palette

Arroyo Seco Canyon Project Areas 2 and 3

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7 LIST OF PREPARERS

This Environmental Impact Report was prepared by the City of Pasadena, as the lead agency. The following professional staff participated in its preparation.

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Dudek

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Laurel Porter, Technical Editor
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Appendix A-1

Notice of Preparation and Initial Study, October 2019

Notice of Preparation

TO:
Responsible and Trustee Agencies,
Organizations, and Interested Parties

FROM:
City of Pasadena
100 North Garfield Avenue
Pasadena, California 91101

SUBJECT:	Notice of Preparation of an Environmental Impact Report and Public Scoping Meeting
PROJECT TITLE:	Arroyo Seco Canyon Project Areas 2 and 3
PROJECT APPLICANT:	City of Pasadena Department of Water and Power
PUBLIC REVIEW PERIOD:	November 4, 2019 through December 6, 2019
SCOPING MEETING:	Thursday, November 21, 2019 from 6:00 P.M. to 8:00 P.M. Robinson Park Recreation Center 1081 N. Fair Oaks Avenue, Pasadena, CA 91103

Pursuant to Section 21165 of the California Public Resources Code and Section 15050 of the California Environmental Quality Act (CEQA) Guidelines, the City of Pasadena (City) is the Lead Agency for the preparation of an Environmental Impact Report (EIR) for the proposed Arroyo Seco Canyon Project Areas 2 and 3 (Project). The Project would be implemented by the Pasadena Department of Water and Power (PWP). In accordance with CEQA Guidelines Section 15082, the City has prepared this Notice of Preparation (NOP) to provide responsible and trustee agencies, the Office of Planning and Research, and the County Clerk with sufficient information describing the Project and its potential environmental effects to enable the responsible agencies to make a meaningful response to this NOP.

The City is requesting specific and detailed input regarding the scope and content of the environmental information related to your agency's statutory responsibility that must be included in the Draft EIR. Pursuant to CEQA Guidelines Section 15083, this NOP also serves to facilitate consultation with any persons or organizations that may be concerned with the environmental effects of the Project. Additionally, this NOP also serves as a notice for the public Scoping Meeting, which is held to expedite and facilitate the consultation process. An Initial Study has been prepared for the proposed Project pursuant to CEQA Guidelines Section 15063 and is available for viewing online at https://ww5.cityofpasadena.net/planning/category/environmental-notices/ and/or PWPweb.com/Arroyo and hardcopies are available for viewing at the PWP office located at 150 South Los Robles Avenue, Suite 200, in Pasadena.

PROJECT LOCATION: The Project site is located within the Arroyo Seco Canyon adjacent to North Arroyo Boulevard (i.e Gabrielino Trail/Access Road), located in Township 1 North, Range 12 West on the Pasadena, California 7.5′ USGS quadrangle map. The proposed Project consists of two primary areas, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements. (See Figure 1)

PROJECT BACKGROUND: In October 2014, the City circulated the Arroyo Seco Canyon Project (ASCP) Initial Study/Mitigated Negative Declaration (IS/MND), State Clearinghouse (SCH)

Number 2014101022, for a 30-day public review period from October 9, 2014 to November 8, 2014. The ASCP required approval of a Conditional Use Permit (CUP) #6222, which involved improvements to three areas, including Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, JPL East Parking Lot. The ASCP and IS/MND were approved by the City in 2015. In July 2015, a lawsuit (Court Case No. BS156207) was filed against the City challenging the approval. In June 2017, the Los Angeles Superior Court entered a Judgment that partially favored the petitioners. The Court found that the elements of the ASCP that related to increased diversions of water required the preparation of an EIR. The Court also ruled that the elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP and complied with CEQA and could proceed without additional CEQA review.

In accordance with the terms and provisions of the Judgment, as modified by a Settlement Agreement between the City and the petitioners, the City is preparing an EIR for the proposed Project. Because several components of the ASCP were allowed to proceed without any additional environmental review pursuant to CEQA, the proposed Project boundaries of Area 2 and Area 3 have been refined from those shown in the 2015 ASCP IS/MND.

PROJECT SUMMARY: The Project involves a requested modification to CUP #6222 in order to construct and operate proposed water infrastructure improvements in Areas 2 and 3. A description of the proposed Project is included in the Initial Study, and a brief summary of proposed Project components is provided below.

Area 2: Diversion and Intake Replacement- Improvements in Area 2 include the removal of the existing diversion/weir structure and the intake structure, which would be replaced with a new diversion/weir structure that could be operated to divert up to 25 cfs of creek flows through the new intake structure and into the existing conveyance system (a combination of tunnels and pipelines). The new intake would include a fish screening feature to prevent future fish populations from passing into the intake and conveyance system. A roughened channel would be constructed directly downstream of the new weir to allow for future fish passage upstream during moderate flow periods. Other improvements include a new service building to house the electrical and hydraulic controls for the diversion structure and new engineered streambed material along the eastern creek slope to prevent erosion adjacent to the Gabrielino Trail/Access Road. (See Figure 2)

Area 3: Spreading Basin Improvements- Improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased flows for infiltration into the Raymond Basin. Various facilities would be demolished, including inlet/outlet structures, pipes and valves, fencing, and other small appurtenant structures, to allow for the reconstructed basins. Creek flows from the existing conveyance system would outlet to the new sedimentation basin or to new spreading Basin E located at the site of the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's open area (i.e. former JPL East Parking Lot). New Basin J would be located between existing Basins 3 and 4, and Explorer Road. (See Figure 3)

During construction activities, the existing Gabrielino Trail/Access Road would provide for vehicular access to and from Areas 2 and 3, and Explorer Road would provide for vehicular access to and from Area 3. The former Travelling Screen and Chlorine Building adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary

construction materials and equipment staging. No new habitable structures would be constructed, and no new employees would be generated by the proposed Project.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED: As identified in the Initial Study, the following topical areas have the potential to result in significant impacts and will be analyzed in the EIR: Air Quality, Biological Resources, Cultural Resources/Paleontological Resources, Hydrology and Water Quality, Noise, Recreation, Transportation, and Tribal Cultural Resources. Other topical areas have been assessed through the Initial Study, were determined to have no impacts or less than significant impacts, and will not be further evaluated in the EIR.

PUBLIC SCOPING MEETING DATE AND LOCATION: A public Scoping Meeting will be held to share information regarding the proposed Project and the environmental review process and to receive written comments about the scope and content of the environmental analysis to be addressed in the Draft EIR. The Scoping Meeting is an information-gathering meeting, not a public hearing, and no public testimony or recordation of the meeting will occur. Attendees are encouraged to submit all comments in writing, which will be reviewed and considered by PWP as part of the environmental analysis of the proposed Project. No decisions about the Project will be made at the Scoping Meeting. A separate public hearing for entitlement requests will be scheduled after the completion of the EIR. The date, time, and location of the public Scoping Meeting are as follows:

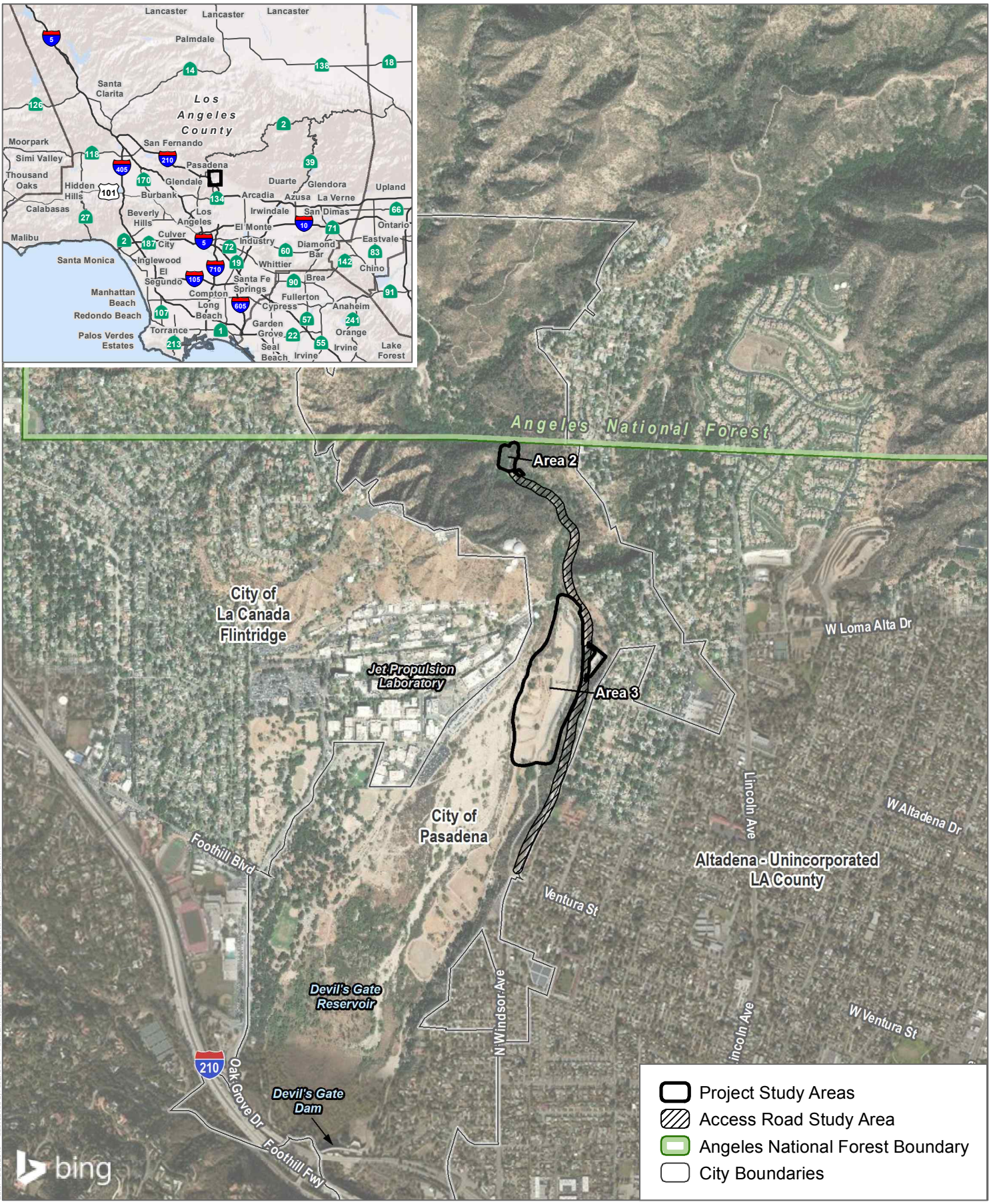
Date: Thursday, November 21, 2019
Time: 6:00 to 8:00 P.M.
Location: Robinson Park Recreation Center
1081 N. Fair Oaks Avenue
Pasadena, CA 91103
(626) 744-7330

SUBMITTING COMMENTS: A copy of this NOP and the Initial Study may be viewed online at PWPweb.com/Arroyo and/or https://ww5.cityofpasadena.net/planning/category/environmental-notices/. The City will consider all written comments regarding the potential environmental effects of the Project received during the public review period. Written comments must be submitted in writing by 5:00 P.M., December 6, 2019. This public review period includes a 2-day courtesy extension to account for overlap with holidays. Written comments will also be accepted at the Scoping Meeting described above. Due to the time limits mandated by State law, your response must be sent at the earliest possible date but not later than 30 days after receipt of this NOP.

Please direct your written comments via email and/or postal service to:

Elisa Ventura, P.E.
City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
E-mail: eventura@cityofpasadena.net

Attachments:
Figure 1: Local Vicinity and Regional Location
Figure 2: Area 2 Conceptual Design Overview
Figure 3: Area 3 Conceptual Design Overview



SOURCE: Bing 2019, Open Street Map 2019

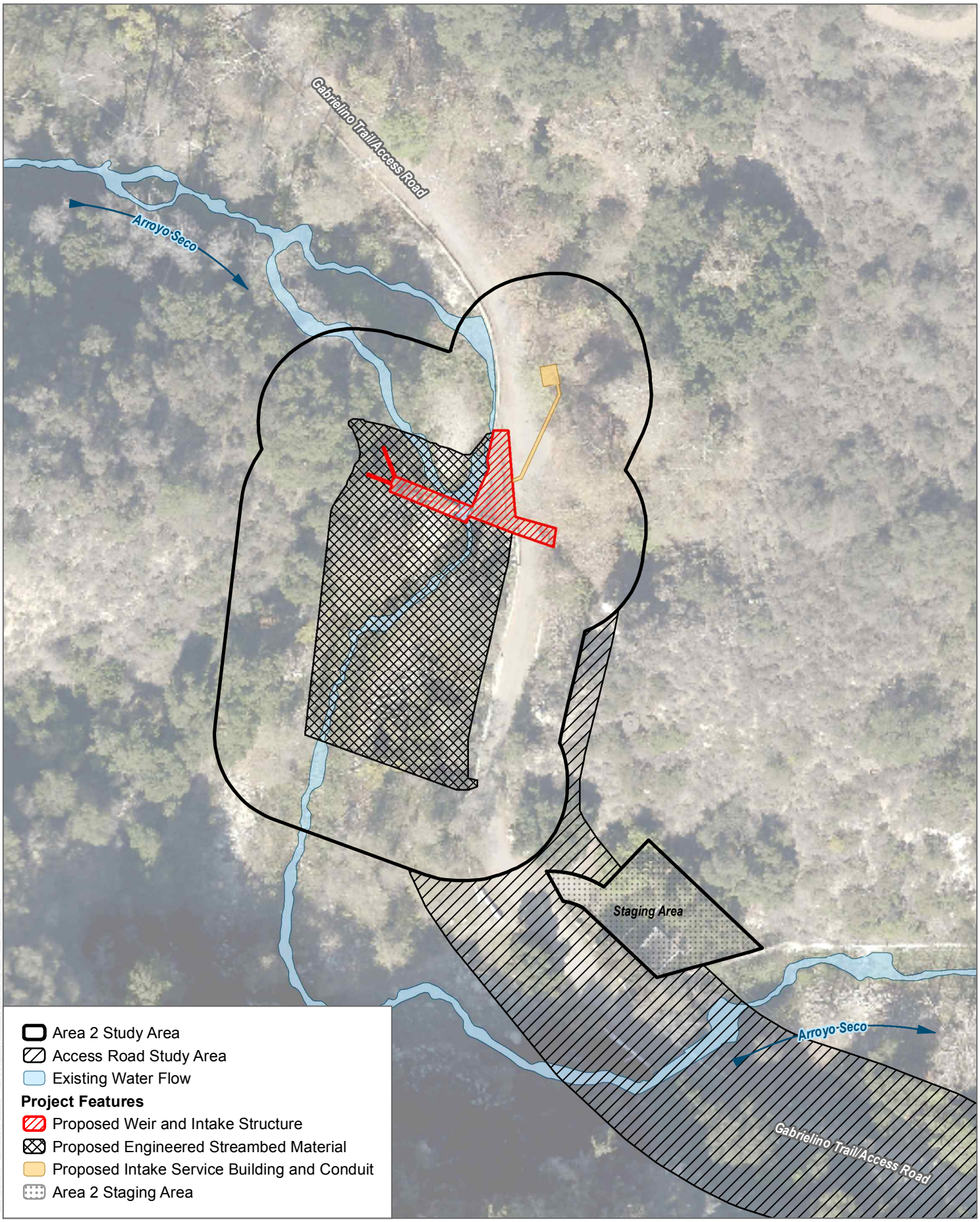
DUDEK

0 700 1,400 Feet

FIGURE 1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: LARIAC Aerials 2014

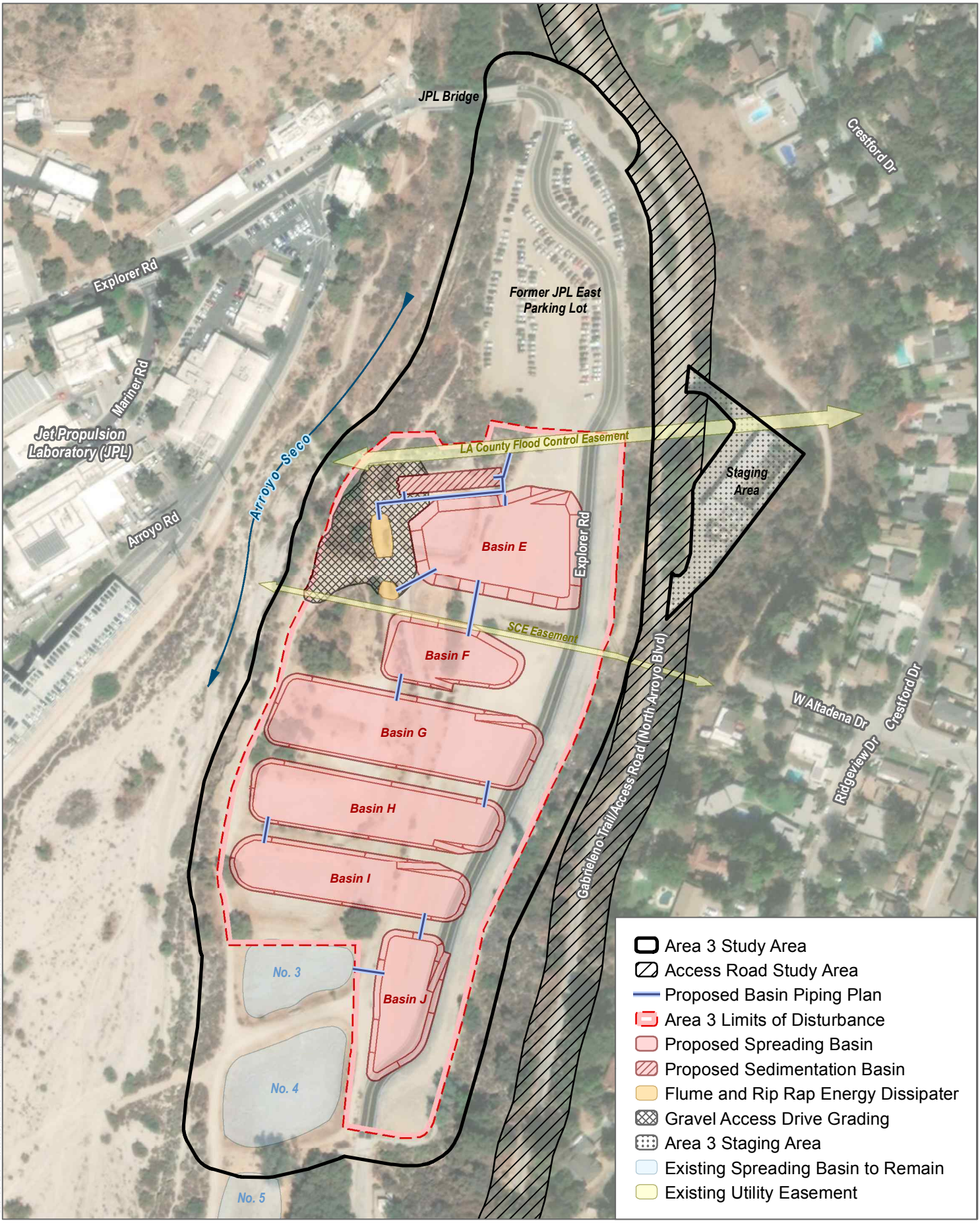
DUDEK

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FIGURE 2

Area 2 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Esri, Digital Globe 2019

DUDEK

0 112.5 225 Feet

FIGURE 3

Area 3 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

ARROYO SECO CANYON PROJECT AREAS 2 AND 3
INITIAL STUDY

Prepared for:

City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
Contact: Elisa Ventura, PE

Prepared by:

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Contact: Kristin Starbird

OCTOBER 2019

Printed on 30% post-consumer recycled material.

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1 Environmental Checklist Form

1. Project Title:	Arroyo Seco Canyon Project Areas 2 and 3
2. Lead agency name and address:	City of Pasadena 150 South Los Robles Avenue, Suite 200 Pasadena, California 91101
3. Contact person and phone number:	Elisa Ventura, PE, Principal Engineer 626.744.4465
4. Project location:	3420 and 3500 North Arroyo Boulevard, City of Pasadena. The Project site includes portions of Assessor Parcel Numbers 5830-001-906 and 5823-015-902. Area 3 begins approximately 0.3-mile north of the intersection of Windsor Avenue and Ventura Street along Explorer Road. The Project site continues northward along the North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road) to the top of Area 2 ending approximately 1 mile north of the intersection of Windsor Avenue and Ventura Street.
5. Project sponsor's name and address:	City of Pasadena Department of Water and Power 150 South Los Robles Avenue, Suite 200 Pasadena, California 91101
6. General plan designation:	Open Space
7. Zoning:	Open Space
8. Description of project:	The proposed Project includes demolition and replacement of surface water diversion facilities and the expansion of spreading basins. See Section 2 for details.
9. Surrounding land uses and setting:	The areas included in the Arroyo Seco Canyon Project are surrounded by residential uses in Pasadena and the unincorporated community of Altadena to the east and south; open spaces in the Angeles National Forest to the north; Devil's Gate Dam and Reservoir to the south; and the Arroyo Seco stream corridor, Oak Grove Park, the NASA-JPL campus, and residential areas in the City of La Cañada Flintridge to the west.
10. Other public agencies whose approval is required:	U.S. Army Corps of Engineers (Section 404 Nationwide Permit); California Department of Fish and Wildlife (Section 1600 Streambed Alteration Agreement); Los Angeles Regional Water Quality Control Board (Section 401 Water Quality Certification); Los Angeles County Flood Control District (Encroachment Permit)
11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1?	Consultation will begin upon issuance of the Notice of Preparation (NOP).

Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact," as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☐ Energy
☐ Geology and Soils	☐ Greenhouse Gas Emissions	☐ Hazards/Hazardous Materials
☒ Hydrology and Water Quality	☐ Land Use and Planning	☐ Mineral Resources
☒ Noise	☐ Population and Housing	☐ Public Services
☒ Recreation	☒ Transportation	☒ Tribal Cultural Resources
☐ Utilities and Service Systems	☐ Wildfire	☒ Mandatory Findings of Significance

Determination (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Prepared By:

Signature

10-29-19
Date

Reviewed By:

Signature

10/29/2019
Date

Evaluation of Environmental Impacts

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
3. Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an Environmental Impact Report (EIR) is required.
4. "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).
5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
    a. Earlier Analysis Used. Identify and state where they are available for review.
    b. Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
    c. Mitigation Measures. For effects that are "Less Than Significant With Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.
6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.
9. The explanation of each issue should identify:
    a. The significance criteria or threshold, if any, used to evaluate each question; and
    b. The mitigation measure identified, if any, to reduce the impact to less than significance.

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2 Project Description

2.1 Introduction

The City of Pasadena (City) Department of Water and Power (PWP) is proposing to implement the Arroyo Seco Canyon Project Areas 2 and 3 (proposed Project or Project). Pursuant to Section 15367 of the state California Environmental Quality Act (CEQA) Guidelines, the City is the Lead Agency and has the principal responsibility for carrying out the Project and has the authority for approving the Project and its accompanying environmental documentation.

The City will prepare an Environmental Impact Report (EIR) pursuant to CEQA Guidelines Section 15084 for the proposed Project. According to CEQA Guidelines 15060(d), a Lead Agency may determine that an EIR is clearly required for a project, the agency may skip further initial review of the project and begin work directly on the EIR. However, the City has prepared this Initial Study, which reflects its independent judgement, in order to focus the EIR on the Project's environmental effects determined to be potentially significant, identify the effects determined not to be significant, and explain the reasons for determining that potentially significant effects would not be significant. Pursuant to CEQA Guidelines Section 15063(d), an Initial Study must contain the following:

(1) A description of the project including the location of the project;

(2) An identification of the environmental setting;

(3) An identification of environmental effects by use of a checklist, matrix, or other method, provided that entries on a checklist or other form are briefly explained to indicate that there is some evidence to support the entries. The brief explanation may be either through a narrative or a reference to another information source such as an attached map, photographs, or an earlier EIR or negative declaration. A reference to another document should include, where appropriate, a citation to the page or pages where the information is found.

(4) A discussion of the ways to mitigate the significant effects identified, if any;

(5) An examination of whether the project would be consistent with existing zoning, plans, and other applicable land use controls; and,

(6) The name of the person or persons who prepared or participated in the Initial Study.

2.2 Project Location

The Project site is located in the City of Pasadena within the Arroyo Seco Canyon at 3420 and 3500 Arroyo Seco Road, City of Pasadena. The Project site includes portions of Assessor Parcel Numbers 5830-001-906 and 5823-015-902, located in Township 1 North, Range 12 West on the Pasadena, California 7.5′ USGS quadrangle map. The Project site can be accessed via Interstate (I) 210 by exiting Windsor Avenue and traveling northward for approximately 0.8-mile to the intersection of Windsor Avenue and Ventura Street. From this intersection, the City's open area (i.e., former Jet Propulsion Laboratory [JPL] East Parking Lot) is located approximately 0.3-mile north along Explorer Road, which constitutes the southern boundary of Area 3.

The proposed Project consists of two primary areas, as shown on Figure 1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements. These areas are connected by the North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road), which serves as a recreational trail and the access road for City of Pasadena and U.S. Forest Service (USFS) vehicles heading into the Arroyo Seco

Canyon. As shown on Figure 1, the proposed Project would involve construction activity and facility improvements in both areas, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The former Travelling Screen and Chlorine Building (Screen Building) adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging.

Within the City of Pasadena, the Arroyo Seco passes through three distinct recreational areas: (1) Upper Arroyo Seco, containing the Hahamongna Watershed Park (HWP) and Devil's Gate Reservoir and Dam; (2) Central Arroyo Seco, extending south of the Devil's Gate Dam to the Colorado Street Bridge; and (3) Lower Arroyo Seco, from the Colorado Street Bridge to the southern boundary of the City. The Project proposes new facilities and improvements only in the Upper Arroyo Seco, as shown on Figure 1.

2.3 Project Background

Settlement Agreement

On October 9, 2014, the City circulated the Arroyo Seco Canyon Project (ASCP) Initial Study/Mitigated Negative Declaration (IS/MND), State Clearinghouse (SCH) Number 2014101022, for a 30-day public review period from October 9, 2014, to November 8, 2014. The City was seeking approval of a Conditional Use Permit (CUP) No. 6222 for the ASCP, which involved improvements to three areas: Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, JPL East Parking Lot. The Final 2015 ASCP IS/MND is available for viewing online at https://ww5.cityofpasadena.net/planning/category/environmental-notices/ and/or PWPweb.com/Arroyo and a hardcopy of the Final 2015 ASCP IS/MND can be viewed during normal business hours at:

City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101

In accordance with CEQA Guidelines Section 15150, the 2015 ASCP IS/MND (ASCP IS/MND), and associated conditions of approval are incorporated by reference into this Initial Study. Incorporation by reference is a necessary device for reducing the size of an environmental document. Specifically, the mitigation measures set forth in the 2015 ASCP IS/MND and as set forth in the Mitigation Monitoring and Reporting Program (MMRP) are incorporated by reference and are available for viewing online at the website and address listed above.

On January 7, 2015, the City's Hearing Officer held a public hearing regarding the requested CUP and made the findings to approve the ASCP IS/MND for CUP No. 6222. On January 20, 2015, Spirit of the Sage Council, Project Soliton, and Hugh Bowles submitted an appeal of the Hearing Officer's decision to the Board of Zoning Appeals. The Board of Zoning Appeals hearing took place on March 4, 2015, and upheld the Hearing Officer's decision by a unanimous vote. The approval was again appealed to the City Council, and on June 1, 2015, the City Council voted to uphold the Board of Zoning Appeals decision by unanimous vote.

The City of Pasadena filed a Notice of Determination (NOD) for the ASCP IS/MND on January 13, 2015, after the Hearing Officer approval, and filed an additional NOD on March 6, 2015, after the Board of Zoning Appeals approval. On July 2, 2015, a lawsuit (Court Case No. BS156207) was filed against the City by petitioners Spirit of the Sage Council and Project Soliton challenging the approval. On March 20, 2017, the Los Angeles Superior Court issued its decision and on June 26, 2017, entered a Judgment that partially favored the petitioners. The Court found that the elements of the ASCP that related to increased diversions of surface water (i.e., greater taking of stream water

from the Arroyo Seco beyond its current withdrawal) required evaluation through the preparation of an EIR. The Court also ruled that the elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP and complied with CEQA. As such, the Court determined that CUP No. 6222 and its related findings and conditions of approval, and the ASCP IS/MND shall remain intact for these components, and would be allowed to move forward without any additional environmental review pursuant to CEQA (Spirit of the Sage Council v. City of Pasadena 2017). These approved components include:

- Area 1, Arroyo Seco Headworks: All ASCP elements.
- Area 2, Arroyo Seco Intake: Access road improvements and related slope reconstruction and protective riprap elements.
- Area 3, JPL East Parking Lot: All ASCP elements, except the expansion of 4 existing spreading basins and the construction of 2 new spreading basins. Specifically, the components of the ASCP IS/MND allowed to proceed include the parking lot, access road, sedimentation basin, demolition of existing structures and pipelines, new pipelines, new public restroom, new security booth and associated utility services (water, sewer, power, and communication lines), and topics related to the existing groundwater contamination associated with the Jet Propulsion Laboratory (JPL) site listing on hazardous materials sites compiled pursuant to Government Code Section 65962.5.

In addition, after the Courts ruling, the petitioners and the City came to an agreement to resolve remaining issues and obtain certain assurances as to future actions of the parties. Through this Settlement Agreement, it was agreed that the City shall have the right to perform maintenance activities, including tilling and grading of the existing spreading basins to re-establish historical percolation rates and maintenance activities that involve negligible or no expansion of use as described in CEQA Guidelines Section 15301 for a Class 1 Categorical Exemption. The Settlement Agreement further clarified that the City may perform excavation and grading necessary for the temporary bridges as described in the ASCP IS/MND.

In accordance with the terms and provisions of the Judgment and Peremptory Writ of Mandate, the City's Declaration in Support of the Judgment, the Statement of Decision on Petition for Writ of Mandate, and the Settlement Agreement (see Appendix A to this Initial Study), the City is preparing an EIR for the proposed Project in accordance with CEQA and the state CEQA Guidelines. Because several components of the ASCP were allowed to proceed without any additional environmental review pursuant to CEQA, the proposed Project boundaries of Area 2 and Area 3 have been refined from those shown in the 2015 ASCP IS/MND to reflect the activities subject to review under this EIR, as described below.

Project Purpose

The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco for direct use or for spreading into its basins for water pumping credits in the Raymond Basin. The City receives between 60 to 80% groundwater pumping credit for the amount of water recharged into the groundwater basin. In the two storm seasons following the 2009 Station Fire, excessive amounts of sediment washed down from the watershed. The debris flows damaged City structures, greatly reducing the City's capacity to divert water for spreading. As a result, PWP proposes to repair and replace damaged facilities in the Upper Arroyo Seco Canyon as a part of the proposed Project. The improvements would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this important local water resource. The proposed Project would implement a multi-benefit approach to the repair and replacement of damaged infrastructure in the Arroyo Seco, with the overall Project objectives to increase the beneficial use of the surface water rights held by the City and to improve

biological functions within the Arroyo Seco. For any future fish populations that may establish in the Arroyo Seco, the new intake would include a fish screening feature to prevent fish populations from passing into the intake and conveyance system, and a roughened channel would be constructed directly downstream of the new weir to allow for future fish passage upstream during moderate flow periods.

The City's General Plan Open Space and Conservation Element sets forth objectives related to the use of water resources in the City (City of Pasadena 2012). The proposed Project supports these objectives, as follows:

- Increase the efficiency of water use among Pasadena residents, and commercial and industrial organizations.

  The proposed Project would facilitate the efficient use of water in the Arroyo Seco by allowing for the full utilization of the City's surface water rights and reducing reliance upon imported water supplies from the Metropolitan Water District of Southern California (MWD). PWP has a longstanding right to divert up to 25 cubic feet per second (cfs) from this source. MWD imports water from the Sacramento-San Joaquin Delta via the State Water Project, and from the Colorado River. In recent years, MWD has imposed allocation limits on its water supply deliveries to its member agencies, and the future reliability of imported water will continue to face uncertainties from climate change, environmental regulations, and droughts. Another important issue associated with imported water is cost, which has increased substantially in the past few years (City of Pasadena 2012). Achieving water supply reliability will depend on a number of key water policy and management decisions on a regional and local level, including implementation of projects such as the proposed Arroyo Seco Canyon Project Areas 2 and 3.

- Protect local water supply sources and plant trees and vegetation that are consistent with habitat and water conservation policies.

  The proposed Project would facilitate the protection of local water supply sources by improving the ability of the diversion weir and intake structure to capture water during high-flow storm events. It has been PWP's practice in the past (more so after floods following the Station Fire damaged the upstream settling basins) to bypass water from high-flow storm events when the water is sediment-laden and turbid in order to protect the function of the existing infrastructure. Improvements in the facilities to better accommodate turbid waters in high-flow events, as well as improvements to the capacity of the spreading basins, would facilitate the beneficial use of available local water supply sources.

- Improve surface permeability and recharge aquifers/enhance storm water quality to prevent pollution/trash from entering Los Angeles and San Gabriel Rivers and ocean.

  The proposed Project would improve the functionality and efficiency of the facilities responsible for the diversion and infiltration of water into the Raymond Basin. PWP has in the past forfeited available water due to the lack of spreading capacity within the spreading basins (Carollo Engineers 2013). The increased capacity and efficiency of the spreading basin improvements in Area 3 (which includes a new sedimentation basin for sediment to settle out before water is directed to the spreading basins) would maximize capacity and infiltration rates, thereby improving the recharge of groundwater supplies.

Additionally, the proposed Project would support the implementation of improvements set forth in the Hahamongna Watershed Park (HWP) Master Plan. The study area for the HWP Master Plan includes the area below the JPL Bridge, which includes Area 3 of the proposed Project (City of Pasadena 2003). Table 1, Hahamongna Watershed Park

Area 5A Water Resource and Associated Improvements, identifies the proposed Project's consistency with the HWP Master Plan Improvements identified for the proposed Project Area 3.

Table 1. Hahamongna Watershed Park Area 5A: Water Resource and Associated Improvements

HWP Master Plan Improvements for Area 5A	Arroyo Seco Canyon Project Areas 2 and 3 (Proposed Project)
Remove the southern ¾ of the east JPL parking lot.	Completed/Not a Part. The parking lot was removed in 2016.
Relocate and improve water conservation distribution system (diverted and pumped-back storm water).	Not a Part. However, implementation of the ASCP does not conflict with or hinder this improvement.
Construct the Eastside Spreading Basins Project including expanded spreading basins 1 through 4, two new basins, and relocated sludge ponds 1 and 2.	Consistent. The proposed Project would implement this proposed improvement.
Complete the pump-back system from the dam area to the spreading basins.	Not a Part. However, implementation of the ASCP does not conflict with or hinder this improvement.
Construct the overall storm drain modification improvements, including the Altacrest Drain improvements and drainage improvements in the Interpretive Area.	Not a Part. However, implementation of the ASCP does not conflict with or hinder this improvement.
Implement the Habitat Establishment Project at the eastside spreading basins from the remaining northern parking lot south to Johnson Field.	Not a Part. However, implementation of the ASCP does not conflict or hinder this improvement.
Convert the northern ¼ of the east JPL parking lot to public parking and restore and establish habitat in this area.	Would be accomplished through implementation of the ASCP assessed under the 2015 IS/MND.
Construct a sewer lift station and force main across the JPL bridge to JPL's sewer system and underground the power to the site for the new public restroom.	Would be accomplished through implementation of the ASCP assessed under the 2015 IS/MND.
Construct a new public restroom at the north end of the east lot; install eastside picnic amenities on the west side of the Stream Corridor Alignment Habitat Project and at the new public restroom. These improvements will be made when specific need and locations are identified.	The restroom would be accomplished through implementation of the ASCP assessed under the 2015 IS/MND. The remainder is Not a Part. However, implementation of the ASCP does not conflict with or hinder this improvement.

2.4 Project Summary

The Project site consists of two primary areas as shown on Figure 1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements, which are connected by the Gabrielino Trail/Access Road. The proposed Project would involve construction activity and facility improvements in both areas, as well as construction vehicle traffic along portions of the Gabrielino Trail/Access Road.

Area 2: Diversion and Intake Replacement

Figure 2a, Area 2 Existing Conditions, identifies the primary existing structures in Area 2, including the concrete diversion weir and intake structure, a fenced area with a screening building and access to sections of the

conveyance system, the Gabrielino Trail/Access Road, and a historic bridge (Bridge No. 3) over the Arroyo Seco. The diversion weir directs water into the intake structure by obstructing the stream flow and creating a small pool of water that flows into the intake. The intake would be operated to divert the City's 25 cfs of water rights, while additional flows beyond 25 cfs would continue downstream. Due to sediment buildup trapped on the upstream side of the weir, the pooling capacity is reduced and the ability to collect water for spreading is limited. When water enters the intake, it is conveyed downstream through the conveyance system to the PWP's spreading basins. The existing intake/diversion system consists of an approximate 9-foot-high reinforced concrete training wall and intake structure with a trash rack on the east bank of the stream, and a reinforced concrete weir with stop logs in slots. Under current conditions, the weir crest is approximately 2 feet above the streambed on the downstream side.

Improvements in Area 2 include the demolition and removal of the existing concrete weir and portions of the intake structure and the construction of a new diversion structure that would be operated to divert up to 25 cfs of creek flows into the existing conveyance system. The intake structure would be remodeled with new concrete walls and top deck to accommodate a new screen configuration. An existing concrete slab that previously supported an equipment building located adjacent to the Gabrielino Trail/Access Road would be demolished. A new 106 square foot (11 feet 4 inches by 9 feet 4 inches) intake service building would be constructed to house the electrical and hydraulic controls for the diversion structure. Electric power for the operation of the diversion structure and control equipment enclosure would be supplied by an existing power line at the screen building (southeast of the intake structure). The locations of the proposed facilities and improvements are shown on Figure 2b, Area 2 Conceptual Design Overview.

The proposed new diversion/intake structure would capture flows up to PWP's surface water rights. This would include all flows during small storm events and dry weather flows in the Arroyo Seco, and a portion of flows during large storm events. During larger storms when the water is too turbid with suspended sediments (e.g., flows generally above 100 cfs), the stream with its associated sediment load would bypass the diversion/intake structure and continue downstream to Devil's Gate Reservoir. Operation of the weir during high flows would be facilitated by the adjustable height weir or crest gate. At low flows, the gate would start in the 'up' position and as flows increase, the gate would be lowered to maintain a constant water surface level in the diversion pool (a pool created behind the weir to allow for an appropriate water elevation to flow into the diversion intake). When the gate is fully lowered, flows would entirely bypass the diversion structure and carry all flows and sediment downstream.

The new diversion/intake structure would improve biological functions in the Arroyo Seco by allowing for fish passage if future fish populations are established, as well as other aquatic wildlife. The existing weir/diversion structure is a barrier to upstream fish passage due to the elevation drop downstream of the structure. The new diversion structure would be designed for the possibility that some future fish may pass downstream when the diversion is not operating (i.e., the gate is lowered to allow flows to continue downstream without diversion) or when the diversion is operating and flows are high enough to spill over the crest gate. A roughened channel would be constructed downstream of the new diversion structure and operable weir such that upstream passage for future fish populations may occur during periods when the diversion is not operating and flows are adequate to allow for passage. In the current condition, water passes through a trash rack to prevent debris from entering the conveyance system to the spreading basins. In addition to filtering such debris, the proposed new intake structure would include a fish screening feature to prevent future fish populations from passing into the intake and conveyance system.

Area 3: Spreading Basin Improvements

Area 3 is located approximately 0.3-mile downstream from Area 2 and includes two existing spreading basins that are known as Pasadena Ponds 1 and 2 (formerly used as sludge ponds for the Behner Treatment Plant) and Spreading Basins No. 1 through 4, the former JPL Parking Lot and adjacent Explorer Road, and the North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road), which would provide construction vehicle access to Area 2 of the Project site. Figure 3a, Area 3 Existing Conditions, identifies the primary structures and facilities in Area 3.

Improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of creek flows for infiltration into the Raymond Basin. Various facilities would be demolished, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chain-link fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins.

Figure 3b, Conceptual Site Plan, depicts the proposed spreading basin improvements. Creek flows from the existing conveyance system would outlet to the new sedimentation basin or to new spreading Basin E located over the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's open area (i.e., former JPL East Parking Lot). Each new basin would have an access ramp for maintenance. Rock boulders would be placed along the western edge of Explorer Road to separate the roadway from the adjacent basins. With the area's sloping terrain, depths of the basins would range from 3 feet to 7 feet. When spreading water, the water depth in the basins would be approximately 1 foot. All basins would include inlets/outlets with 24-inch interconnection piping. Spillways, pipelines, culverts, and valves would be provided to connect the basins to each other. Basin J would be the last newly constructed basin located entirely within the former JPL East Parking Lot, which would include interconnection piping into the existing Basin 3. Other basins downstream of Basin 3 are not a part of the proposed Project, although Basin 4 may be temporarily impacted during construction.

Gabrielino Trail and Bridge Crossings

The Gabrielino Trail (i.e., North Arroyo Boulevard) runs generally parallel to the Arroyo Seco and along the eastern side of the former JPL East Parking Lot and serves as a recreation trail for hikers, bikers, and equestrian uses. It also serves as a maintenance access road that leads to the Behner Water Treatment Plant and into the Arroyo Seco Canyon area to provide access for PWP and the USFS. During construction activities, the Gabrielino Trail/Access Road would provide for vehicular access to and from Area 2, and sometimes Area 3 (Explorer Road will be its primary access road).

Along the Gabrielino Trail/Access Road, three bridges cross portions of the Arroyo Seco. Bridge Nos. 1, 2, and 3 are located between Areas 2 and 3, respectively . Bridge No. 1 is a culvert-style bridge with concrete slab deck over Millard Creek, approximately 0.13-mile north of the JPL Bridge. A July 2015 Bridge Condition Assessment found that the bridge abutments were being undermined due to scouring and that the Gabrielino Trail/Access Road had sloughed off in sections. A structural overlay bridge spanning the length of this bridge was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage.

Bridge No. 2 is located approximately 130 feet north of Bridge No. 1 and is a reinforced concrete arch bridge with decorative cast-concrete railing. Bridge No. 2 was likely constructed to provide a formal entrance to the Upper Arroyo Seco and the ANF, and it appears to meet the required criteria to be listed as a historical resource in the California Register of Historic Resources (CRHR) and in the City of Pasadena as a landmark (BonTerra Psomas 2015).

Bridge No. 3 is located approximately 0.34-mile north of the JPL Bridge within Area 2 and was constructed with truss-bridge forms using wood timbers. It was constructed by the Civilian Conservation Corps (CCC) in 1939 and is associated with events that made a significant contribution to the history of the United States and California. Bridge No. 3 appears to meet the required criteria to be listed as a historical resource in the National Register of Historic Place (NRHP) and in the CRHR. The bridge was heavily damaged by the 2010 storms. A structural overlay bridge spanning the length of Bridge 3 was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage. A structural evaluation of Bridge 3 subsequent to the structural overlay, however, shows the condition of Bridge 3 continues to deteriorate (TJC 2018).

Additionally, stone masonry walls line the east side of the Arroyo Seco at Bridge No. 2 and continue upstream to Bridge No. 3. The stone masonry walls would not be altered by Project activities. The structural overlay bridge crossings on Bridge Nos. 1 and 3 would remain in place throughout the duration of construction. Upon completion of the proposed Project, the City intends to keep the bridge structures as-is, complete with additional support structures, into the foreseeable future. No construction activities on the bridges are anticipated. As set forth in the Settlement Agreement, the impact of retaining these bridge structures will be studied in the EIR.

Construction Activities

Construction of the Project improvements is anticipated to take approximately 16 months, starting in August 2021 with Project completion expected by January 2023. In the interest of minimizing the export of excavated materials from the Project site, the City may implement a mechanical shaker to sort and sift through excavated soils to separate finer soils from larger rocks, thereby allowing for the beneficial reuse of the materials as engineered fill materials during the construction of the spreading basins. Rock materials may be used on site for decorative/landscaping purposes throughout the Project study area, added to an existing stockpile that has been created by the City in an area along the west bank of the Arroyo for future uses, or may be exported off site.

Construction trucks hauling soils and debris to and from Scholl Canyon Landfill are expected to come to the site from I-210 at the Windsor Avenue off-ramp and head north on Windsor Avenue to the intersection with Ventura Street. At this intersection is a fork in the road, one leading to Explorer Road into Area 3 and the other leading to the gated North Arroyo Boulevard, which passes adjacent to residential properties and the Behner Treatment Plant. Near the JPL Bridge over the Arroyo Seco near the northern boundary of Area 3, North Arroyo Boulevard splits and provides access to the Gabrielino Trail/Access Road and to the JPL Bridge/Explorer Road. Construction trucks would use North Arroyo Boulevard to access Area 2 and Explorer Road would be used to access Area 3. From I-210, trucks would head west on SR-134; exit at the Figueroa Street/Scholl Canyon Road off-ramp; head north-northeast toward the landfill. Trucks would come back from the landfill entering the eastbound on-ramp on the SR-134 at Figueroa Street and head east; trucks would then go west on I-210 to Windsor Avenue to Explorer Road and, ultimately, to the site.

Occasional partial closures for the Gabrielino Trail/Access Road would be required for construction truck and equipment access. The Screen Building adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging.

Operational Activities

City personnel would continue to provide maintenance of the diversion and intake structures in Area 2 as occurs under existing conditions. When necessary, cleaning of the spreading basins in Area 3 would continue to be accomplished by mechanically scraping the top layer of soil using front-end loaders, graders, or scrapers. Following

removal, the surface would be disked or harrowed to loosen any soil compaction caused by cleaning. An estimated 100 truckloads of soil from the existing and proposed spreading basins would have to be disposed of off site every 5 years, which is reflective of current maintenance activities. As such, no substantive changes to ongoing operations and/or maintenance activities are anticipated.

2.5 Project Setting

Physical Setting Overview

The Arroyo Seco is a major tributary of the Los Angeles River, flowing from the San Gabriel Mountains in the Angeles National Forest (ANF). The Canyon has a north-south alignment with steep east- and west-facing slopes. The Hahamongna Watershed Park Master Plan describes the rocky streambed as containing an ephemeral stream, which is the source of its given Spanish name "arroyo seco" meaning "dry wash" (City of Pasadena 2003). However, the Arroyo Seco north (upstream) of the JPL Bridge has been classified by the U.S. Fish and Wildlife Service as having a seasonally flooded water regime, which means surface water is typically present for extended periods, especially in the winter and early spring, but is absent by the end of the spring or early summer in most years (USFWS 2019).

The Arroyo Seco originates in the San Gabriel Mountains, with waters flowing south through the cities of Pasadena, South Pasadena and Los Angeles, before joining the Los Angeles River just east of Elysian Park and west of the Interstate (I) 5/I-110 Interchange. Within the City of Pasadena, the Arroyo Seco passes through three distinct recreational areas: (1) Upper Arroyo Seco, containing HWP and Devil's Gate Dam; (2) Central Arroyo Seco, containing the Brookside Golf Course and Rose Bowl; and (3) Lower Arroyo Seco, containing an archery range, casting pond, and Memorial Grove. The Project proposes improvements in the Upper Arroyo Seco (in the City of Pasadena on land owned by the City). HWP is bound on the south by the Devil's Gate Dam and Oak Grove Drive. Oak Grove Drive and the JPL of the California Institute of Technology bound the HWP to the west in the City of La Cañada-Flintridge. To the east, HWP is bound by the residential neighborhoods of Pasadena and Altadena. The HWP extends northward into the San Gabriel Mountains and includes approximately 1,300 acres of open spaces and recreational amenities, including the Gabrielino Trail that is heavily used for hiking/bicycling and equestrian activities.

Upstream of the JPL Bridge, the Arroyo Seco is largely vegetated with coast live oak with patches of white alder and occasional California sycamores. Immediately downstream of the diversion weir, vegetation is dominated by a mix of California sycamores and white alders with occasional Goodding's black willows and arroyo willows. Special status bird species that may occur in the Project area include the state and federally listed Endangered southwestern willow flycatcher and least Bell's vireo, as well as the California Species of Special Concern listed yellow-breasted chat and the yellow warbler (BonTerra Psomas 2014).

Downstream of the JPL Bridge, the Arroyo Seco fans out into the alluvial system of the Devil's Gate Reservoir. In November 2018, the Los Angeles County Flood Control District (LACFCD) began the removal of 1.7 million cubic yards of accumulated sediment located within 42 acres of the Devil's Gate Reservoir. Sediment removal activities would occur adjacent to existing Spreading Basin No. 14. Approximately 70 acres of habitat restoration would occur in the remaining portions of the Reservoir, including along the sloped areas between the Arroyo Seco and the spreading basins as well as within the southernmost Spreading Basin No. 17. Sediment removal activities are anticipated to continue through 2022 with habitat restoration activities occurring through 2023 (County of Los Angeles 2018). More information about the LACFCD's Devils Gate Sediment Removal Project can be found online at: https://dpw.lacounty.gov/swe/devilsgate/about.shtml.

Planning Context

The HWP is almost entirely designated and zoned as Open Space in the City of Pasadena's General Plan Land Use Plan and Zoning Map, including Areas 2 and 3 (City of Pasadena 2016, 2018). The Open Space designation and zone applies to City-owned land with active and passive public recreational facilities and natural open space. A Modification to the Conditional Use Permit (CUP) No. 6222 is required for any parkland and recreational improvements within the OS Zoning District.

The Arroyo Seco Master Plan is a park/facility planning document that consists of four elements: (1) Hahamongna Watershed Park Master Plan, (2) Central Arroyo Seco Master Plan, (3) Lower Arroyo Seco Master Plan, and (4) Design Guidelines for the Arroyo Seco. The Hahamongna Watershed Park Master Plan (HWMP) and the Arroyo Seco Design Guidelines are applicable documents that address select components of the proposed Project.

The HWMP sets forth objectives for the future use and development of HWP, which includes approximately 1,300 acres of open space that extends up the Arroyo Seco Canyon from the Devil's Gate Dam. The lower watershed, the 330 acres roughly defined as the floodplain and basin behind the Dam, is the focus of the HWMP. The HWMP establishes a framework for flood management, water conservation, habitat restoration, recreation, and cultural resources protection in this area. The HWMP was adopted in 2003 and an amendment approved in 2010.

The projects specified in the HWMP that are within the Project's boundaries include the expansion of the existing spreading grounds through the creation of new spreading basins on the central and southern portions of the former JPL East Parking Lot. The HWMP also calls for habitat restoration around the spreading basins. Other improvements are planned in the HWMP that were covered and approved under the ASCP IS/MND, including parking lot improvements and a new restroom.

2.6 Discretionary Actions

Table 2 lists all the agencies that are known or expected to have permit or approval authority over the proposed Project. This Initial Study covers all federal, state, local government, and quasi-government approvals that may be needed to construct, implement, or operate the Project, whether or not they are specifically identified in Table 2 or elsewhere in this Initial Study.

Table 2. Agency Approvals and Requirements

Agency	Approved/Permit Required	Purpose	Notes
City of Pasadena	Project approval	Approve the proposed Project and allocate City funds.	–
	Conditional Use Permit Modification	Allow for utility improvements in the Open Space zone	In compliance with the City's Zoning Code
	Tree removal authorization	Allow removal of trees in areas to be disturbed.	In compliance with City Trees and Tree Protection Ordinance
U.S. Army Corps of Engineers (USACE)	Section 404 Nationwide Permit	Allow the discharge of dredge and fill material into "waters of the United States."	Nationwide Permit (NWP) required for temporary and permanent disturbance of Arroyo Seco in Area 2

Table 2. Agency Approvals and Requirements

Agency	Approved/Permit Required	Purpose	Notes
Los Angeles Regional Water Quality Control Board (RWQCB)	Section 401 Water Quality Certification	Protect water quality within "waters of the United States."	Water Quality Certification required for temporary and permanent disturbance of Arroyo Seco in Area 2 and for temporary impacts due to spreading basin expansion in Area 3
California Department of Fish and Wildlife (CDFW)	Section 1600 Streambed Alteration Agreement	Authorize changes to the natural flow or the bed, channel, or bank of any river, stream, or lake and associated impacts to biological resources.	Streambed Alteration Agreement required for temporary and permanent disturbance of Arroyo Seco in Area 2 and for temporary impacts due to spreading basin expansion in Area 3
Los Angeles County Flood Control District	Encroachment Permit	Authorize construction activities within the Altadena Storm Drain Easement	–

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3 Initial Study Checklist

3.1 Aesthetics

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Except as provided in Public Resources Code Section 21099, would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

a) Would the project have a substantial adverse effect on a scenic vista?

The City's General Plan Open Space and Conservation Element describes the Arroyo Seco as being an important primary green space for the City that includes iconic elements of the City's regional identity. Although there are no specifically designated and protected scenic vistas enumerated in the City's General Plan, the Green Space, Recreation and Parks Element states:

> Citywide Parks can be expected to draw users on a regional basis. Typically, a Citywide Park would include large natural open space areas. These areas may contain amenities such as trails and vista points. In addition to recreational opportunities, natural open space areas typically contain important visual features that contribute to the recreational experience. Pasadena's Citywide parks are Brookside Park, Hahamongna Watershed Park, and Lower Arroyo Park (City of Pasadena 2007).

Area 2 is located within a small portion of the Arroyo Seco and includes the adjacent Gabrielino Trail/Access Road. Views in this area are limited to the adjacent surrounding vegetation and canyon slopes. Recreational users along the Gabrielino Trail/Access Road have views of Area 2; however, this site is not visible from other areas within the Arroyo Seco Canyon due to intervening topography and vegetation.

The Project site is located within the HWP. The HWP Master Plan includes the area below the JPL Bridge, which includes Area 3 of the proposed Project (City of Pasadena 2003). The HWP Master Plan states:

> From the narrow canyon, just below Devil's Gate Dam, to the broad flood plain with its wooded and chaparral-covered slopes and up to the prominent points with their grand vistas, this cultural resource called Hahamongna Watershed Park should be enhanced and preserved.

The existing ponds 1 and 2 within Area 3 are fenced and are not publicly accessible facilities. However, a trail located between existing Basin 1 and Basin 2 provides connectivity among the hiking/riding trails in the HWP and provides for views of the San Gabriel Mountains, Devil's Gate Reservoir, and Arroyo Seco Canyon.

The existing water infrastructure facilities included in Areas 2 and 3 are located within important scenic areas of the City that are highly valued for their vegetated open space character; however, they would not be considered scenic resources in and of themselves. Views of the Arroyo Seco, Devil's Gate Reservoir, and surrounding natural areas from the Gabrielino Trail/Access Road would be considered scenic vistas. The visual character of the area can generally be described as including a relatively undisturbed natural stream and associated vegetation in a wooded canyon setting. The beauty of the area provides an important amenity for many recreational users.

The HWP Master Plan includes a proposal to construct the Sunset Overlook, which would be located just north of the Windsor/Ventura entrance to the HWP. A small picnic and interpretive area would be developed to take advantage of the broad views of the basin. The site overlooks the spreading basins and would provide opportunities for education on water resources and habitat restoration. Implementation of the proposed Project would not interfere with any plans to construct the small picnic and interpretive area at the Sunset Overlook, nor would it have a substantial adverse effect on the existing or future scenic views of the area. The Project site is too far from the Sunrise Overlook located near Berkshire Creek, to be visible from that location.

Within Areas 2 and 3, construction activities would temporarily detract from the natural setting, as construction equipment, staging areas, demolition/excavation, grading activities, and construction work would be visible to persons near the disturbed areas during the construction phase. Construction activities would temporarily diminish the visual quality of the areas being disturbed, and possibly the scenic vistas from portions of the Gabrielino Trail/Access Road. However, this impact would be a short-term visual nuisance. Also, security fencing that may be provided around construction work areas would shield views of construction activities. The security fencing would be located around equipment staging areas, which includes parking for vehicles/equipment when not in use and stockpiled materials.

The long-term views of scenic resources from Areas 2 and 3 would not be substantively altered from the current existing conditions. In Area 2 and as shown in Figures 2a and 2b, the new diversion and intake structure would be in largely the same location as currently located and would maintain a similar height and would span the creek, as in the current condition. Engineered streambed material, similar to riprap, which is made of natural stones, would be installed along the upstream and downstream sides of the new diversion structure to reduce erosion and would allow for natural vegetation to grow. A roughened channel would be constructed directly downstream of the new weir to allow for future fish passage upstream during moderate flow periods. The engineered streambed material would be constructed to visually mimic the rocky and undulating natural streambed and would be constructed with natural stones of varying sizes. Replacement and new chain-link fencing would be extended along the current alignment of the K-rail barriers, which would be removed as a part of the Project.

Views of the diversion/intake structure along the Gabrielino Trail/Access Road are limited because the facility is located to the east of the hiking trail, below the grade of the trail behind chain-link fencing, and is obscured by existing mature vegetation. Views of the existing facilities in Area 2 are included in Figure 4a, Area 2 Existing Conditions Photographs. The new structure would be similarly obscured from the viewshed of recreational users of the Gabrielino Trail/Access Road. No new vertical structures (e.g., buildings, towers) would be constructed at the site that could obstruct views of the stream or surrounding canyons and vegetation from the Gabrielino Trail/Access Road.

It is anticipated that approximately eight mature trees would be removed in Area 2 and approximately one mature tree would be removed in Area 3 as part of Project construction (BonTerra Psomas 2014). Replacement of these trees would be required under the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code), which depending on the size of the tree to be removed and the size of the replacement tree container size, could require a replacement ratio between 2:1 or up to 12:1. Therefore, there would be an increase in the number of post-Project trees in the Arroyo Seco. With the replacement of these trees within the Arroyo Seco Canyon in compliance with City requirements, the removal of approximately eight trees in Area 2 and approximately one tree in Area 3, would not substantially adversely affect a scenic vista.

The new 106 square foot (11 feet 4 inches by 9 feet 4 inches) intake service building would be constructed to house the electrical and hydraulic controls for the diversion structure (see Figure 2b). The structure would be located on the east side of the Gabrielino Trail/Access Road at the site of a former 10-foot by 15-foot concrete slab and cement/mortar retaining wall. The building would be 10 feet tall and be constructed with an exterior stone masonry façade stem wall and lath/plaster stucco finish, with a roll-up door for access to the interior mechanical equipment. The building would reflect the natural colors and materials of the surrounding area and would not obscure views of the Arroyo Seco Canyon or otherwise substantially adversely affect a scenic vista.

In Area 3 and as shown in Figures 3a and 3b, the existing chain-link fencing around the Ponds 1 and 2 would be replaced to surround the new sedimentation basin; otherwise, no new permanent fencing would be constructed. The new sedimentation basin and spreading Basin E would be located at the site of the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's graded open area (i.e., former JPL East Parking Lot). Each new basin would have an access ramp for maintenance. Rock boulders would be placed along the western edge of Explorer Road to separate the roadway from the adjacent basins. Basin J would be the last newly constructed basin located entirely within the former JPL East Parking Lot, which would include interconnection piping into the existing Basin 3. Other basins downstream of Basin 3 are not a part of the proposed Project, although Basin 4 may be temporarily impacted during construction and is included in the Study Area. Views of the existing facilities in Area 3 are included in Figure 4b, Area 3 Existing Conditions Photographs.

In summary, the expanded and reconfigured basins would be located over the existing basins and the former JPL East Parking Lot. The basins would continue to be earthen structures that occasionally contain open water, which would be consistent with the current condition and may be considered a visual improvement over the former JPL East Parking Lot. Impacts to scenic vistas would be less than significant, and no mitigation is required. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic. Therefore, this topic will not be further evaluated in the EIR.

b) Would the project substantially damage scenic resources including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Several freeways and highways have been included in the California Scenic Highway System as "Officially Designated Scenic Highways" or "Eligible State Scenic Highways." The nearest Officially Designated Scenic Highway is State Route (SR)-2, Angeles Crest Highway, which travels through the San Gabriel Mountains from I-210 in La Cañada Flintridge to the SR-138 past Wrightwood (Caltrans 2013). As part of the SR-110, the Arroyo Seco Parkway is a designated National Scenic Byway (FHWA 2013). The closest roadways identified in Caltrans Scenic Highway Program are:

- SR-2, which is an Officially Designated Scenic Highway, is located approximately 1.5 miles northwest of Area 2 at its nearest point, and there are no views of the Arroyo Seco Canyon or HWP due to distance, structures, topography, and intervening vegetation.
- I-210, which is an Eligible Scenic Highway from the I-5 in Sylmar to the SR-134 in Pasadena, is located near the southern edge of Devil's Gate Dam. Travelers on the I-210 can catch fleeting views of some of the vegetation within the Devil's Gate Reservoir and the distant mountains, but the spreading basins in Area 3 and the more distant Arroyo Seco Canyon are not visible from the I-210.
- SR-110, which is a National Scenic Byway, terminates in Old Pasadena near East Holly Street, which is approximately 3.6 miles south of Area 3. There are no views of the Arroyo Seco Canyon or HWP due to distance, structures, topography, and intervening vegetation.

The proposed improvements in Areas 2 and 3 would not be visible from the SR-2, the I-210, or the SR-110; therefore, no impacts on scenic resources along these scenic highways would occur and this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

c) In non-urbanized areas, would the project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point).

The visual character of the Area 2 is predominantly characterized by the Arroyo Seco and associated vegetation and trees, and by the graded Gabrielino Trail/Access Road and chain-link fencing running north-south along the length of the area. As shown in Figure 4a, the aesthetic aspects of the current views of Area 2 from the Gabrielino Trail/Access Road are of the vegetated canyon slopes and creek bed. Distant views are limited due to the curve in the creek and Gabrielino Trail/Access Road, as well as mature trees and vegetation. As shown in Figure 4b, the aesthetic aspects of the current views of Area 3 are predominantly characterized by the open views of the vegetated canyon slopes adjacent to the Gabrielino Trail/Access Road, existing spreading basins, and City's graded open area (i.e., former JPL East Parking Lot) and Explorer Road.

Construction activities would temporarily detract from the natural setting, as construction equipment, staging areas, excavation, grading activities, demolition, and construction work would be visible to persons near the disturbed areas during the construction phase. As discussed under Threshold 3.1(a), construction equipment and activities are a temporary visual nuisance that are commonplace; however, this impact is more noticeable in the context of the natural setting in Area 2, which is visited by people wishing to experience a natural setting. Construction activities would temporarily diminish the visual quality of the areas being disturbed; however, this impact would be a short-term inconvenience, and temporary impacts would be less than significant.

In Area 2, the proposed new diversion structure would span the width of the stream, engineered streambed material would be constructed on both sides of the diversion structure, and the intake service building would be located on the east side of the Gabrielino Trail/Access Road. The existing man-made Gabrielino Trail/Access Road, intake structure, diversion structure, chain-link fence, and K-rails in Area 2 have been in place for a long time and the proposed facilities are replacements of existing structures and are not new structures in an otherwise pristine setting. As described under Threshold 3.1(a), the new diversion and intake structure would be in the same location as currently located (see Figures 2a and 2b), and would maintain a similar height and would span the creek, as in the current condition. Views of the diversion/intake structure along the Gabrielino Trail/Access Road are limited because the facility is located to the east of the hiking trail, below the grade of the trail behind chain-link fencing, and is obscured by existing mature vegetation.

It is anticipated that approximately eight mature trees would be removed in Area 2. However, replacement of these trees would be required under the City's Tree Ordinance, which depending on the size of the tree to be removed and the size of the replacement tree container size, could require a replacement ratio between 2:1 or up to 12:1. Therefore, there would be an increase in the number of post-Project trees in the Arroyo Seco, and the removal eight trees and replacement in accordance with the City's Tree Ordinance would not substantively degrade public views of the site or surroundings. Therefore, the proposed infrastructure improvements in Area 2 would result in a similar visual character as the current conditions and the proposed Project would not result in an impact that could adversely affect a scenic vista or substantially degrade the visual character or quality of the area.

In Area 3, the expansion of the existing spreading basins into the City's graded open space (i.e., former JPL East Parking Lot) would increase the amount of periodic open water in the area, which could be interpreted by some to be a beneficial visual impact, as there may be the potential for increased use of the open water by waterfowl. As such, aesthetic impacts related to long-term operations within Area 3 would be less than significant. Impact associated with substantially degrading the existing visual character or quality of public views of the site and its surroundings would be less than significant, and no mitigation is required. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic. Therefore, this topic will not be further evaluated in the EIR.

d) Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

No new lighting or reflective surfaces that could cause glare are proposed in Areas 2 and 3. No construction activities would occur during nighttime hours. The proposed Project in Area 3 would be in compliance with the Arroyo Seco Master Plan Design Guidelines, which require that no lighting shall occur in natural areas. As such, there would be no impacts related to light and glare and this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.2 Agriculture and Forestry Resources

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

a) Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

The California Department of Conservation administers the Farmland Mapping and Monitoring Program (FMMP) pursuant to Section 65570 of the California Government Code. Due to the predominance of urban development in the southern and central sections of Los Angeles County (which includes the City of Pasadena), this area was not included in the mapping effort by the FMMP (FMMP 2011). As such, there are no designated farmlands in or near the Arroyo Seco Canyon. Also, there are no existing or ongoing agricultural activities in or near the Arroyo Seco Canyon.

The Upper Arroyo Seco is designated and zoned as Open in the City of Pasadena's General Plan Land Use Plan and Zoning Map (City of Pasadena 2015). The Arroyo Seco originates in the ANF; however, Areas 2 and 3 are located south and outside of the ANF. There are no designated Farmland or Farmland Soils within or near the Project site. Thus, no impacts on Farmland or Farmland Soils would occur. Therefore, no impacts on Prime Farmland, Unique Farmland, or Farmland of Statewide Importance would occur. Therefore, this topic will not be further evaluated in the EIR.

b) Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

The Project site and the surrounding area are not zoned for agricultural use, and there are no Williamson Act contracts in the City. Therefore, the Project would not conflict with an agricultural zone or Williamson Act contract. No impact would occur. Therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

c) Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

There are no timberland or timberland production zones in the City. The Open Space designation and zone for the Project site applies to active and passive public recreational facilities and natural open spaces that are environmentally and ecologically significant (City of Pasadena 2016). The proposed improvements would occur along the Arroyo Seco, where no forest or timberland resources have been identified in the City's General Plan. As such, no impact would occur. Therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

d) Would the project result in the loss of forest land or conversion of forest land to non-forest use?

No loss of forest resources or conversion of forest land to non-forest use would occur with the proposed Project. Proposed Project facilities would be constructed in the same location as existing facilities and there would be no conversion of land uses. It is anticipated that approximately eight mature trees would be removed in Area 2, which is near the Angeles National Forest. Replacement of these trees would be required under the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code), which depending on the size of the tree to be removed and the size of the replacement tree container size, could require a replacement ratio between 2:1 or up to 12:1. Therefore, there would be an increase in the number of post-Project trees in the Arroyo Seco. With the replacement of these trees within the Arroyo Seco Canyon in compliance with City requirements, the removal of approximately eight trees in Area 2 would not constitute conversion of forest land to non-forest use. Long-term recreational activities in the Arroyo Seco Canyon and operation and maintenance activities on the PWP facilities would not adversely affect nearby forest resources. No impact on forest resources would occur with the Project. Therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

e) Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

There are no agricultural activities in or near the Upper Arroyo Seco, and no farmland conversion or impacts to agricultural uses would result from Project implementation. The Project would not conflict with the adjacent Low Density Residential (LD) or the Open Space-National Forest (O-NF) designation of

unincorporated County land to the north and east of Area 2 (LACDRP 2015, LACDRP 1986). No impacts related to the conversion of agricultural resources would occur, and no mitigation is required. Therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.3 Air Quality

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☒	☐	☐	☐
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☒	☐	☐	☐
c) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☒	☐

a) Would the project conflict with or obstruct implementation of the applicable air quality plan?

The Project site is located in the Los Angeles County portion of the South Coast Air Basin (SCAB) and, for air quality regulation and permitting, is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). Both the State of California and the U.S. Environmental Protection Agency (USEPA) have established health-based Ambient Air Quality Standards (AAQS) for air pollutants, which are known as "criteria pollutants." The AAQS are designed to protect the health and welfare of the populace within a reasonable margin of safety. The SCAQMD develops an Air Quality Management Plan (AQMP) that establishes a program of rules and regulations directed at attaining the National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS). Criteria air pollutants include ozone (O_3), nitrogen dioxide (NO_2), CO, sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and lead. Pollutants that are evaluated herein include volatile organic compounds (VOCs) and oxides of nitrogen (NO_x), which are important because they are precursors to O_3, as well as CO, sulfur oxides (SO_x), PM_{10}, and $PM_{2.5}$.

Regarding NAAQS and CAAQS attainment status, the SCAB is designated as a nonattainment area for national and California O_3 and $PM_{2.5}$ standards (CARB 2017). The SCAB is designated as a nonattainment area for California PM_{10} standards; however, it is designated as an attainment area for national PM_{10}

standards. The SCAB nonattainment status of O_3, PM_{10}, and $PM_{2.5}$ standards is the result of cumulative emissions from various sources of air pollutants and their precursors within the SCAB, including motor vehicles, off-road equipment, and commercial and industrial facilities. The SCAB is designated as an attainment area for national and California NO_2, CO, and SO_2 standards. Although the SCAB has been designated as partial nonattainment (Los Angeles County) for the federal rolling 3-month average lead standard, it is designated attainment for the state lead standard.

SCAQMD's 2016 AQMP is a regional and multi-agency effort (SCAQMD, CARB, Southern California Association of Governments [SCAG], and USEPA) that incorporates the latest scientific and technical information and planning assumptions, including the 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); updated emission inventory methodologies for various source categories; and SCAG's latest growth forecasts. The main purpose of an AQMP is to bring an area into compliance with the requirements of federal and state air quality standards.

For a project to be consistent with the AQMP, the pollutants emitted from the project should not (1) conflict with or exceed the assumptions in the AQMP or (2) exceed the SCAQMD CEQA air quality significance thresholds. The SCAQMD has adopted significance thresholds to assess the regional impact of air pollutant emissions in the SCAB. A project with emissions rates below the SCAQMD Criteria Pollutant Mass Emissions Significance Thresholds is considered to have a less than significant effect on air quality.

The proposed Project is consistent with the Zoning and General Plan Land Use designations for the site and is therefore consistent with the growth expectations for the region. Further, the proposed Project would not result in development or new land uses that have not been anticipated in the AQMP. However, it is not known whether the proposed Project would result in an exceedance of SCAQMD CEQA air quality significance thresholds for short-term construction related activities. Air quality impacts will be evaluated in the EIR using state-recommended models, such as the California Emissions Estimator Model (CalEEMod), CARB's Mobile Source Emissions Inventory Model (EMFAC), and CARB's Offroad Equipment Inventory Model (OFFROAD). Mitigation measures will be provided, if required, to address short-term construction-related activities. Long-term operational impacts are not anticipated due to the negligible increase in operations and maintenance associated with the proposed Project's implementation.

The proposed Project could result in impacts related to implementation of the applicable air quality plan. As such, this topic will be further evaluated in the EIR. The findings from the ASCP IS/MND did not require or include mitigation measures for this topic. However, the proposed Project construction activities will be re-evaluated and assessed in the EIR using the latest assumptions and modeling methods, and mitigation will be included, if applicable.

b) Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

The SCAQMD's approach for assessing cumulative impacts is based on the AQMP forecasts of attainment of ambient air quality standards in accordance with the requirements of the federal and state Clean Air Acts. The proposed Project could result in impacts related to the cumulatively considerable net increase of a criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard. This topic will be further addressed in the EIR. The findings from the ASCP IS/MND did not require or include mitigation measures for this topic. However, the proposed Project construction activities will be re-evaluated and assessed in the EIR using the latest assumptions and modeling methods, and mitigation will be included, if applicable.

c) Would the project expose sensitive receptors to substantial pollutant concentrations?

The nearest sensitive receptors are residential homes near Area 2 located along Canyon Dell Drive and Aralia Road approximately 780 feet (0.15-mile) to the east in the community of Altadena. The nearest sensitive receptors to Area 3 include single-family residences located along Ridgeview Drive in Altadena, approximately 225 feet from the eastern edge of the former JPL parking lot, and approximately 100 feet higher in elevation than the parking lot. The potential for exposure to substantial pollutant concentrations could potentially result from the operation of construction equipment, including equipment needed for earthmoving at the spreading basins. Additionally, the City may implement a mechanical shaker to sort/sift through excavated soils to separate larger rocks for later beneficial reuse as construction fill for the spreading basins as well as other beneficial uses within the HWP, which could result in fugitive dust. The proposed Project's potential to cause or contribute to exceedances of ambient air quality standards at sensitive receptors near the proposed activities will be assessed using the SCAQMD's localized significance thresholds (LSTs). The proposed Project could result in impacts related to the exposure of sensitive receptors to substantial pollutant concentrations. This topic will be further evaluated in the EIR. The findings from the ASCP IS/MND did not require or include mitigation measures for this topic. However, the proposed Project construction activities will be re-evaluated and assessed in the EIR using the latest assumptions and modeling methods, and mitigation measures will be included, if applicable.

d) Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

According to the SCAQMD's CEQA Air Quality Handbook, land uses associated with odor complaints typically include certain agricultural/livestock uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding (SCAQMD 1993). The proposed Project does not propose any of these land uses and would not otherwise produce objectionable long-term operational odors.

Short-term construction equipment and activities would generate odors associated with diesel exhaust emissions from construction equipment and paints associated with the intake service building. There may be situations where construction activity odors would be noticeable by persons on the Gabrielino Trail, but these odors would not be unfamiliar or necessarily objectionable. The odors would be temporary and would dissipate rapidly from the source with an increase in distance. Therefore, the impacts would be short-term; would not be objectionable to a substantial number of people; and would be less than significant. All Project-related odors are construction related and short term in nature; no long-term operational odors would be generated. As such, the proposed Project would have a less than significant impact regarding objectionable odors. Impacts related to odors adversely affecting substantial numbers of people would be less than significant, and no mitigation is required. Therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.4 Biological Resources

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☒	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☒	☐	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

a) Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

The Project area provides potentially suitable habitat for the following seven federally and/or state Threatened and Endangered species: Braunton's milkvetch (*Astragalus brauntonii*), Nevin's barberry (*Mahonia nevinii*), San Fernando Valley spineflower (*Chorizanthe parryi* var. *Fernandina*), arroyo toad (*Anaxyrus californicus*), California red-legged frog (*Rana draytonii*), southwestern willow flycatcher (*Empidonax traillii extimus*), and least Bell's vireo (*Vireo bellii pusillus*) (BonTerra Psomas 2015). The southwestern willow flycatcher and least Bell's vireo are migratory bird species, however, that have the potential to occur in each spring/summer breeding season.

Three additional non-listed special status wildlife species have been observed on the Project site: coast range newt (*Taricha torosa torosa*), two-striped garter snake, (*Thamnophis hammondii*), and yellow warbler (*Setophaga petechia*). Other special status species, such as the silvery legless lizard, may also occur in the Project area. Special status bat species, including silver-haired bat (*Lasionycteris noctivagans*), western red bat (*Lasiurus blossevillii*), and hoary bat (*Lasiurus cinereus*), potentially occur in the study area and may roost on the Project site (BonTerra Psomas 2015).

The Project site contains the potential for providing habitat for candidate, sensitive, or special status species. Additionally, the proposed Project would divert flows from the Arroyo Seco at the proposed new diversion/intake structure in Area 2. Plant and wildlife resources at the site of construction activities within Area 2 and downstream of the diversion point have the potential to be impacted due to construction activities and the potential reduction in downstream flows. As such, impacts would be considered potentially significant and this issue will be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts to special status species will be re-evaluated in the EIR using updated survey data and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

b) Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

The proposed Project is anticipated to result in permanent and temporary impacts to riparian habitat. Sensitive vegetation communities that may be impacted by proposed Project activities include: California sagebrush scrub/California buckwheat scrub; California buckwheat scrub; California sycamore woodland; white alder grove/California sycamore woodland; mulefat thickets; riparian herb; and coast live oak woodland (BonTerra Psomas 2015). Acquisition of permits from resource agencies would be required, as well as compensatory mitigation. As such impacts would be considered potentially significant. This issue will be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts to riparian habitats and other sensitive communities will be re-evaluated in the EIR using updated survey data and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

c) Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

The proposed Project is anticipated to impact areas of non-wetland "waters of the state" and "isolated waters" under the Regional Water Quality Control Board (RWQCB) jurisdiction and California Department of Fish and Wildlife (CDFW) jurisdiction. Additionally, Project components in Area 2 would impact non-wetland "waters of the United States" under the jurisdiction of the U.S. Army Corps of Engineers (USACE). Acquiring the necessary permits for impacts to jurisdictional resources and compensatory mitigation would be required. As such impacts would be considered potentially significant. This issue will be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts to wetlands will be re-evaluated in the EIR using updated survey data and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

d) Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

The proposed Project site is located south of the Angeles National Forest. The Gabrielino Trail/Access Road and the Arroyo Seco allows for the movement of people and wildlife into and out of the Forest. Migratory nesting birds and raptors have the potential to occur in vegetation throughout the Project area. The Devil's Gate Dam and the I-210 are barriers to movement and constitute the separation between the Upper Arroyo Seco and the Central Arroyo Seco. The removal of the headworks in Area 1 that was analyzed and approved in the ASCP IS/MND would eliminate an impediment to fish movement within the Arroyo Seco and facilitate the feasibility of fish passage through this area. Additionally, in order to allow for improved biological functions in the Arroyo Seco, the new intake would include a fish screening feature to prevent future fish populations from passing into the intake and conveyance system. A roughened channel would be constructed directly downstream of the new weir to allow for future fish passage upstream during moderate flow periods. Nevertheless, the proposed Project may result in potentially significant impacts to the movement of migratory wildlife. This issue will be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts to native resident or migratory fish or wildlife species will be re-evaluated in the EIR using updated survey data and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

e) Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

It is anticipated that approximately eight mature trees would be removed in Area 2 and approximately one mature tree would be removed in Area 3 as part of Project construction (BonTerra Psomas 2014). Replacement of these trees would be required under the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code), which depending on the size of the tree to be removed and the size of the replacement tree container size, could require a replacement ratio between 2:1 or up to 12:1. Impacts would be potentially significant and this topic would be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts to local policies will be re-evaluated in the EIR using updated survey data and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

f) Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

There is no adopted Habitat Conservation Plan (HCP); Natural Community Conservation Plan (NCCP); or other approved local, regional, or state habitat conservation plan in the City of Pasadena. There are two NCCPs in Los Angeles County: (1) the Rancho Palos Verdes NCCP covers 8,616 acres and provides a Preserve of 1,402 acres at the southwestern end of the County (nearly 30 miles southwest of Area 3) (Ranch Palos Verdes 2018); and (2) the West Mojave Plan covers 9.3 million acres of the western portion of the Mojave Desert, which includes the Antelope Valley area of Los Angeles County (northeastern section of Los Angeles County and nearly 20 miles northeast of Area 1) (BLM 2005). There are several HCPs in Los Angeles County but the HCP that is located nearest the HWP is the Newhall HCP along the Santa Clara River, west of I-5 (San Marino Environmental Associates 2004). Area 1 is located over 30 miles southeast

of the Newhall HCP area. The Project would not affect these conservation plans. Therefore, the Project would not conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan. No impact would occur, and no mitigation is required; therefore, this topic will not be further analyzed in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.5 Cultural Resources

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?	☒	☐	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☒	☐	☐	☐
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☒	☐

a) Would the project cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5?

According to the Phase I Cultural Resources Assessment prepared for the ACSP IS/MND, there are resources on the Project site that are potentially eligible for the National Register of Historic Places (NRHP) or the California Register of Historic Resources (CRHR). Bridge No. 1 is a culvert-style bridge with concrete slab deck over Millard Creek, approximately 0.13-mile north of the JPL Bridge, and was determined not to be a historic resource. A structural overlay bridge spanning the length of this bridge was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage. Bridge No. 2 is located approximately 130 feet past Bridge No. 1 and is a reinforced concrete arch bridge with decorative cast-concrete railing. Bridge No. 2 was likely constructed to provide a formal entrance to the Upper Arroyo Seco and the ANF, and it appears to meet the required criteria to be listed as a historical resource in the CRHR and in the City of Pasadena as a landmark (BonTerra Psomas 2015).

Bridge No. 3 is located approximately 0.34-mile north of the JPL Bridge and was constructed with truss-bridge forms using wood timbers. Bridge No. 3 appears to meet the required criteria to be listed as a historical resource in the NRHP and in the CRHR. The bridge was heavily damaged by the 2010 storms. A structural overlay bridge spanning the length of Bridge 3 was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage. A structural evaluation of Bridge 3 subsequent to the structural overlay, however, shows the condition of Bridge 3 continues to deteriorate (TJC 2018).

Additionally, stone masonry walls line the east side of the Arroyo Seco at Bridge No. 2 and continue upstream to Bridge No. 3. The stone masonry walls would not be altered by Project activities. The structural overlay bridge crossings on Bridge Nos. 1 and 3 would remain in place throughout the duration of the proposed Project. Upon completion of the proposed Project, the City intends to keep the bridge structures as-is, complete with additional support structures, into the foreseeable future. No construction activities on the bridges are anticipated. Project implementation would require construction truck traffic over the bridges and the associated structural overlays would remain in place. The proposed Project could result in impacts due to a substantial adverse change in the significance of a historical resource pursuant to §15064.5. The findings from the ASCP IS/MND also required mitigation for this topic. The proposed Project's impacts to historic resources will be evaluated in the EIR and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

b) Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

A California Historical Resources Information System (CHRIS) records search was conducted for the proposed Project site and surrounding 0.5-mile records search area at the South Central Coastal Information Center (SCCIC), located on the campus of California State University, Fullerton on October 3rd, 2019. The SCCIC records indicate that one previously recorded cultural resource exists within the Project site, and one previously recorded cultural resource exists immediately adjacent to the Project site. One resource (P-19-189942), the Hahamongna Watershed Park, is an open space informally used since the 1880s, and formally developed into a park in the 1930s. One resource (P-19-186535,) a Historic dedication plaque placed by the USFS, is located adjacent to the Project site, but would not be impacted by the Project. Additional resources have been previously recorded within the surrounding 0.5-mile records search area. Of these, five consist of prehistoric archaeological resource discoveries and 9 consist of historic buildings and structures.

Previous disturbance during construction activities of existing facilities (e.g., diversion and intake structures, Gabrielino Trail/Access Road, bridges, and spreading basins) makes it unlikely that significant cultural resources are present in these areas. However, buried resources could exist in the Project site and be damaged by excavation and grading activities for Project construction. The proposed Project could result in impacts due to a substantial adverse change in the significance of an archaeological resource. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts to archaeological resources will be re-evaluated in the EIR and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

c) Would the project disturb any human remains, including those interred outside of dedicated cemeteries?

A literature review of documents on file at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton was completed by Patrick O. Maxon, MA, RPA on March 18, 2013 (BonTerra Psomas 2015). The review consisted of an examination of the U.S. Geological Survey's (USGS') Pasadena, California 7.5-minute quadrangle to evaluate the project area for any sites recorded or cultural resources studies within a 1-mile radius of the Project site. Data sources consulted at the SCCIC included archaeological records, Archaeological Determinations of Eligibility, historic maps, and the Historic Property Data File (HPDF) maintained by the California Office of Historic Preservation (OHP). The records search and field survey indicate no evidence of human remains on or near the Arroyo Seco (BonTerra Psomas 2015).

In the unlikely event of an unanticipated encounter with human remains, the California Health and Safety Code and the California Public Resources Code require that any activity in the area of a potential find be halted and the Los Angeles County Coroner be notified. There would be less than significant adverse impacts to human remains with compliance with California Public Resources Code (PRC) Section 5097.98, which requires all work be halted in the immediate vicinity of the discovery if human remains are encountered during excavation activities. PRC Section 5097.98 also requires the County Coroner be notified who is required to determine whether the remains are of forensic interest. If the Coroner, with the aid of an Archaeologist, determines that the remains are prehistoric, s/he is required to contact the Native American Heritage Commission (NAHC). The NAHC is responsible for designating the most likely descendant (MLD), who is responsible for the ultimate disposition of the remains, as required by Section 7050.5 of the California Health and Safety Code. The MLD is required to make his/her recommendation within 48 hours of being granted access to the site. The MLD's recommendation is required to be followed if feasible, and may include scientific removal and non-destructive analysis of the human remains and any items associated with Native American burials (California Health and Safety Code §7050.5). Therefore, through compliance with state and local regulations, impacts to human remains would be less than significant, and no mitigation is required. Therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.6 Energy

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☒	☐
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

a) Would the project result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Energy use during construction activities in Area 2 and 3 would include the use of fossil fuels for construction equipment, material deliveries, demolition waste disposal, and construction crew travel, and the use of electricity for the ongoing operation of the diversion structure. No natural gas is required.

Temporary electric power for as-necessary lighting and electronic equipment would be provided by PWP. The amount of electricity used during construction would be minimal, because typical demand would stem from electrically powered hand tools. The electricity used for construction activities would be temporary and minimal; therefore, proposed Project construction would not result in wasteful, inefficient, or unnecessary consumption of electricity. As such, impacts associated with short-term construction use of electricity would be less than significant.

Petroleum consumed by construction equipment, transport of construction materials, and worker trips would be the primary energy resource expended over the course of construction activities. Heavy-duty construction equipment, vendor trucks, and haul trucks would use diesel fuel. Construction workers would likely travel to and from the Project area in gasoline- or diesel-powered vehicles. Construction is expected to take approximately one year. Once construction activities cease, petroleum use from off-road equipment and transportation vehicles would end. Because of the short-term nature of construction and relatively small scale of the construction activities required for the Project, the petroleum consumption would be negligible when compared to California's daily total use of approximately 1.8 million barrels of petroleum. As such, impacts associated with short-term construction use of petroleum would be less than significant.

Operational electrical energy would be needed in Area 2 for the proposed intake service building to operate the diversion weir and intake structures. There are no long-term operational electrical demands for the spreading basins in Area 3 beyond what would be required to power a water meter. The proposed Project would not create a high enough demand for energy to require development of new energy sources. Long-term maintenance activities would not be substantively different from current existing conditions in which the diversion structure and the spreading basins currently require ongoing maintenance. With the relatively small sizes of the proposed facilities, energy needs would also be limited and would not be considered wasteful or inefficient. The Project would utilize surface water resources in the Arroyo Seco to increase groundwater recharge and, in turn, would have beneficial impacts on the PWP's water supply, including decreased demand for State Water Project (SWP) water deliveries. Energy requirements to transport water through the SWP system are high, and local sources of water are more energy efficient. The increase in groundwater recharge due to the Project could require an incremental increase in energy use for groundwater well pumping. However, decreased reliance upon imported water sources would be a benefit for energy efficiency. Impacts would be less than significant, and no mitigation is required. Therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

No demand for natural gas would be created by the Project. The reductions in demand for imported SWP water deliveries due to increased groundwater recharge would help off-set, if not fully account for, increased Project-related electrical demand. The proposed project would follow applicable energy standards and regulations during the construction phase(s). In addition, the proposed project would be built and operated in accordance with all existing, applicable regulations at the time of construction. All electrical components would be constructed in accordance with the City's Building Code (Title 14 of the Pasadena Municipal Code, which incorporates the 2016 California Building Code [CBC]). Through implementation of federal, state, and local regulations, the proposed Project would not conflict with an adopted energy conservation plan; therefore, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.7 Geology and Soils

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?[1]	☒	☐	☐	☐
[1] Because the topic of paleontological resources is the only topic in Geology/Soils to be addressed in the EIR, it will be included within the chapter called "Cultural Resources."				

A Geotechnical Feasibility Study Report was prepared for the ASCP IS/MND in August 2013 by Converse Consultants. Applicable findings from this report are summarized below (see Appendix B to this Initial Study).

a) Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

The Project site is not located within a currently designated State of California Earthquake Fault Zone (formerly Alquist-Priolo Special Studies Zones) for surface fault rupture. A segment of the Sierra Madre Fault crosses the Arroyo Seco, just north of the JPL Bridge. However, there is no designated Alquist-Priolo Special Studies Zone for the fault in the Upper Arroyo Seco. Area 2 is not located within a designated Earthquake Fault Zone, but traces of the Sierra Madre Fault are located approximately 1,000 feet north and southeast of Area 2. Area 3 is not located within a designated Earthquake Fault Zone, but a trace of the Sierra Madre Fault crosses through the northern portion of Area 3. Therefore, the Project site could be potentially exposed to fault rupture. While structures sitting directly on top of a ruptured fault could be damaged in an earthquake event along the fault, the proposed Project does not include any habitable structures or structures that are critical for public safety (BonTerra Psomas 2015). As such, impacts related to rupture of a known earthquake fault would be less than significant and this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

ii) Strong seismic ground shaking?

Seismic shaking could be significant during an earthquake along other earthquake faults in the region. The new diversion and weir structures in Area 2 could sustain damage during an earthquake event; however, there are no critical or habitable structures in proximity to Area 2 that could be affected by a failure at the diversion structure. Ground shaking would not pose major safety hazards to the spreading basins in Area 3 because the basins would be designed to contain water at depths that would not pose a hazard to the public if water were to lap over the edge during a seismic event. There are no critical or habitable structures in the proximity of the spreading basins that could be affected by any overtopping water in a strong seismic event. The spreading basins, diversion structure, intake, and service building have been designed and would be constructed in compliance with all applicable building code requirements and code regulations, such as the City's Building Code (Title 14 of the Pasadena Municipal Code, which incorporates the 2016 CBC). The California Building Code requires the preparation of engineering geologic reports, supplemental ground-response reports, and/or geotechnical reports for all new construction; new structures on existing sites; and alterations to existing buildings. It also includes seismic design criteria and requirements for use in the structural design of buildings and specifies building components that require special seismic certification. Construction of the proposed Project would also be in accordance with the recommendations of the Geotechnical Feasibility Report, which includes seismic design parameters, and would ensure that the structural integrity of the proposed structures and improvements can withstand seismic shaking (BonTerra Psomas 2015). Therefore, through compliance with applicable federal, state, and local regulations, the proposed Project would result in less than significant impacts related to seismic ground shaking. As such, impacts related to strong seismic ground shaking will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

iii) Seismic-related ground failure, including liquefaction?

The Arroyo Seco is located within a Seismic Hazard Zone for liquefaction, with adjacent steep slopes susceptible to landslides. The Geotechnical Feasibility Study Report included results from a boring (BH-3) taken within the Gabrielino Trail/Access Road in Area 2. The results showed that the area is underlain by a 3-foot thick sandy soil layer over granitic bedrock, which was found to be "massive and very hard." Area 2 has exposed older alluvium consisting of brown silty sand with cobbles and boulders. Groundwater in Area 2 was not encountered during borings at a depth of 3.5 feet, but is expected to be seasonably shallow due to the Arroyo Seco.

The Geotechnical Feasibility Study states that the presence of shallow granitic bedrock in Area 2 along the Gabrielino Trail/Access Road indicates that it is not susceptible to liquefaction hazards and seismically induced settlement would be negligible. While the slope just east of the Gabrielino Trail/Access Road is stable, small rock fall hazards are expected.

Area 3 is located within a Seismic Hazard Zone for liquefaction. Area 3 is underlain by stream deposits and terrace deposits, both consisting of primarily light brown silty sand, underlain by numerous cobbles and boulders. The stream deposits and terrace deposits are both moderately dense to very dense. Groundwater was not encountered in exploratory borings to a depth of 21 feet.

The potential for liquefaction of bedrock is low, but liquefaction in the stream channel is expected to be high. The diversion structure in Area 2 would be located within the stream and may be exposed to liquefaction hazards. Slopes in Area 2 have a potential for small rock fall hazards, and slopes that would be created could be unstable. Pipelines in Area 3 could also be exposed to liquefaction hazards that may lead to ground settlement (BonTerra Psomas 2015). Design and construction of the proposed improvements would have to address liquefaction and slope stability in accordance with the recommendations of the Geotechnical Feasibility Report and in accordance with applicable Building Code and City requirements. As such, the Project would not cause or exacerbate any seismic-related ground failure including liquefaction condition. Impacts would be less than significant and will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

iv) Landslides?

According to the Geotechnical Feasibility Study, Area 2 has adjacent steep slopes but due to the observed bedrock, it was determined that the slopes are stable, although small rock fall hazards may exist due to the steepness of adjacent slopes. No mapped landslides were identified in the Geotechnical Feasibility Study. Design and construction of the proposed improvements would have to address slope stability and landslide potential in accordance with the recommendations of the Geotechnical Feasibility Report and the Building Code and City requirements. No critical or habitable structures would be constructed that could result in the risk of loss, injury, or death involving landslides due to the proposed Project. As such, impacts would be less than significant related to landslides and will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project result in substantial soil erosion or the loss of topsoil?

During construction, erosion-control measures would be implemented as part of the Stormwater Pollution Prevention Plan (SWPPP) for the Project. Prior to the start of construction activities, the Contractor is required to file a Permit Registration Document (PRD) with the State Water Resources Control Board (SWRCB) in order to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with the Construction and Land Disturbance Activities (Order No 2009-009-DWQ, NPDES No. CAS000002) or the latest approved general permit. This permit is required for earthwork that results in the disturbance of 1 acre or more of total land area. The required SWPPP will mandate the implementation of best management practices (BMPs) to reduce or eliminate construction-related pollutants in the runoff, including sediment. Implementation of the erosion control BMPs in the SWPPP would reduce construction-related erosion, and impacts would be less than significant.

Area 2 is located within a 5-year floodplain and the slopes and Gabrielino Trail/Access Road are subject to potential flooding following periods of heavy rainfall. Structures, including engineered streambed material, have been designed to consider the inundation and scour by flood events. The upstream and downstream engineered streambed material would be specifically designed to reduce scour and maintain the integrity of the diversion/intake structure and adjacent Gabrielino Trail/Access Road. There would be no loss of topsoil associated with activities in Area 2, and the engineered streambed material would reduce erosion and allow for vegetation to grow, if naturally occurring.

Area 3 would involve the reconfiguration and expansion of the existing spreading basins, which would require the export of soils excavated from the former JPL East Parking Lot. These soils were located beneath a parking lot and did not support natural biological communities or agriculture, which are land uses that depend on topsoil. Additionally, in order to minimize export from the Project site, the City may implement a mechanical shaker to sort/sift through excavated soils to separate larger rocks for beneficial reuse on the Project as well as other beneficial uses within the HWP. As such, impacts would be less than significant related to substantial soil erosion or loss of topsoil and will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

c) Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

In Area 2, the area is located on granitic bedrock and is not considered to be unstable or subject to landslide, lateral spreading, subsidence, liquefaction or collapse. In Area 3, the Geotechnical Feasibility Study determined that the slope stability near the existing stream channel has a factor of safety greater than 1.496, which would be reduced to 1.292 upon construction of the proposed sediment basin. Because both factors of safety remain above 1.0, the slope does not pose a risk of instability. The slopes nearer the former JPL East Parking Lot as well as the slopes adjacent to the Arroyo Seco have adequate factors of safety to meet minimum requirements. Slopes would be periodically eroded by flows within the Arroyo Seco and slope stability would be changed by the designed slope profile. However, groundwater saturation of subsurface soils would not impact slope stability.

Groundwater extraction wells in the general vicinity of Area 3 may also make this area susceptible to subsidence, although no significant regional subsidence has occurred in the City. The proposed spreading basins in Area 3 would increase recharge of the Monk Hill Subbasin of the Raymond Groundwater Basin. With between 60%–

80% of the recharge water pumped out, the Project would decrease the potential for subsidence (BonTerra Psomas 2015). The Geotechnical Feasibility Study includes seismic design parameters and recommendations for all constructed features. Compliance with the Geotechnical Feasibility Study and applicable Building Code and City requirements would avoid hazards associated with landslide, lateral spreading, subsidence, liquefaction or collapse due to Project implementation. Impacts would be less than significant, and no mitigation is required; therefore, this topic will not be further analyzed in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?

The soil borings taken near surface soils in Area 3 have a "Very Low" expansion potential (no soil expansion analysis was made for near surface soils in Area 2). The Project site may contain collapsible soils due to its location within and near the Arroyo Seco stream channel. However, no critical or habitable structures would be constructed that could result in substantial direct or indirect risks to life or property related to expansive soils due to the proposed Project. Design and construction of the proposed improvements would have to address slope stability and landslide potential in accordance with the recommendations of the Geotechnical Feasibility Report and the CA Building Code. Therefore, compliance with applicable federal, state, and local regulations would address the geologic hazards that are present on the site. Impacts would be less than significant, and no mitigation is required; therefore, this topic will not be further analyzed in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

e) Would the project have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

The proposed Project would not involve the construction of any restrooms or otherwise require the use of septic tanks or alternative wastewater disposal systems. The construction crew would be served by portable toilets that would be brought to the site at the start of Project construction. These portable toilets would be regularly cleaned out and removed at the end of construction. There would be no impacts related to the use of septic tanks or alternative wastewater disposal systems. As there would be no impacts, no mitigation is required; therefore, this topic will not be further analyzed in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

f) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

According to record search conducted for the ASCP IS/MND, the Project area is underlain by several geological rock units with varying paleontological sensitivity. Quartz Diorite (qd), located between Areas 2 and 3, has no potential to yield paleontological resources. Leucocratic Granitic Rocks (gr) that are present west and east of Area 2 have no potential to yield paleontological resources. Quaternary Older Alluvium Fan Deposits (Qoa) located south of Area 2 have moderate potential to yield paleontological resources. Quaternary Older Alluvial Fan Sediments (Qof) east of Area 3 have low potential to yield paleontological resources. Quaternary Stream Deposits (Qg) in the stream course of the Arroyo Seco in Areas 2 and 3 have low potential to yield paleontological resources (BonTerra Psomas 2015).

Ground disturbance would occur at the stream bottom in Area 2, which is overlain by recent alluvial material deposited by stream flows and generally does not contain fossil resources. The areas underlain by granitic

bedrock also have no paleontological sensitivity. At the edges of the stream is older alluvium that may have limited potential for paleontological resources (BonTerra Psomas 2015).

While no paleontological resources were observed on the surface of the Project site, underlying older Quaternary fluvial deposits may contain significant vertebrate fossils. Therefore, deeper excavations associated with the spreading basins could expose paleontological resources that have the potential to be damaged by heavy equipment, which would be a significant impact. This issue will be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts to paleontological resources will be re-evaluated in the EIR using updated records search data and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

3.8 Greenhouse Gas Emissions

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

a) Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Given that the proposed Project's emissions would almost entirely be associated with short-term construction activities, it is not anticipated that the proposed Project would result in any significant impacts related to greenhouse gas (GHG) emissions. However, because the quantification of air quality impacts will be calculated, the EIR will estimate the GHG emissions associated with construction of the Project using CalEEMod based on the same construction scenario utilized in the air quality analysis. Project-generated operational GHG emissions that will be estimated include those associated with mobile sources, electrical use, and solid waste disposal. The emissions estimates will be based on information provided by the City staff or CalEEMod default values. This topic will be further evaluated in the EIR. The findings from the ASCP IS/MND did not require or include mitigation measures for this topic. However, the proposed Project construction activities will be re-evaluated and assessed in the EIR using the latest assumptions and modeling methods.

b) Would the project generate conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

Given that the proposed Project's emissions would almost entirely be associated with short-term construction activities, it is not anticipated that the proposed Project would conflict with any applicable plans for the purpose of reducing GHGs, including the City of Pasadena's Climate Action Plan (CAP). The CAP was adopted in 2018 and includes a strategy to reduce Pasadena's GHG emissions in a manner consistent with state law and statewide GHG emissions reduction targets. However, the EIR will discuss how the proposed Project complies with state regulations (Assembly Bill 32) and General Plan goals, objectives, CAP measures, and policies that help the City contribute to regional GHG reduction efforts. The EIR will also provide a qualitative post-2020 analysis that will evaluate whether or not the Project-generated GHG emissions would impede the attainment of the 2030 and 2050 reduction goals identified in Senate Bill 32 and Executive Order S-3-05, respectively. The EIR analysis will be prepared consistent with the SCAQMD's guidance and thresholds. The findings from the ASCP IS/MND did not require or include mitigation measures for this topic. However, the proposed Project construction activities will be re-evaluated and assessed in the EIR using the latest assumptions and modeling methods.

3.9 Hazards and Hazardous Materials

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☒	☐

a) Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

The proposed Project would not result in the long-term operational routine transport, use, or disposal of hazardous materials beyond the current conditions within Areas 2 and 3. Both the current diversion structure/intake and the proposed diversion structure/intake would require periodic maintenance activities that could involve chemicals required for the operation of the weir gate and mechanical controls. There would be no operational changes or need for additional chemicals or hazardous materials for the operation of the spreading basins.

Construction activities would utilize hazardous materials on a short-term basis, and compliance with existing federal, state, and local regulations regarding hazardous material use, storage, disposal, and transport would prevent risks to public health and safety. Construction wastes that meet hazardous waste criteria would be stored, manifested, transported, and disposed of in accordance with the California Code of Regulations (Title 22) and to the satisfaction of the Los Angeles County Fire Department, which serves as the local Certified Unified Program Agency (CUPA). Therefore, with compliance with applicable state and local regulations, the proposed Project would not create significant hazards to the public or the environment. Impacts would be less than significant, and no mitigation is required; therefore, this topic will not be further analyzed in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

The Cortese List, mandated under Section 65962.5 of the Government Code, is a list of databases that compile information regarding hazardous waste sites. The California Environmental Protection Agency (CalEPA) provides a list of hazardous waste site databases, which consists of the Department of Toxic Substances Control (DTSC) EnviroStor database; the State Water Resources Control Board (SWRCB) GeoTracker database; SWRCB's list of hazardous solid waste disposal sites; SWRCB's list of active Cease and Desist Orders (CDOs) and Cleanup and Abatement Orders (CAOs); and DTSC's list of sites subject to corrective action pursuant to the California Health and Safety Code, Section 25187.5 (CalEPA 2019). The nearest listed site to the Project site is JPL (EPA ID No. CA9800013030; Federal Facility Agreement Docket Number 1998-27):

- The JPL site at 4800 Oak Grove Drive in the City of La Canada-Flintridge (ID No. 19970008- Federal Superfund Site) is listed as an active site on the DTSC EnviroStor Database. No other sites are listed within the Pasadena or the adjacent community of Altadena.

- The JPL site at 4800 Oak Grove Drive in the City of La Canada-Flintridge (ID No. T0603703875- LUST Cleanup Site) is listed as an open cleanup status on the SWRCB GeoTracker database. No other sites are listed within the Pasadena or the adjacent community of Altadena.
- There are no listings near or at the Project site in the SWRCB's list of hazardous solid waste disposal sites; SWRCB's list of active Cease and Desist Orders (CDOs) and Cleanup and Abatement Orders (CAOs); and DTSC's list of sites subject to corrective action pursuant to the California Health and Safety Code, Section 25187.5

The 2015 ASCP IS/MND was determined to have adequately analyzed and mitigated for the potential impacts associated with the groundwater contamination associated with JPL (see Appendix B to this Initial Study). The findings from the ASCP IS/MND required mitigation for this topic and no new impacts would result from the proposed Project, and no new mitigation is required. Therefore, this topic will not be further analyzed in the EIR.

c) Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

The nearest school to the Project site is the Linda Vista Elementary School/Odyssey Charter School located approximately 1,230 feet (0.23-mile) from construction traffic along the Gabrielino Trail/Access Road, and approximately 0.26-mile from the limits of grading within Area 3. Construction activities would utilize hazardous materials commonly associated with construction activities (e.g., fuels, cleaners, solvents) in the short-term, but these would be handled in accordance with existing federal, state, and local regulations regarding hazardous material use, storage, disposal, and transport to prevent risks to public health and safety. Construction wastes that meet hazardous waste criteria must be stored, manifested, transported, and disposed of in accordance with the California Code of Regulations (Title 22) and to the satisfaction of the Los Angeles County Fire Department, which serves as the local CUPA. The proposed Project would not include any facilities that could result in hazardous emissions or handle hazardous materials, substances, or waste within 0.25-mile of an existing school. Impacts would be less than significant, and no mitigation is required; therefore, this topic will not be further analyzed in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

d) Would the project be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

As discussed in Threshold 3.9(b) above, the JPL campus has been placed on the NPL of sites subject to regulation under the CERCLA, with cleanup efforts financed under the federal Superfund program. As part of the cleanup effort, subsurface groundwater contamination located beneath Area 3 of the Project site is subject to ongoing remediation through wellhead treatment efforts. The findings from the ASCP IS/MND required mitigation for this topic. The 2015 ASCP IS/MND, was determined to have adequately analyzed and mitigated for the potential impacts associated with the groundwater contamination associated with JPL (see Appendix B to this Initial Study). The findings from the ASCP IS/MND required mitigation for this topic and no new impacts would result from the proposed Project, and no new mitigation is required. Therefore, this topic will not be further analyzed in the EIR.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

There are no airports or airstrips within 2 miles of the Arroyo Seco Canyon. The nearest airports are the Burbank Bob Hope Airport and the El Monte Airport, which are both approximately 11 miles from the Project site. There is a heliport and a helipad near the Arroyo Seco. The Project would not involve the construction of high-rise structures or involve activities that could pose a safety hazard to helicopter or aircraft operations or airport activities, nor would it conflict with an airport land use plan. There would be no impact to airports or airstrips from the Project. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

f) Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Any closures to the Gabrielino Trail/Access Road, including those that would affect access to the USFS Ranger Station in the ANF, will be short-term and/or partial. During work days, traffic in the Project area would be facilitated by the use of a flagperson or other traffic control measures. At the end of each workday, the Gabrielino Trail/Access Road would be made passable. Residents and businesses affected by the road work, utility agencies with facilities in the area, the Pasadena Fire and Police Departments, and other emergency service providers would all be notified in advance of construction activities in accordance with provisions in the City's Supplements and Modifications to the Greenbook. The 2015 ASCP IS/MND included mitigation for this topic to address potential short-term closures of the Gabrielino Trail/Access Road and bridges. No new or different impacts would result from the proposed Project and the MMRP would be implemented during construction activities on the Gabrielino Trail/Access Road. Impacts would be less than significant and no additional mitigation is required. Therefore, this topic will not be further analyzed in the EIR.

g) Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?

The Arroyo Seco Canyon is located in an area designated as a Very High Fire Hazard Severity Zone (CAL FIRE 2011). In August 2009, the Station Fire burned nearly 252 square miles in the Angeles National Forest, and the threat of future wildfires is an ever-present danger throughout Southern California. Although wildfires are a potential hazard at the Project site, the proposed Project would not involve construction or operation of habitable structures that may expose people to wildfire hazards in the area. The construction and operation of new water infrastructure facilities would have no effect on the number of people or structures exposed, either directly or indirectly, to wildfires because the facilities would not increase the number of visitors or workers in the area and would not exacerbate an existing wildfire hazard. Potential sources of hazards from fire include sparks from construction equipment and vehicles and from malfunctioning electrical systems during construction. However, the City's Fire Prevention Code includes fire safety measures that need to be followed during construction and demolition. The ASCP IS/MND required mitigation for this topic to address potential hazards associated with construction activities; however, unlike the ASCP IS/MND, the proposed Project does not involve construction in the exposed vegetation within Area 1. Area 2 construction would be within and around the Arroyo Seco creek, and Area 3 construction would be within largely unvegetated spreading basins and the former JPL East Parking Lot. Impacts associated with exposing people or structures to a significant risk of loss, injury, or death from wildland fires would be less than significant, and no mitigation is required. Therefore, this topic will not be further analyzed in the EIR.

3.10 Hydrology and Water Quality

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
result in substantial erosion or siltation on or off site;	☒	☐	☐	☐
substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site;	☒	☐	☐	☐
create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	☒	☐	☐	☐
impede or redirect flood flows?	☒	☐	☐	☐
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☒	☐

a) Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

The Upper Arroyo Seco is not listed as an impaired water body under Section 303(d) of the Clean Water Act (SWRCB 2012). The proposed Project would allow for the settlement of silts and fine sediments in the newly designed sedimentation basin prior to spreading water in basins within Area 3, which would have beneficial impacts on water quality in the Arroyo Seco. During construction, there is the potential for small amounts of oil, grease, and other vehicle fluids to leak from vehicles.

The City's Stormwater Management and Discharge Control Ordinance (Chapter 8.7 of the Pasadena Municipal Code) has the explicit purpose of reducing pollutants in stormwater and urban runoff to the maximum extent practicable. The intent of the Ordinance is to protect and enhance water quality of our

watercourses, water bodies, and wetlands in a manner pursuant to and consistent with the federal Clean Water Act, and pursuant to National Pollutant Discharge Elimination System (NPDES) Permit No. CA0061654, as amended, and any successor legislation and permits. Restrictions in this Ordinance are applicable to both construction activities and operations. The following BMPs apply to all construction sites:

- Sediment and construction waste from construction sites and parking areas shall not leave the site.
- Between October 15 and April 15, any sediments or other materials which are tracked off the site shall be removed the same day as they are tracked off the site. A sediment barrier shall be installed on land exceeding 15% slope in accordance with Chapter 14.05 of the Municipal Code, and where determined necessary by the building official.
- Excavated soil shall be located on the site in a manner that eliminates the possibility of sediments running into the street or adjoining properties. Between October 15 and April 15, soil piles shall be covered until the soil is either used or removed.
- No washing of construction or other industrial vehicles shall be allowed adjacent to a construction site. No runoff from washing vehicles on a construction site is allowed to leave the site.

For operations, the Municipal Code includes restrictions related to the protection of natural water courses (Chapter 8.70.100) and containment and notification of spills (Chapter 8.70.110).

For projects that disturb 1 acre or more of soil, or whose projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 acre or more, are required to obtain coverage under the General Permit for Discharges of Stormwater Associated with Construction Activity Construction General Permit Order 2009-0009-DWQ (Construction General Permit). Construction activity subject to this permit includes clearing, grading and disturbances to the ground such as stockpiling or excavation. The Construction General Permit requires the development of a Stormwater Pollution Prevention Plan (SWPPP) by a certified Qualified SWPPP Developer (QSD). Compliance with General Permit issued by the SWRCB and the City's Stormwater Management Ordinance would require implementation of BMPs during construction to address the potential for pollutants from entering the Arroyo Seco. The Project's potential to violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality would be less than significant, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

The Raymond Basin is a groundwater basin that underlies the northwestern portion of the San Gabriel Valley and is divided into the Santa Anita Subarea, Pasadena Subarea, and Monk Hill Subarea. The City has both groundwater rights and surface water rights in the Monk Hill and Pasadena Sub-basins. The City's surface water rights in the Arroyo Seco overlay the Monk Hill Sub-basin.

About 1/3 of the surface runoff from the Raymond Basin is conveyed by the Arroyo Seco, which flows across the Monk Hill Subarea and the Pasadena Subarea, and joins the Los Angeles River by cutting through the San Rafael Hills. Artificial recharge of the Monk Hill subarea via off-stream spreading basins historically has occurred as a result of infiltration of stormwater runoff and, to a lesser degree, injection of treated imported water. Artificial recharge has ranged from 450 acre-feet per year to 9,700 acre-feet per year during the period of 1994-95 through 2011-12 (RBMB 2016).

Groundwater levels in the Monk Hill Subarea have fluctuated but remained relatively stable since 2000. Recharge of the Monk Hill Subarea from precipitation occurs on the mountain watershed and on the valley floor. Recharge from precipitation in the mountain watershed has ranged from 760 acre-feet to 9,280 acre-feet during the period of 1994-95 through 2011-12, with a long-term average annual recharge of 3,500 acre-feet from the mountains. Recharge of the Monk Hill subarea from precipitation on the valley flow has ranged from 17 acre-feet to 3,220 acre-feet per year during the period 1994-95 through 2011-12, with a long-term average annual recharge of 790 acre-feet from the valley floor. Water production in the Monk Hill Subarea includes groundwater pumping, purchases of treated imported water and a minor amount of treated water from local surface water diversions. Groundwater production has ranged from 3,870 acre-feet to 12,970 acre-feet during the period 1994-95 to 2011-12 and has averaged 6,990 acre-feet per year (RBMB 2016).

The City's surface water rights from the Arroyo Seco and tributaries pre-dates 1914 and includes taking surface water from the stream up to and including 25 cfs. Historically, PWP has either taken the stream water by diverting it at the intake structure directly for potable use with the addition of disinfectant (prior to 1972), and treatment at the Behner Water Treatment Plant (1972 to 1994), or by recharging the aquifer through spreading (1974 to present). The City uses the spreading grounds in order to protect its water rights; however, PWP is not currently able to fully utilize these surface water rights due to the limited capacity of its facilities.

The proposed Project does not involve extraction of groundwater and, therefore, would not decrease groundwater supplies. The Project also does not interfere substantially with groundwater recharge, but in fact would allow for the recharge of an additional 1,100 acre-feet of water annually, which would supplement the PWP's local water supplies. Importantly, PWP is able to pump between 60 to 80 of the water that is infiltrated through the spreading basins, which would result in a net augmentation of groundwater in storage. This is a beneficial impact on PWP's water resources. The Raymond Basin Management Board adjudicates water resources in this groundwater basin by setting the pumping rights and managing the groundwater storage accounts of public and private water agencies, including the PWP. Continued management of the Raymond groundwater basin would prevent adverse impacts to underlying groundwater resources, and impacts would be less than significant.

Construction activities would require water for dust control, equipment cleaning, and incidental uses, but this water demand would be provided by water trucks and would not directly impact underlying groundwater supplies. While recharge at existing spreading basins may be temporarily disrupted during the construction phases of the diversion and weir structures, the intake structure, and the spreading basins, the long-term increase in recharge due to the proposed Project would have a beneficial impact on groundwater supplies. The proposed Project would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

i) result in substantial erosion or siltation on or off site;

ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site;

iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or

iv) impede or redirect flood flows?

The proposed improvements in Area 2 would increase the amount of water capable of being diverted into the intake structure and downstream spreading basins and could therefore result in alterations to an existing drainage pattern. As required by the Settlement Agreement, as discussed in Section 2.3 of this Initial Study, the Court found that the elements of the ASCP that related to increased diversions of surface water (i.e., greater taking of stream water from the Arroyo Seco beyond its historical withdrawal) required the preparation of an EIR. The findings from the ASCP IS/MND did not require or include mitigation measures for this topic; however, this topic will be further evaluated in the EIR using updated analyses and mitigation will be included, if applicable.

d) In flood hazard, tsunami, or seiche zones, would the project risk release of pollutants due to project inundation?

The proposed Project is not within a designated tsunami zone or a seiche zone. A seiche is a standing wave oscillating in a body of water, such as a lake or bay. Seiches are generally caused by strong winds or atmospheric conditions and may be caused by earthquakes in smaller bodies of water. The proposed Project site is located upstream of Devil's Gate Dam. The top of this Dam is at an elevation of 1,075 feet above msl. The lowest ground elevation is at Area 3 and is 1,100 feet above msl and the basins are approximately 0.6-mile from the southernmost spreading basin (Basin J) to the general area of potential standing water behind the Devil's Gate Dam. Thus, waters behind the Dam would be below the elevation of and a great distance from the spreading basins and seiche waves would not affect the spreading basin structures. The basins would have freeboard from water surface to upper edge of the basin; pipes and outlets for water to flow into interconnected basins; and overflow pipes to direct water back into the Arroyo Seco. Thus, no seiche hazards would be created by the Project.

There are no opportunities for seiche at Area 2. Also, the potential for flood hazards associated with the failure of the Dam would release waters downstream into the Central and Lower Arroyo Seco and would not affect the proposed improvements in Areas 2 or 3. Additionally, the Project site is approximately 23 miles northeast of the Pacific Ocean and not subject to impacts from tsunamis.

The Flood Insurance Rate Maps of the Federal Emergency Management Agency (FEMA) show that Area 2 is located in Zone D (areas in which flood hazards are undetermined, but possible) and Area 3 is located in Zone X (areas determined to be outside the 0.2% annual chance floodplain) (FEMA 2019). The slopes in Area 2 and Gabrielino Trail/Access Road are subject to potential flooding following periods of heavy rainfall. However, there would be no opportunities for the Project to risk release of pollutants because the

infrastructure improvements in Areas 2 and 3 would not involve the storage, use, or transport of any hazardous materials or sources of potential pollutants. The Project would not result in adverse impacts related to the risk of release of pollutants due to inundation from flood, tsunami, or seiche zones. As such, no mitigation is required and this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

e) Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

The Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties is the Water Quality Control Plan (WQMP) for the Los Angeles Region, which includes the City of Pasadena. The Basin Plan: (i) identifies beneficial uses for surface and groundwaters, (ii) includes the narrative and numerical water quality objectives that must be attained or maintained to protect the designated beneficial uses and conform to the state's anti-degradation policy, and (iii) describes implementation programs and other actions that are necessary to achieve the water quality objectives established in the Basin Plan (LARWQCB 2019). Reach 3 of the Arroyo Seco, designated to be above Devil's Gate Dam, has the following beneficial uses: domestic water supply (MUN); industrial activities (IND); industrial process dependent upon water quality (PROC); groundwater recharge (GWR); warm water ecosystems (WARM); cold water ecosystems (COLD); terrestrial ecosystems (WILD); and wetland ecosystems (WET). The Raymond Basin has the following beneficial uses: MUN, IND, PROC, and for agricultural supply (AGR) (LARWQCB 2019).

The proposed Project does not include any facilities or land uses that could generate pollutants that could result in water quality impacts. As discussed in Threshold 3.10(a), compliance with the City's Stormwater Management Ordinance would protect and enhance water quality of watercourses, water bodies, and wetlands in a manner pursuant to and consistent with the federal Clean Water Act, and pursuant to NPDES Permit No. CA0061654. Restrictions in this Ordinance are applicable to both construction activities and operations. Additionally, compliance with the General Permit issued by the SWRCB would require implementation of BMPs during construction to address the potential for pollutants from entering the Arroyo Seco. The Project's potential to violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality would be less than significant, and no mitigation is required.

California Department of Water Resources (DWR) is required to prioritize and update California's groundwater basin prioritization in accordance with the requirements of Sustainable Groundwater Management Act (SGMA) and related laws. SGMA requires that groundwater resources be managed sustainably for long-term reliability and multiple benefits for current and future beneficial uses. SGMA applies to all California groundwater basins and requires that high- and medium-priority groundwater basins form Groundwater Sustainability Agencies (GSAs) (DWR 2019). DWR is required to prioritize California's 517 groundwater basins and subbasins as either high, medium, low, or very low. Raymond Basin's adjudication in 1944 established a management that utilizes a fixed safe-yield operation. As a result, the Raymond Basin was determined by DWR to be "Very Low" priority, and is therefore not subject to the requirements to form a Groundwater Sustainability Agency to develop a Groundwater Sustainability Plan.

PWP's 2015 Urban Water Management Plan demonstrates PWP's long-term water supply and resource planning, including an evaluation of its water supply sources. Current water and groundwater supply quality is analyzed and various projects aimed to improve water and groundwater quality and to increase local water supply sources are identified. The document identifies the ASCP as an anticipated future component of the City's water supply.

> By restoring and improving the intake structure, installing a new sediment removal mechanism, and expanding recharge operations with the creation of additional spreading basins, it is projected that PWP will benefit from an average 600 AFY of groundwater pumping credits (PWP 2015).

Additionally, the PWP is currently in the draft phases of preparing a 2019 Water System and Resource Plan (WSRP), which will act as an update to both the 2002 Water System Master Plan and the 2011 Water Integrated Resource Plan and is intended to establish policies and develop strategies for meeting PWP's current and future water needs (City of Pasadena 2019). The WSRP will also take into consideration the ASCP contributions to groundwater supply.

The Project's potential to substantially degrade surface or groundwater quality would be less than significant, and no mitigation is required. Additionally, the proposed Project would have beneficial impacts on groundwater supplies in the Raymond Basin and would not conflict with or obstruct implementation of a sustainable groundwater management plan. Impacts would be less than significant, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.11 Land Use and Planning

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

a) Would the project physically divide an established community?

The proposed Project does not involve the displacement of existing residences or the construction of barriers through the developed residential areas located east the Arroyo Seco. Therefore, the Project would not divide an established community and no impacts would occur. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

The proposed Project includes a portion of Assessor Parcel Number (APN) 5830-001-906 and a portion of APN 5823-015-902. The Project boundaries are located within the Open Space land use designation in the General Plan and the Open Space zone, as defined in Article 2, Zoning Districts, Allowable Land Uses, and Zone-Specific Standards in the City's Municipal Code. The City has requested a modification to CUP No. 6222 to increase utilization of the City's surface water rights through replacement of the existing diversion/intake facilities in Area 2 and construction of new and expanded spreading basins in Area 3 of the ASCP. A Conditional Use Permit or modification to a CUP are required for any recreational improvements within the Open Space zone and the proposed Project would not conflict with the City's Zoning Code.

Chapter 3.32 of the City's Municipal Code is the Arroyo Seco Public Lands Ordinance, which outlines the City's regulations for publicly owned lands within the Arroyo Seco. This ordinance only applies to the Central and Lower Arroyo Seco and does not pertain to the Project site, which is located north of the Devil's Gate Dam.

There are no adopted habitat conservation plans or natural community conservation plans in the City of Pasadena. According to the USFWS, the Project site is not located within designated critical habitat for the California Red-Legged Frog, least Bell's vireo or southwestern willow flycatcher (BonTerra Psomas 2015). The proposed Project components are consistent with the HWP Master Plan, as previously summarized in Table 1, Area 5A Water Resource and Associated Improvements, which identifies the proposed Project's consistency with the HWP Master Plan Improvements identified for Area 3. The proposed Project site does not have any overlay districts or other applicable land use regulations. Therefore, the Project would not conflict with any land use plans, policies, or regulations adopted for the purpose of avoiding or mitigating an environmental effect. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.12 Mineral Resources

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☒	☐
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☒	☐

a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

The California Geological Survey (CGS) has identified deposits of regionally significant aggregate resources in the state in accordance with the Surface Mining and Reclamation Act (SMARA). Clusters or belts of mineral deposits are designated as Mineral Resources Zone 2 (MRZ-2), which include areas that require special management due to the presence of mineral resources important to the state. The Devil's Gate Reservoir is designated as an MRZ-2 zone and contains sand and gravel deposits. This zone encompasses Area 3. However, there is no active mining operation in this MRZ-2 zone (DOC 2017). Review of maps prepared by the California Department of Conservation shows that there are no oil, gas or geothermal fields in or near the Upper Arroyo Seco. Additionally, there are no active or idle oil wells in or near the canyon. The nearest well is a plugged and inactive well located approximately 6 miles southwest of Area 3 (DOC 2018).

The proposed improvements in Areas 2 and 3, would not affect the availability of sand and gravel resources in the Project area. Any large cobbles and/or boulders that would be disturbed by the Project construction activities would be harvested for beneficial reuse within the Arroyo Seco Canyon, as feasible. Improvements in Area 2 may use boulders depending on integrity, shapes, and sizes for the rock wall and engineered streambed material protection. Improvements in Area 3 may also utilize cobbles and boulders (e.g., structure facades, walkway/trail edges, signs). Large cobbles and boulders in Area 2 would be moved away from active construction areas and stockpiled, as feasible, for future decorative uses, to conserve these resources.

The improvements in Area 3 would require export of soil materials excavated through the creation of the spreading basins for disposal at an off-site landfill or gravel pit, although some of the excavated material may be used as fill material for the basin walls and other Area 3 improvements, if appropriate. The HWP Master Plan and Arroyo Seco Design Guidelines call for the use of local arroyo stone in structures, walls, fences, signs, entries, and along trails to reflect the culture and style that is present along the Arroyo Seco. In compliance with the HWP Master Plan and Arroyo Seco Design Guidelines, excavation activities in Area 3 would be required to include the collection of arroyo stones for use in structures, signs, walls, and other improvements in the Canyon, subject to design review and approval by the City's Planning Division. This would reduce the off-site disposal of excavated soils and materials. Additionally, the improvements in Area 3 would not create large immovable structures that would impede any future use of the area for mineral resource recovery.

Thus, the Project would maintain the availability of these mineral resources and would not preclude future mining operations in this area. Impacts pertaining to the potential loss of known mineral resources that would be of value to the region or residents of the state would be less than significant, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

There are no identified oil, gas, or geothermal resources or ongoing mining/extraction activities in the Upper Arroyo Seco. The City of Pasadena Comprehensive General Plan does not identify any mineral resources in the City (City of Pasadena 2015). The HWP Master Plan talks about the removal of sand and gravel from the Devil's Gate Reservoir in the past but does not identify aggregate or other mineral resources in and around the reservoir that should be protected or preserved (City of Pasadena 2003).

The Project would not require mineral resources, nor would it change the availability of resources within Devil's Gate Reservoir. The construction of water infrastructure facilities and diversion of water into the

spreading basins would not affect sand and gravel resources in the Reservoir. Additionally, no new structures or facilities would be constructed as part of the Project that could potentially restrict or obstruct future mineral resource recovery activities within Devil's Gate Reservoir. Impacts related to the potential loss of locally important mineral resources would be less than significant, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.13 Noise

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project result in:				
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☒	☐	☐	☐
b) Generation of excessive groundborne vibration or groundborne noise levels?	☒	☐	☐	☐
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

a) Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Noise-sensitive receptors include land uses where an excessive amount of noise would interfere with normal operations or activities and where a high degree of noise control may be necessary. Examples include schools, hospitals, and residential areas. Recreational areas may be considered noise-sensitive where quiet and solitude may be an important aspect of the specific recreational experience.

The closest homes to Area 2 are approximately 780 feet (0.15-mile) to the east on Canyon Dell Drive in Altadena. Residential neighborhoods to the west in La Cañada Flintridge are more than 0.25-mile from Area 2. There are single-family residential neighborhoods to the east of Area 3. Some homes are in the City of Pasadena and others are in Altadena. The closest homes to Area 3 are on Ridgeview Drive in Altadena, approximately 225 feet from the eastern edge of the former JPL parking lot and are approximately 100 feet higher in elevation than the parking lot. North Windsor Avenue, between I-210 and Explorer Drive, would be used by traffic generated by the proposed Project. There are homes adjacent to North Windsor Avenue in the City of Pasadena and in the community of Altadena. While the Project would be located in the City of Pasadena, there are nearby noise-sensitive receptors in the unincorporated community of Altadena.

No long-term operational noise impacts are anticipated because the proposed facilities would not be substantively different from the existing operations. No new employees would be required and no new maintenance activities to/from the Project site would occur. Noise impacts associated with the proposed Project would be limited to the construction phase. The primary noise sources during construction would be the diesel engines from construction equipment, truck traffic, any required jackhammering of rocks and earthmoving, and the shaker machine to sort cobbles/rocks. As such, the Project has the potential to result in impacts associated with a substantial temporary increase in ambient noise levels in the vicinity of the Project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. This issue will be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic. The proposed Project's impacts related to noise will be re-evaluated in the EIR using updated survey data and mitigation will be included, if applicable, and may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

b) Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

Short-term construction activities in Areas 2 and 3 will require earthmoving and heavy equipment to facilitate removal of large cobbles and boulders, if present. Heavy equipment and movement of boulders could result in excessive groundborne vibration. As such, the proposed Project has the potential to result in excessive vibration or groundborne noise levels in the vicinity of the Project. The findings from the ASCP IS/MND did not require mitigation for this topic; however, this issue will be further evaluated in the EIR using updated survey data and mitigation will be included, if applicable.

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

There are no airports or airstrips within 2 miles of the Arroyo Seco Canyon. The nearest airports are the Burbank Bob Hope Airport and the El Monte Airport, which are both approximately 11 miles from the site. The Project would not subject persons in the area to noise from public or private airports, nor would the Project generate aircraft noise. There is a heliport and a helipad near the Arroyo Seco but no change in helicopter noise would occur with the Project. There would be no impact. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.14 Population and Housing

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

a) Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

The Project does not propose the construction of new homes or businesses that may induce direct population growth in the area. Also, no extension of infrastructure to unserved areas is proposed. The presence of the construction crew would be temporary and would not generate a measurable demand for housing, goods, or services in the area. No change in the PWP's operational or maintenance activities would occur that would lead to new employees that could indirectly induce growth or development in the area. The Project would improve the PWP's surface water diversion facilities and increase groundwater recharge. This would, in turn, reduce the PWP's reliance on imported water resources and would reduce its operating costs, but would not promote development in the City or the surrounding area. There would be no impact related to the inducement of substantial unplanned population growth, either directly or indirectly, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

The proposed Project would have no impact on any existing housing and would not displace people. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.15 Public Services

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

Fire protection?

The Pasadena Fire Department provides fire protection services to the City and operates eight fire stations. Pasadena Fire Station 38 at 1150 Linda Vista is located 2.4 miles south of Area 3. However, the Los Angeles County Fire Station No. 12 at 2760 North Lincoln Avenue in Altadena is located only 0.6 miles east of Area 3. County Fire Camp No. 2 is located southwest of the JPL campus and serves as a helicopter standby location during the fire season, with a crew of ten firefighters. County Fire Station No. 82 is located 1 mile southwest of Area 3 on the west side of the Arroyo Seco. The Los Angeles County Fire Department has automatic aid agreements with 33 cities in the County, including the City of Pasadena, to provide fire protection services during a fire or medical emergency regardless of territory. Thus, City and County firefighters would provide emergency response to the Upper Arroyo Seco in the event of a fire incident.

The Project does not involve the development of habitable structures, public buildings, or involve any operational activities that could increase demands for fire protection services. Proposed improvements related to the water infrastructure and appurtenant facilities are required to be designed and constructed in accordance with the Pasadena Fire Prevention Code (Chapter 14.28 of the City's Municipal Code), which adopts the California Fire Code with changes and additions to the adopted code. Temporary construction activities would not result in additional demands for fire protection such that new government facilities would be required. The proposed Project would not result in an increased residential population, increased commercial development, or any other intensification of land uses that could potentially require increased services of the Fire Department. Because there would be no increase in demand for Fire Department services, there would be no impact associated with the new or altered government facilities, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

Police protection?

The Pasadena Police Department provides police protection and law enforcement services in the City. The Police Department has a Park Safety Specialist Team that is assigned to patrol City parks, including Hahamongna Watershed Park. In addition, the Police Department has a Volunteer Mounted Unit that consists of volunteers on horses who provide patrol services in the remote park areas of the City, such as Hahamongna Watershed Park (Pasadena 2013). The Pasadena Police Department also participates in the California Law Enforcement Mutual Aid Plan and the California Disaster and Civil Defense Master Mutual Aid Agreement, which allow the City to request mutual aid from and to provide mutual aid to adjacent police protection and law enforcement agencies.

The Project does not involve the development of habitable structures, public buildings, or operational activities that could increase demands for police protection services. After each workday, construction equipment would be secured in a fenced area to minimize the risk of theft or vandalism. Temporary construction activities would not result in additional demands for police protection such that new government facilities would be required. The proposed Project would not result in an increased residential population, increased commercial development, or any other intensification of land uses that could potentially require increased services of the Police Department. Because there would be no increase in demand for Police Department services, there would be no impact associated with the new or altered government facilities, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

Schools, Parks, Other Public Facilities?

The proposed Project would not generate a demand for school, parks, libraries, or other public facilities services because no residential land uses are proposed, and there would be no increase in permanent employment that would have an indirect impact or result in additional demands on these resources. There would be no impact associated with the new or altered government facilities, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.16 Recreation

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☒	☐	☐	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

The Upper Arroyo Seco provides recreational opportunities for area residents and visitors. The Project site is located within HWP, which is developed with the Gabrielino Trail/Access Road that provides opportunities for hiking, biking, and equestrian activity up the Arroyo Seco Canyon and into the ANF. This park is maintained by the Pasadena Parks and Natural Resources Division. The HWP has numerous other active and passive recreational opportunities, including sports fields, hiking trails, picnic areas, equestrian center, a disc golf course, and other amenities. This park is maintained by the Pasadena Parks and Natural Resources Division.

The Arroyo Seco Trail runs along both sides of the Arroyo Seco and is part of the Rim of the Valley Trail Corridor that connects the Santa Monica Mountains and the San Gabriel Mountains through trails in the San Fernando and La Crescenta Valleys. This trail also continues south along the Central and Lower Arroyo Seco to connect with the Los Angeles River Trail. North of Devil's Gate Dam, there are several local trails on both sides of the Arroyo Seco, including the East Rim Trail, the West Rim Trail, the Mountain View Trail, the Flint Wash Trail, the Gould Canyon Trail, the Altadena Crest Trail, and the Gabrielino Trail.

The Project would not induce population growth directly or indirectly that could generate a need for or increase the use of parks and recreational facilities. No additional recreational amenities are associated with the proposed improvements in Areas 2 and 3. However, during construction within Areas 2 and 3, there may be times when portions of the Arroyo Seco Trail, Altacrest Trail, and Gabrielino Trail/Access Road would be closed to the public. While the trails would be kept open during construction to the extent possible, there would be days when equipment and construction activities would be on and/or near the trails, making recreational trail use hazardous for the general public.

Impacts associated with temporary construction activity could increase the use of other adjacent park amenities and other recreational facilities. The sediment removal activities associated with the ongoing Devil's Gate Reservoir project being conducted by the LACFCD would also result in the temporary closure of some local trails. It is unlikely that any direct impacts from temporary additional use would result in substantial physical deterioration of the facility, but reduced access to recreational trails during construction, which might be exacerbated by other construction projects in the HWP area, will be discussed in the EIR. The findings from the ASCP IS/MND required mitigation for this topic, and this EIR may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?

The proposed Project would not involve the construction of any recreational facilities. The Project would not generate a demand for parks that could result in the construction or expansion of recreational facilities because no residential land uses are proposed, and there would be no increase in permanent employment that would have an indirect impact or result in additional demands on these resources. There would be no impact associated with the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.17 Transportation

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?	☒	☐	☐	☐
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☒	☐
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
d) Result in inadequate emergency access?	☐	☐	☒	☐

a) Would the project conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?

The Foothill Freeway (I-210) I-210 has eight travel lanes as it passes along the southern edge of Devil's Gate Dam. Access to the Arroyo Seco Canyon is provided via the I-210's Arroyo Boulevard/Windsor Avenue off-ramp. Windsor Avenue is a two-lane road that runs north and ends at its intersection with Ventura Street and Explorer Road. Explorer Road continues northerly toward the former JPL East Parking Lot adjacent to the spreading basins and turns west across the Arroyo Seco (over the JPL Bridge) and southwesterly onto the JPL campus.

Construction trucks hauling soils and construction debris to and from Scholl Canyon Landfill are expected to come to the site from I-210 at the Windsor Avenue off-ramp and head north on Windsor Avenue to the intersection with Ventura Street. At this intersection is a fork in the road, one leading to Explorer Road into Area 3 and the other leading to the gated North Arroyo Boulevard, which passes adjacent to residential properties and the Behner Treatment Plant. Near the JPL Bridge over the Arroyo Seco near the northern boundary of Area 3, North Arroyo Boulevard splits and provides access to the Gabrielino Trail/Access Road and to the JPL Bridge/Explorer Road. Construction trucks would use North Arroyo Boulevard to access Area 2 and Explorer Road to access Area 3.

During construction of Area 2, however, there will be periods where sections of the trail will need to be partially or fully closed, mainly during excavations, construction of the new intake, and hauling in materials/equipment. The portion of trail along the construction zone may also need to be reduced in width for the duration of the construction period during work hours to allow for parked construction vehicles (e.g., pickup trucks). Access to Area 2 (and the USFS Ranger Station in the ANF) would be made available during construction activities, but short-term partial closures may occur. The Gabrielino Trail/Access Road would be made passable at the end of each workday. The City will follow the Supplements and Modifications to the Greenbook regarding notifications of residents and businesses affected by the temporary closures of the Gabrielino Trail/Access Road; notification of utility agencies with facilities in the area; the Pasadena Fire and Police Departments; and other emergency service providers.

From I-210, trucks would head west on SR-134; exit at the Figueroa Street/Scholl Canyon Road off-ramp; head north-northeast toward the landfill. Trucks would come back from the landfill entering the eastbound on-ramp on the SR-134 at Figueroa Street and head east; trucks would then go west on I-210 to Windsor Avenue to Explorer Road and, ultimately, to the site.

Project-related construction activities would generate new vehicle trips from construction equipment and construction crews coming to the site; trucks bringing in building materials; trucks taking out excavated soils and other debris for off-site disposal; and construction equipment leaving the site after each construction phase. Additionally, it is anticipated that the proposed Project activities may overlap with the sediment removal activities associated with the ongoing Devil's Gate Reservoir project being conducted by the LACFCD. As such, the proposed Project has the potential to result in cumulative short-term impacts that could conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. As such, this topic will be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic, and this EIR may include modifications to mitigation measures or deletion of measures that are no longer best practices from the ASCP IS/MND.

b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

CEQA Guidelines Section 15064.3(a) sets forth the purpose of the entire new Section 15064.3. First, the subdivision clarifies that the primary consideration, in an environmental analysis, regarding transportation is the amount and distance that a project might cause people to drive. Subdivision (b) focuses on specific criteria for determining the significance of transportation impacts related to land use projects, transportation projects, qualitative analysis, and methodology. The proposed Project is a water utility infrastructure project and not a "land use" project in that it is not developing any land uses or habitable structures that would generate long-term operational traffic. As such, the proposed Project would not result in an increase in vehicle miles traveled (VMT). Short-term construction related traffic would be addressed through Threshold 3.17(a). As such, this topic will not be further evaluated in the EIR. This is a new threshold of significance and the ASCP IS/MND did not include an assessment for this topic.

c) Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

The proposed Project would not result in any new roadway features or alignments or otherwise alter the geometric design of an existing roadway. No changes to the existing two temporary structures on the existing bridges would occur with the proposed Project. As such, there would be no impacts associated with a substantial increase in hazards due to a geometric design feature or incompatible uses, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic; however, the proposed Project does not involve construction of temporary bridges or alterations to the Gabrielino Trail/Access Road.

d) Would the project result in inadequate emergency access?

During the construction phase, the Gabrielino Trail/Access Road would be used for temporary construction vehicle access but construction equipment would not block access to or from the ANF and nearby U.S. Forest Ranger Station. The proposed Project would not result in any new roadway features or alignments or otherwise hinder emergency access vehicles. The Project would be conducted in compliance with the City's Supplements and Modifications to the Greenbook regarding notification of residents and businesses

affected by the road work; utility agencies with facilities in the area; the Pasadena Fire and Police Departments; and other emergency service providers. Although the Gabrielino Trail/Access Road is not a public road, it would be made passable at the end of each workday. Thus, access to Area 2 (and the USFS Ranger Station in the ANF) would be made available during construction activities, but short-term partial closures may occur. Potential impacts related to inadequate emergency access would be less than significant. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND required mitigation for this topic; however, the components of the ASCP being considered herein do not involve any construction activities within the ANF or adjacent to the Ranger Station.

3.18 Tribal Cultural Resources

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☒	☐	☐	☐
b. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?	☒	☐	☐	☐

a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)?

The proposed Project involves earthwork within and adjacent to the Arroyo Seco and has the potential to result in substantial adverse changes in the significance of a tribal cultural resource, cultural value to a California Native American tribe that is potential eligible in the CRHR. As such, this topic will be further evaluated in the EIR. This is a new threshold of significance that was not

required to be analyzed at the time of the circulation of the Notice of Intent to Adopt (NOI) an MND (i.e., July 1, 2015), and the ASCP IS/MND did not include an assessment for this topic.

ii) ***A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?***

The proposed Project is subject to compliance with Section 20180.3.2 of the PRC, Assembly Bill (AB) 52, which requires lead agencies to consult with California Native American tribes that request such consultation, and also requires that the tribes ask the Lead Agency to be contacted for consultation. Lead agencies must notify California Native American Tribes that are traditionally and culturally affiliated with the geographic area of the project and that have requested such notification. As such, this topic will be further evaluated in the EIR. This is a new threshold of significance that was not required to be analyzed at the time of the circulation of the Notice of Intent to Adopt (NOI) an MND (i.e., July 1, 2015), and the ASCP IS/MND did not include an assessment for this topic.

3.19 Utilities and Service Systems

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☒	☐
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?	☐	☐	☒	☐
c) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☒	☐

a) Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment, or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

The new diversion/weir and intake structures in Area 2 and the expanded spreading basins in Area 3 would increase the PWP groundwater recharge by approximately 1,100 acre-feet per year (afy). With the PWP allowed to extract between 60 and 80 percent of this volume, imported water supplies could be offset with local supplies by over 580,000 gpd. Potable water use by the Project is limited to short-term construction activities only for dust suppression. A water truck would come to the construction sites, with water obtained from off-site sources, as needed. This water demand would be short-term and minimal. No new or expanded potable water infrastructure is proposed. The Project would not affect water wells located near Area 3, but it would be necessary to relocate a portion of the JPL water line that crosses Area 3 (the JPL service was partially relocated in 2016). The new relocated line would be installed prior to removing the existing line to avoid disruption in water service to the JPL campus. Once the new water line is ready for use, the existing line would be either abandoned in place, or interfering sections would be removed. The hume line as part of the conveyance system that connects the intake in Area 2 to the spreading basins in Area 3 would be truncated and a new section added to tie into the sedimentation basin; water conveyance would be disrupted during construction of the new line and the spreading basins. This impact would be temporary and would not cut off water services to existing PWP customers.

No restroom or other wastewater generating facilities are proposed. During construction, portable toilets would be provided at the site for the construction crew, and these portable toilets would be regularly cleaned and their contents disposed of off site by an outside company. No new stormwater drainage infrastructure would be required because no new impervious surfaces would be constructed that could increase stormwater runoff or otherwise affect stormwater drainage. Impacts associated with the Project's water infrastructure facilities to increase diversions of Arroyo Seco flows would be analyzed in the EIR, as previously described in this Initial Study.

Construction equipment would be powered by petroleum via portable generators. Long-term energy consumption associated with the Project includes electricity consumption in Area 2 for the proposed intake service building to operate the diversion/weir structure, and the basin metering in Area 3. Electricity would be provided to Area 2 from an existing electrical connection at an existing equipment building, and an extension of this service via underground conduit to the new service building. Electricity would be provided to Area 3 via the existing electrical infrastructure formerly used to power the parking lot lighting. A new service-rated panelboard, pad-mounted electrical cabinets, underground conduit, and a light pole will be constructed. Construction activities would not require the use of natural gas, and no natural gas would be required for the proposed improvements and amenities. Similarly, the proposed Project would not require the use of telecommunication infrastructure because no habitable structures would be constructed. The Project proposes new local communications wiring that will allow for transmission of Supervisory Control and Data Acquisition (SCADA) telemetry data transmitted via radio. Potential impacts related to the relocation or construction of new or expanded water, wastewater treatment, or stormwater drainage, electric power, natural gas, or telecommunications facilities, would be less than significant. This topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

b) Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?

Potable water use by the Project is limited to short-term construction activities only for dust suppression. A water truck would come to the construction sites, with water obtained from off-site sources or fill on site from a temporary metered connection provided by PWP, as needed. This water demand would be short-term and minimal. The spreading basins in Area 3 would be decommissioned while the new basins are being excavated and existing basins are expanded. During these times, the intake structure in Area 2 would be closed and PWP would temporarily not be recharging surface waters. However, PWP maintains a groundwater storage reserve and access to MWD imported water deliveries if needed. Therefore, PWP is capable of accommodating the temporary interruption in spreading without disrupting water supplies and/or affecting reasonably foreseeable future development during normal, dry, and multiple dry years. Impacts would be less than significant, and no mitigation is required. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

c) Would the project result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

No restroom or other wastewater generating facilities are proposed. During construction, portable toilets would be provided at the site for the construction crew, and these portable toilets would be regularly cleaned and their contents disposed of off site by an outside company. There would be no impacts. As such, this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

d) Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

Construction activities in Areas 2 and 3 would generate construction debris and soil export that requires disposal at Scholl Canyon Landfill. It is anticipated that some cut soils would include larger rocks that may be recovered through the use of an on-site shaker. It is the City's intention to utilize this recovered material on site rather than disposing of the materials to the extent feasible. The construction activities must be conducted in compliance the City's Construction and Demolition Waste Management Ordinance (Chapter 8.62 of the Pasadena Municipal Code), which reduces landfill waste by requiring applicable projects to divert a minimum of 75% of generated construction and demolition debris in compliance with state and local statutory goals and policies. The Ordinance creates a mechanism to secure compliance with the stated waste diversion requirements. There would be no new long-term operational waste generated by the proposed Project. Through compliance with existing regulations, impacts-related solid waste regulations and reduction goals would be less than significant, and thus this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

e) Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

As discussed in Threshold 3.19(d), the Project's construction activities must be conducted in compliance with the City's Construction and Demolition Waste Management Ordinance, which requires applicable projects to divert a minimum of 75% of generated construction and demolition debris in compliance with state and local statutory goals and policies. The Ordinance creates a mechanism to secure compliance with the stated waste diversion requirements. There would be no new long-term operational waste generated by the proposed Project.

Through compliance with existing regulations, impacts-related solid waste regulations and reduction goals would be less than significant, and thus this topic will not be further evaluated in the EIR. The findings from the ASCP IS/MND also did not require or include mitigation measures for this topic.

3.20 Wildfire

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☒	☐
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☒	☐

a) Would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

The Arroyo Seco Canyon and adjacent areas are designated as a Very High Fire Hazard Severity Zone by the California Department of Forestry and Fire Protection (CAL FIRE 2011). During construction of Area 2, however, there will be periods where sections of the trail will need to be partially or fully closed, mainly during excavations, construction of the new intake, and hauling in materials/equipment. The portion of trail along the construction zone may also need to be reduced in width for the duration of the construction period during work hours to allow for parked construction vehicles (e.g., pickup trucks). Access to Area 2 (and the USFS Ranger Station in the ANF) would be made available during construction activities, but short-term partial closures may occur. The Gabrielino Trail/Access Road would be made passable at the end of each workday. The City will follow the Supplements and Modifications to the Greenbook regarding notifications of residents and businesses affected by the temporary closures of the Gabrielino Trail/Access Road; notification of utility agencies with facilities in the area; the Pasadena Fire and Police Departments; and other emergency service providers. The ASCP IS/MND required mitigation for this topic to address potential short-term closures of the Gabrielino Trail/Access Road and bridges. No new or different impacts would result from the proposed Project and the MMRP would be implemented during construction activities on the Gabrielino Trail/Access Road. Impacts would be less than significant and no additional mitigation is required. Therefore, this topic will not be further analyzed in the EIR.

b) Due to slope, prevailing winds, and other factors, would the project exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

The Project does not involve the development of habitable structures, public buildings, or involve any operational activities that could increase impact related to the exacerbation of wildfire risks because the Project would not generate a new resident population or increase visitation. Proposed improvements related to the water infrastructure and appurtenant facilities are required to be designed and constructed in accordance with the Pasadena Fire Prevention Code (Chapter 14.28 of the City's Municipal Code), which adopts the California Fire Code with changes and additions to the adopted code. Area 2 construction would be within and around the Arroyo Seco creek, and Area 3 construction would be within largely unvegetated spreading basins and the former JPL East Parking Lot. Water trucks would be available for dust control and would be required to keep areas of earthmoving periodically sprayed with water to minimize fugitive dust, which would further minimize wildfire hazards in the construction area. The proposed Project would not result in an increased residential population, increased commercial development, or any other intensification of land uses that could potentially result in an exacerbation of wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire. As such, this topic will not be further evaluated in the EIR. This is a new threshold of significance that was not required to be analyzed in the ASCP IS/MND, which did not include an assessment for this topic.

c) Would the project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

As described in Threshold 3.20(b), the proposed Project would not result in an increased residential population, increased commercial development, or any other intensification of land uses that could potentially result in an exacerbation of wildfire risks; therefore, there would be no requirement to install or maintain associated wildfire infrastructure. As such, this topic will not be further evaluated in the EIR. This is a new threshold of significance that was not required to be analyzed in the ASCP IS/MND, which did not include an assessment for this topic.

d) Would the project expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

As discussed under Threshold 3.20(b), the Project would not involve construction or operation of habitable structures that may expose people to wildfire or post-wildfire hazards in the area. The improvements in Area 2 are specifically designed to withstand floodwaters, are equipped with upstream and downstream engineered streambed material to reduce erosion and scour and would not expose downstream land uses to significant risks related to flooding or slope stability. All project components would be required to comply with the City's Floodplain Management Regulations Ordinance (Chapter 14.27 of the Pasadena Municipal Code), which requires facilities to be adequately anchored to prevent flotation, collapse, or lateral movement; to be constructed with materials and equipment resistant to flood damage; to have utility and service facilities designed and located to prevent water from entering; and to provide adequate drainage to reduce exposure to flood hazards. Proposed structures would also be required to be designed and constructed in accordance with the City's Building Code and the recommendations of the geotechnical investigation which would ensure construction would avoid activities associated with landslide and soil instability. As such, this topic will not be further evaluated in the EIR. This is a new threshold of significance that was not required to be analyzed in the ASCP IS/MND, which did not include an assessment for this topic.

3.21 Mandatory Findings of Significance

	Potentially Significant Impact	Less Than Significant Impact With Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?

As discussed above in Section 3.4, Biological Resources, Section 3.5, Cultural Resources, and 3.10, Hydrology and Water Quality, the proposed Project would lead to the disturbance of existing plant, aquatic, and animal habitats on and near the Arroyo Seco, as well as have potential impacts to hydrology and cultural resources in the Project area. Implementation of the mitigation measures may be required to ensure that the Project does not degrade the quality of the environment; does not substantially reduce the habitat of fish or wildlife species; does not reduce the number or restrict the range of Rare or Endangered plant or animal; and does not eliminate important examples of the major periods of California history or prehistory. As such, impacts would be potentially significant and would be assessed in the EIR.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Other projects are anticipated to be ongoing in or near the HWP. These cumulative projects include, but are not limited to the Los Angeles County Flood Control District's sediment removal at Devil's Gate Reservoir as well as the components of the ASCP that were approved through the 2015 ASCP IS/MND. The proposed Project could have impacts that are individually limited, but cumulatively considerable, such that the incremental effects are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. These impacts will be analyzed in the EIR.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

The proposed Project would have environmental effects that could cause adverse effects on human beings, either directly or indirectly, as they relate to Air Quality, Noise, Recreation, and Transportation, as previously discussed under these environmental issues. As such, these topics will be evaluated in the EIR.

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4.2 List of Preparers

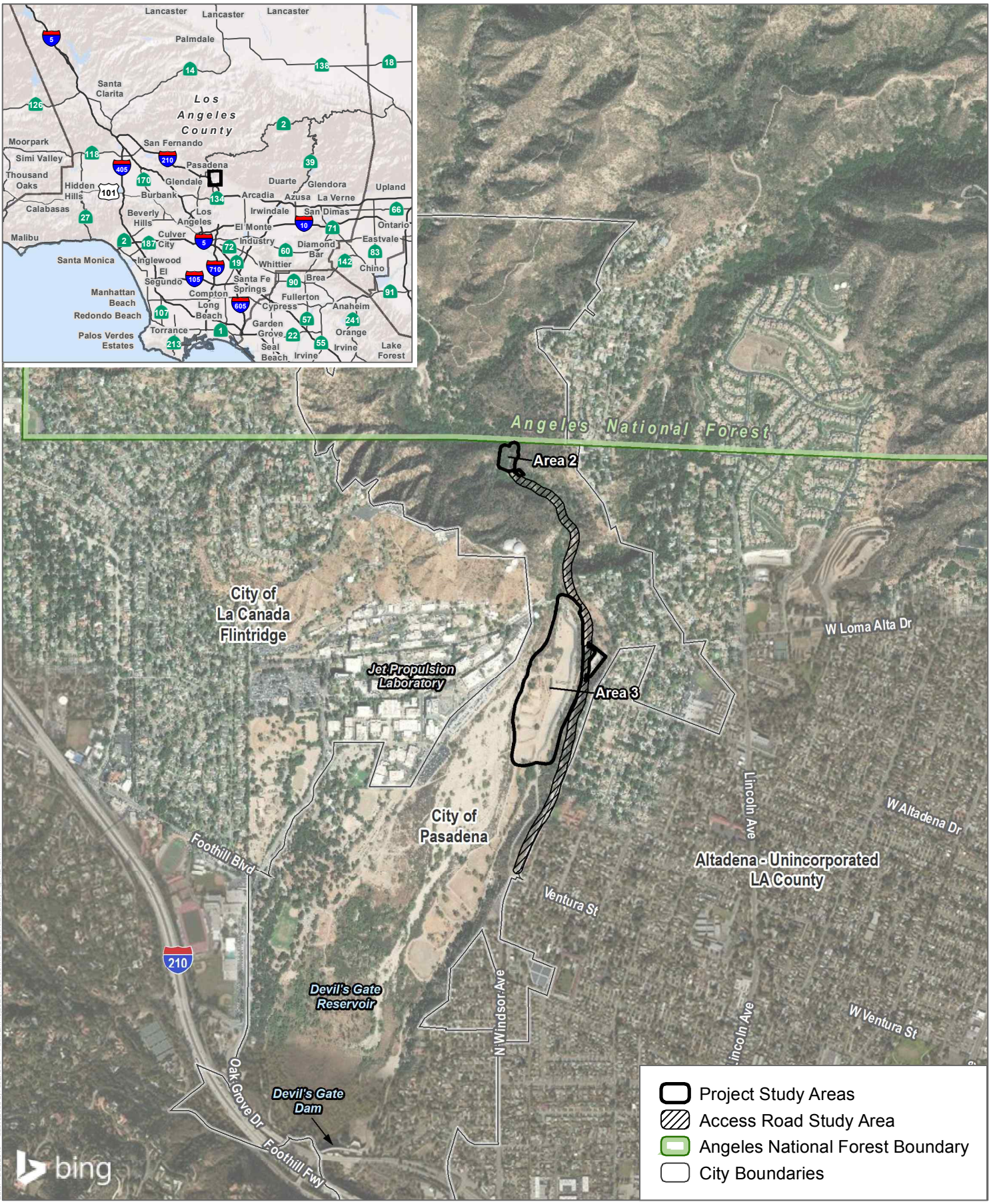
Pasadena Water and Power

Brad Boman, PE	Engineering Manager
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John Bellas, LEED AP	Project Planner
Perry Banner	Project Planner

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Kristin Starbird	Senior Project Manager
Shannon Baer	CEQA Analyst
Michael Cady	Senior Biologist
Samantha Murray	Historic Built Environment Lead
Christopher Starbird	GIS Analyst
Corrine Price	Editor/Publications

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SOURCE: Bing 2019, Open Street Map 2019

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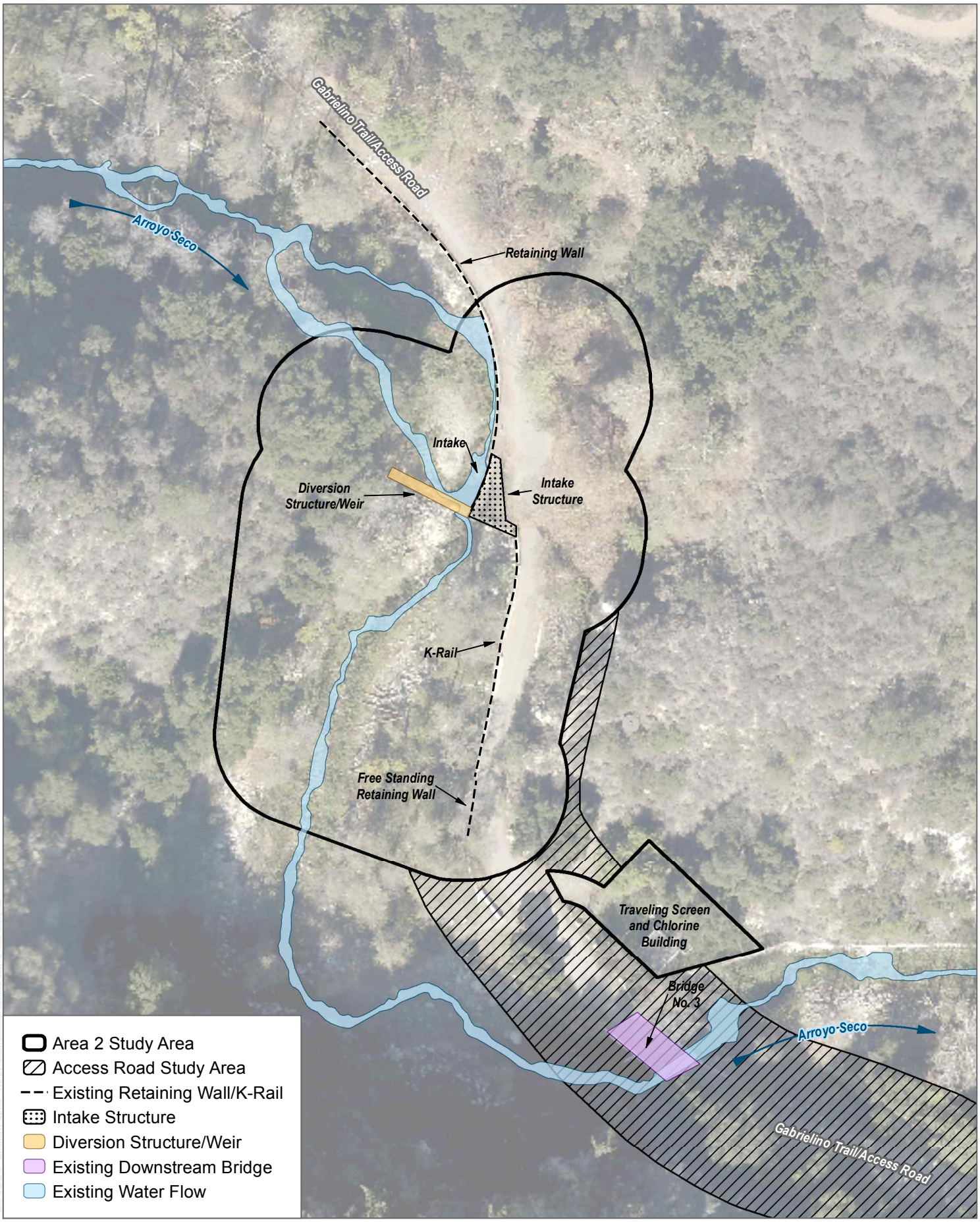
0 700 1,400 Feet

FIGURE 1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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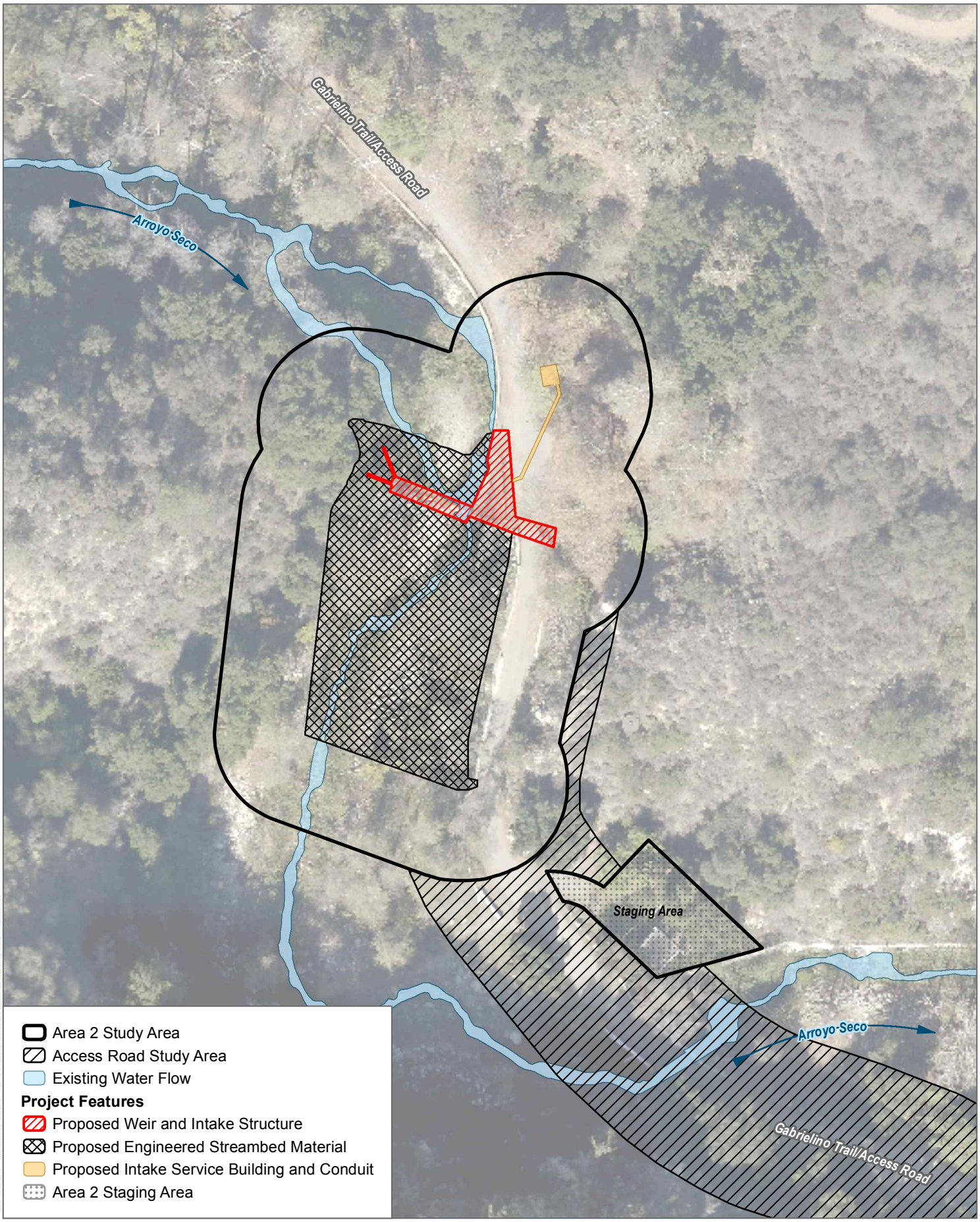
0 35 70 Feet

FIGURE 2A

Area 2 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

INTENTIONALLY LEFT BLANK



SOURCE: LARIAC Aerials 2014

DUDEK

0 35 70 Feet

FIGURE 2B

Area 2 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

INTENTIONALLY LEFT BLANK



SOURCE: Esri, Digital Globe 2019

DUDEK

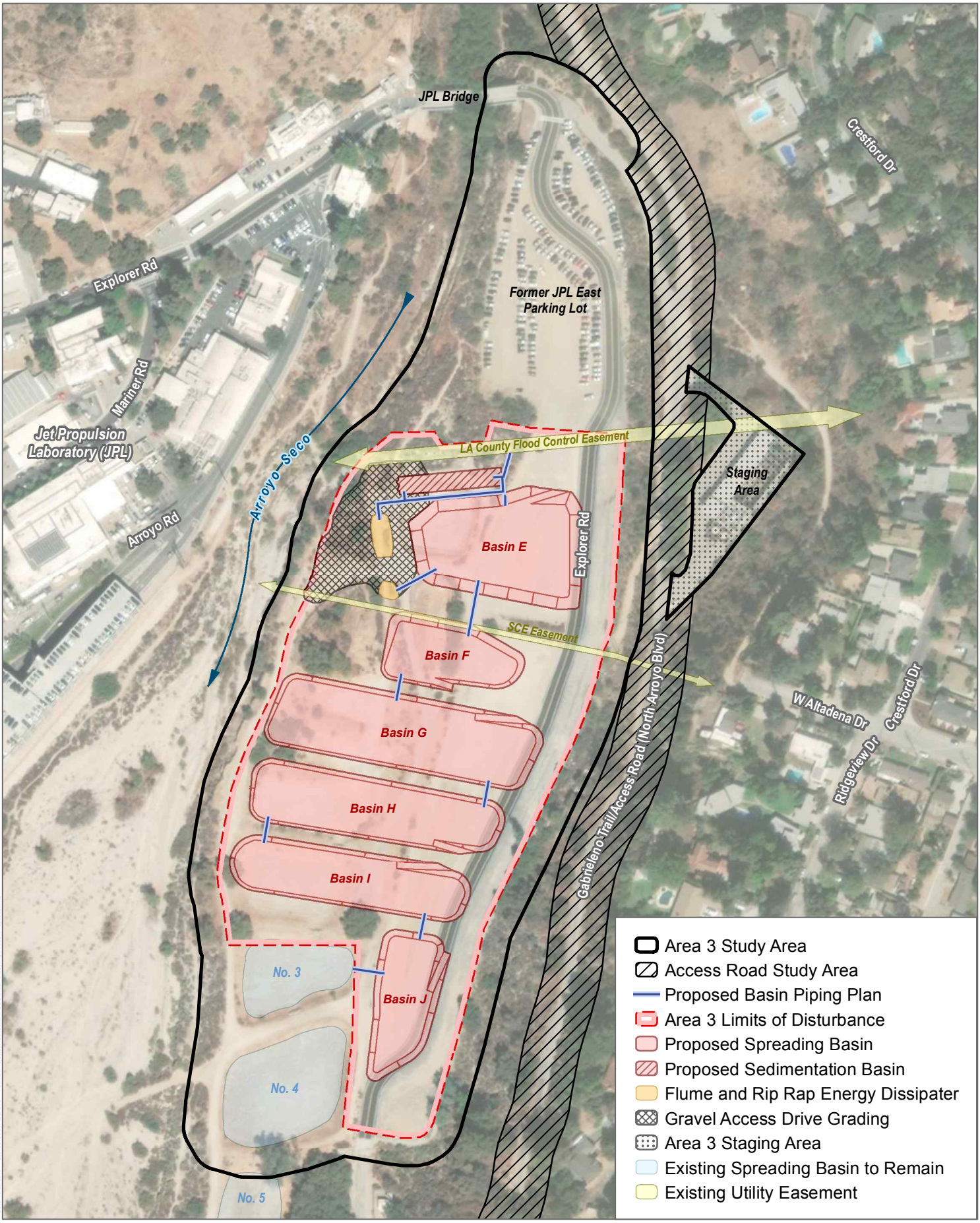
0 112.5 225 Feet

FIGURE 3A

Area 3 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

INTENTIONALLY LEFT BLANK



SOURCE: Esri, Digital Globe 2019

DUDEK

0 112.5 225 Feet

FIGURE 3B

Area 3 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

INTENTIONALLY LEFT BLANK

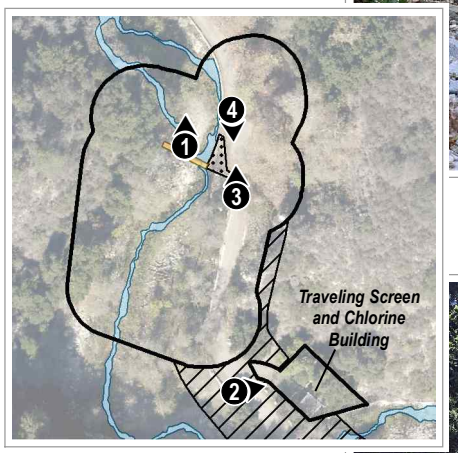






Photo 1



Photo 2



Photo 3



Photo 4

Photo Location and Direction
Diversion Structure/Weir
Intake Structure
Area 2 Study Area
Access Road Study Area

Note: Photos 1 and 2 taken April, 2019.
Photos 3 and 4 taken July, 2019.

SOURCE: LARIAC 2014

FIGURE 4A

Area 2 Existing Conditions Photographs

Arroyo Seco Canyon Project Areas 2 and 3

DUDEK

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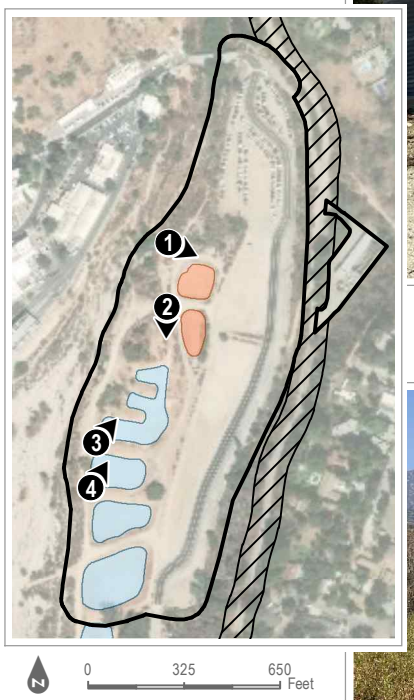




Photo 1

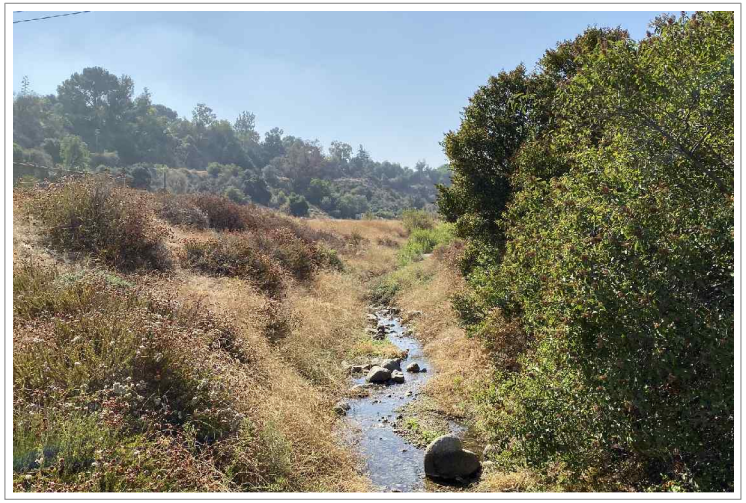


Photo 2

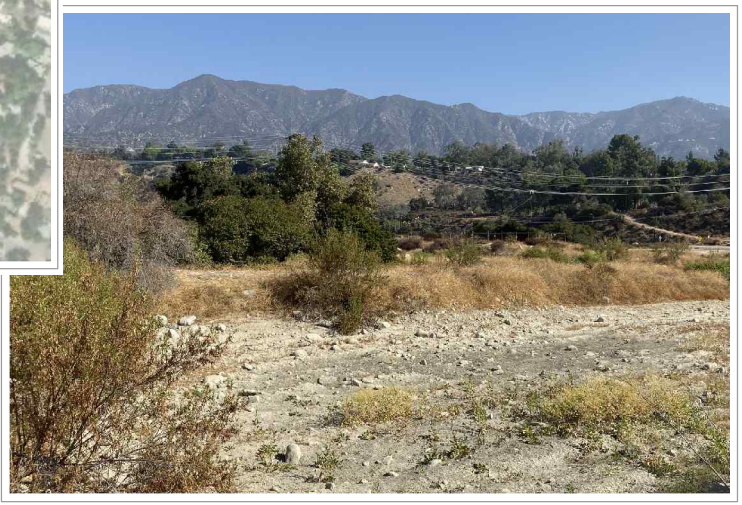


Photo 3



Photo 4

Photo Location and Direction
Area 3 Study Area
Access Road Study Area
Existing Drying Bed
Existing Spreading Basin

Note: Photos taken October, 2019

Esri, Digital Globe 2019

FIGURE 4B

Area 3 Existing Conditions Photographs

Arroyo Seco Canyon Project Areas 2 and 3

DUDEK

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Appendix A-2

Initial Study Appendices, October 2019

A: Judgment and Peremptory Writ of Mandate, the City's Declaration in Support of the Judgment, the Statement of Decision on Petition for Writ of Mandate, and the Settlement Agreement

B: Geotechnical Feasibility Study Report, Converse Consultants

ARROYO SECO CANYON PROJECT AREAS 2 AND 3
INITIAL STUDY

TECHNICAL APPENDICES

Prepared for:

City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
Contact: Elisa Ventura, PE

Prepared by:

DUDEK
38 North Marengo Avenue
Pasadena, California 91101
Contact: Kristin Starbird

OCTOBER 2019

Appendix A

Judgment and Peremptory Writ of Mandate, the City's Declaration in Support of the Judgment, the Statement of Decision on Petition for Writ of Mandate, and the Settlement Agreement

SUPERIOR COURT OF CALIFORNIA, COUNTY OF LOS ANGELES

DATE: 06/26/17			DEPT. 15
HONORABLE RICHARD FRUIN	JUDGE	E. GARCIA	DEPUTY CLERK
HONORABLE	JUDGE PRO TEM		ELECTRONIC RECORDING MONITOR
H. AVALOS, C.A.	Deputy Sheriff	NONE	Reporter

BS156207

SPIRIT OF THE SAGE COUNCIL ET A
VS
CITY OF PASADENA ET AL

CEQA
170.6 O'DONNELL - RESPONDENT

Plaintiff Counsel

NO APPEARANCES

Defendant Counsel

NATURE OF PROCEEDINGS:

THERESA E. FUENTES
PASADENA CITY ATTORNEY'S OFFICE
100 N. GARFIELD AVE., ROOM N210
PASADENA, CA 91109

BRYAN W. PEASE
LAW OFFICE OF BRYAN W. PEASE
3170 FOURTH AVE., SUITE 250
SAN DIEGO, CA 92103

MINUTES ENTERED
06/26/17
COUNTY CLERK

SUPERIOR COURT OF CALIFORNIA, COUNTY OF LOS ANGELES

DATE: 06/26/17			DEPT. 15
HONORABLE RICHARD FRUIN	JUDGE	E. GARCIA	DEPUTY CLERK
HONORABLE	JUDGE PRO TEM		ELECTRONIC RECORDING MONITOR
H. AVALOS, C.A.	Deputy Sheriff	NONE	Reporter

BS156207

Plaintiff Counsel

SPIRIT OF THE SAGE COUNCIL ET A VS CITY OF PASADENA ET AL

NO APPEARANCES

Defendant Counsel

CEQA
170.6 O'DONNELL - RESPONDENT

NATURE OF PROCEEDINGS:

NON-APPEARANCE CASE REVIEW;

The Court is in receipt of the Proposed Judgment Granting Peremptory Writ of Mandate and the Proposed Writ of Mandate.

The Court having reviewed the said documents, finds the judgment to be proper, and the said judgment is signed and filed this date. Counsel for the Petitioner to file Notice of Entry Judgment.

The Proposed Writ of Mandate is forwarded to Room 118, with the check for $25.00 for the Clerk's signature.

The Court also issues the following document: NOTICE OF ENTRY OF JUDGMENT AND PEREMPORTY WRIT OF MANDATE

Said document and the said judgment are both served on all sides via U.S. Mail.

CLERK'S CERTIFICATE OF MAILING

I, the below-named Executive Officer/Clerk of the above-entitled court, do hereby certify that I am not a party to the cause herein, and that on this date I served the minute order dated 6/26/17,

MINUTES ENTERED
06/26/17
COUNTY CLERK

SUPERIOR COURT OF CALIFORNIA, COUNTY OF LOS ANGELES

DATE: 06/26/17			DEPT. 15
HONORABLE RICHARD FRUIN	JUDGE	E. GARCIA	DEPUTY CLERK
HONORABLE	JUDGE PRO TEM		ELECTRONIC RECORDING MONITOR
H. AVALOS, C.A.	Deputy Sheriff	NONE	Reporter

BS156207

SPIRIT OF THE SAGE COUNCIL ET A
VS
CITY OF PASADENA ET AL

CEQA
170.6 O'DONNELL - RESPONDENT

Plaintiff Counsel: NO APPEARANCES

Defendant Counsel:

NATURE OF PROCEEDINGS:

upon each party or counsel named below by placing the document for collection and mailing so as to cause it to be deposited in the United States mail at the courthouse in Los Angeles, California, one copy of the original filed/entered herein in a separate sealed envelope to each address as shown below with the postage thereon fully prepaid, in accordance with standard court practices.

Dated: 6/26/17

Sherri R. Carter, Executive Officer/Clerk

By: _____
E. GARCIA, DEPUTY CLERK

TODD T. CARDIFF
LAW OFFICE OF TODD T. CARDIFF
1901 FIRST AVE., SUITE 219
SAN DIEGO, CA 92101

MINUTES ENTERED
06/26/17
COUNTY CLERK

FILED
Superior Court of California
County of Los Angeles
JUN 26 2017
Sherri R. Carter, Executive Officer/Clerk
By S. Garcia Deputy

NOTICE OF ENTRY OF JUDGMENT AND PEREMPTORY WRIT OF MANDATE

SPIRIT OF THE SAGE COUNCIL, PROJECT SOLITON v. CITY OF PASADENA, CITY OF PASADENA WATER AND POWER, Case No. BS 156207

The court issued its Statement of Decision on Petition for Writ of Mandate on March 20, 2017. The court thereafter received drafts for a Judgment and Peremptory Writ of Mandate from each side. The court held a hearing on April 24, 2017 to discuss and resolve the parties' differences as to the proposed draft Judgment and Peremptory Writ of Mandate.

The parties have since lodged revised drafts for the Judgment and Peremptory Writ of Mandate, and also objections to the drafts proposed by the other side. The principal issue dividing the parties has been the definition of those parts of the Project that are to be severed from the Peremptory Writ. The court's Statement of Decision, p. 16 provides:

The Project has separate components and petitioners have not challenged the City's approvals as to certain parts of the Project. The parties may consider whether a severance is appropriate under Public Resources Code section 21168.9(b) and submit a Writ providing for an appropriate severance. Any severance, however, must not prejudice full compliance with CEQA.

The City lodged a proposed Judgment and a proposed Peremptory Writ of Mandate on May 3, 2017. Petitioners lodged their objections and also submitted their proposed Judgment and Peremptory Writ of Mandate on June 1. The City filed its Further Memorandum and the Declaration of Gary Takara and lodged revised drafts for a Judgment and Peremptory Writ of Mandate on June 20. Petitioners filed their objections on June 22, and requested therein that the court hold another hearing to settle the form of the Judgment and Peremptory Writ of Mandate. The court declines to hold a further hearing. The City has proposed a Writ that defines a severance in a manner that "will not," the City promises, "prejudice complete and full compliance with CEQA." The definition of the parts of the project that may proceed are defined in detail in the Takara declaration and are sufficiently described in the proposed Peremptory Writ of Mandate. The court accordingly adopts the forms lodged by the City.

The court has signed, entered and herewith serves its Judgment and Peremptory Writ of Mandate.

DATED: June 26, 2017

Richard L. Fruin Jr.

RICHARD L. FRUIN, JR.
Superior Court of California
County of Los Angeles

FILED
Superior Court of California
County of Los Angeles
JUN 26 2017
Sherri R. Carter, Executive Officer/Clerk
By _____ Deputy
E. Garcia

REC'D
JUN 20 2017
FILING WINDOW

SUPERIOR COURT FOR THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES - CENTRAL DISTRICT

SPIRIT OF THE SAGE COUNCIL, a California Public Benefit Corporation; PROJECT SOLITON, a California Public Benefit Corporation

Petitioners,

v.

CITY OF PASADENA, a public entity; CITY OF PASADENA WATER AND POWER; and DOES 1 through 25, inclusive;

Respondents.

Case No. BS 156207

Assigned for All Purposes to the Honorable Judge Richard Fruin Department 15

~~[PROPOSED]~~ JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE

This matter came on regularly for hearing on December 15, 2016, with additional hearings on January 13 and 18, 2017, in Department 15 of this Court, located at 111 N. Hill Ave., Los Angeles CA. Todd T. Cardiff and Bryan W. Pease appeared on behalf of petitioners Spirit of the Sage Council and Project Soliton, and Theresa E. Fuentes, Assistant City Attorney, appeared on behalf of respondent City of Pasadena and its Water and Power Department.

The Court, having reviewed the record of respondent's proceedings in this matter, the briefs submitted by all parties, and the oral argument of all counsel; the matter having been submitted for decision and the Court having ruled on the entirety of the matter as set forth in its Statement of Decision attached hereto; the Court having invited the parties to propose severance of the project pursuant to Public Resources Code Section 21168.9 and consistent with its Statement of Decision; and the Court having directed that judgment and a peremptory writ of mandate issue in this proceeding,

IT IS ORDERED THAT:

1. Judgment is entered in favor of petitioners in part.

2. A peremptory writ of mandate directed to respondent shall issue under seal of this Court, invalidating respondent's approval of Conditional Use Permit No. 6222 and certification of a Mitigated Negative Declaration with the exception of those specific project elements the Court found severable under Public Resources Code Section 21168.9(b), as set forth in the Writ.

3. Petitioners are entitled to costs of suit. This Court reserves jurisdiction over this matter to determine entitlement to attorneys' fees after proper notice and motion.

4. This Court also reserves jurisdiction over any return on the writ of mandate by respondent.

DATED: June 26, 2017 By: Richard Fruin
Honorable Judge Richard Fruin

PROOF OF SERVICE

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

I, CLAIRE A. VORHIS, hereby declare and state:

I am employed in the County of Los Angeles; I am over the age of eighteen years and not a party to the within entitled action. My business address is 100 North Garfield Avenue, Suite N210, Pasadena, California. My mailing address is PO Box 7115, Pasadena, CA 91109-7215.

On June 20, 2017, I served the foregoing document described as:

[PROPOSED] JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE

on the interested parties by placing a true copy thereof enclosed in a sealed envelope addressed as follows:

SEE ATTACHED SERVICE LIST

[ ] **BY FACSIMILE:** Based on an agreement of the parties to accept service by fax transmission, I faxed the documents to the persons at the fax number. No error was reported by the fax machine that I used. A copy of the record of the fax transmission, which I printed out is attached..

[ ] **BY MAIL:**

[ ] As follows: I am "readily familiar" with the City's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage thereon fully prepaid at Pasadena, California, in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

[ ] I deposited such envelope in the mail at Pasadena, California. The envelope was mailed with postage fully prepaid.

[ ] **BY PERSONAL SERVICE:**

[ ] I delivered such envelope by hand to the offices of the addressee pursuant to CCP § 1011.

[X] BY EMAIL OR ELECTRONIC TRANSMISSION:

[X] Based on an agreement of the parties to accept service by e-mail or electronic transmission (with a courtesy hard copy should any document exceed 30 pages), I caused the documents to be sent to the persons at the e-mail addresses listed above. I did not receive, within a reasonable time after the transmission, any electronic message or other indication that the transmission was unsuccessful.

I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

EXECUTED on June 20, 2017, at Pasadena, California.

CLAIRE A. VORHIS

ATTORNEYS' SERVICE LIST

SPIRIT OF THE SAGE COUNCIL, a California Public Benefit Corporation; PROJECT SOLITON, a California Public Benefit Corporation, Petitioners v. CITY OF PASADENA, a public entity; CITY OF PASADENA WATER AND POWER; and DOES 1 through 25, inclusive, Respondents.

City Attorney File No. 7534
Case No. BS 156207

Todd T. Cardiff, Esq. — Attorneys for Petitioner
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Telephone: (619) 546-5123
Facsimile: (619) 546-5133
todd@tcardifflaw.com

and -

Bryan W. Pease, Esq. — Attorneys for Petitioner
LAW OFFICES OF BRYAN PEASE
302 Washington Street, Suite 404
San Diego, CA 92103
bryanpease@gmail.com

RECEIVED
2017 JUN 30 AM 8:48
CITY OF PASADENA
CITY ATTORNEY
CIVIL DIVISION

MICHELE BEAL BAGNERIS, City Attorney
State Bar No. 115423
THERESA E. FUENTES, Assistant City Attorney
State Bar No. 175139
JOHN W. NAM, Deputy City Attorney
State Bar No. 272025
100 N. Garfield Avenue, Room N210
Pasadena, California 91109
Telephone: (626) 744-4141
Facsimile: (626) 744-4190

Attorneys for Defendant, CITY OF PASADENA
[FEE EXEMPT GOV. CODE §6103]

SUPERIOR COURT FOR THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES - CENTRAL DISTRICT

SPIRIT OF THE SAGE COUNCIL, a California Public Benefit Corporation; PROJECT SOLITON, a California Public Benefit Corporation

Petitioners,

v.

CITY OF PASADENA, a public entity; CITY OF PASADENA WATER AND POWER; and DOES 1 through 25, inclusive;

Respondents.

Case No. BS 156207

Assigned for All Purposes to the Honorable Judge Richard Fruin Department 15

DECLARATION OF GARY TAKARA IN SUPPORT OF CITY OF PASADENA'S [PROPOSED] JUDGMENT

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///

I, Gary Takara, declare:

1. I am an Engineering Manager in the City of Pasadena's ("City") Water and Power Department ("PWP"), and have held this position since June 2015. I started with the City in March 1994 as an Associate Engineer. I have over 27 years in water resource management and related engineering experience. In 1990, I received my Bachelor of Science from California Polytechnic, Pomona in Civil Engineering.
2. In my current capacity as Engineering Manager, my job duties include managing the PWP Water Supply and Water Quality groups. I supervise the project team for the Arroyo Seco Canyon Project ("Project") at issue in this case. I have been intimately involved in the planning, engineering, grant administration, and implementation of the Project. All of the physical work done to date on the Project has received my review and approval prior to implementation.
3. As a result of the Station Fire in 2009 and subsequent heavy rains in 2010, the Arroyo Seco experienced substantial debris flows and flooding that damaged existing PWP water diversion facilities in the Arroyo. In general, the Project involves removal of facilities in Area 1 (Arroyo Seco Headworks), repair and replacement of damaged and worn facilities in Area 2 (Arroyo Seco Intake), and repair, maintenance, construction of new facilities, and recreational improvements in Area 3 (JPL East Parking Lot).
4. I am aware of the court's Statement of Decision in this matter, and in particular of the court's "Comments for Hearing on April 24, 2017 at 10:00 A.M" wherein the court stated: "The court's Statement of Decision is not limited to increased water appropriations over the City's historical usage. It refers to any additional capacity to take stream water at Area 2 or any other location within the Project boundaries."
5. The purpose of my declaration is to provide expert opinion to distinguish between the specific Project elements that would facilitate to the City's capacity to take additional stream water so that those may be severed from the Project as appears to be the desire of the court, and the remainder of the Project related to either recreational/JPL

accommodating improvements, or repair, maintain, and operate of PWP facilities necessary to fully return back to normal operations.

6. None of the work in Area 1 is related to increasing PWP's capacity to take additional stream water. That work is related to removing facilities from the Arroyo Seco and conducting streambed repair necessary as a result of such removal.

7. In Area 2, all Project elements are directly related to PWP's ability to take additional stream water, with the exception of the access road improvement and related slope reconstruction and protective riprap. The road improvements are necessary to reach Area 1 with the construction equipment required to conduct the removal described above.

8. The work in Area 3 is of overlapping utility, and is best explained by reference to Table 3.1-1 of the Initial Study/Mitigated Negative Declaration at issue in this case, a copy of which is attached hereto as Exhibit A for the court's reference. None of the Project elements in the following rows have anything to do with increasing PWP's capacity to take additional stream water: JPL East Parking Lot; New public restroom; Bridge Crossing; Trails; Trailhead; Habitat restoration (none proposed as part of the Project); Pipeline Relocation and Demolition (further explanation provided below); Storm Drain Improvements (none proposed as part of the Project); Overlook (none proposed as part of the Project); Park Entrance (none proposed as part of the Project); Access Road; Pump-back system (none proposed as part of the Project); Water line; Overhead power and communications lines; Septic Tanks and Sewer lines; Security Gates; Lighting; and Public telephones (not proposed as part of the Project).

    a. The only Project elements in Area 3 related to increasing PWP's capacity to take additional stream water are found in the "Spreading Basins" row, and consist of "expand 4 existing basins" and "construct 2 [new] spreading basins." Those items are highlighted in yellow on Exhibit A for sake of clarity.

    b. In that same row, the Project element of "replace 2 sludge ponds with 2 new spreading basins" would <u>not</u> enable to take additional stream water. PWP currently operates the sludge ponds as spreading basins, so this work is necessary

to improve existing facilities to better serve the use for which they are currently operated.

c. Also in that same row, the Project element of "construct 2 sedimentation basins" is necessary as a result of the ruined state of the headworks in Area 1, as debris currently freely flows downstream and will eventually clog up PWP's existing facilities without proper management.

d. None of the Project elements in the row titled "Pipeline Relocation and Demolition" are related to an increased capacity to take stream water.

i. The Project element "replace and realign Hume line from the north end of parking lot to the spreading basins" is related to an existing pipeline that currently directs water to the spreading basins and is not intended to be increased in size but simply realigned to accommodate the proposed layout for improvements at Area 3.

ii. The Project element "relocate the JPL water line to the new access road" moves an existing line to be located out of the way to construct the 2 sedimentation basins. (See notation regarding "Relocate the 12-inch diameter Arroyo Booster pipeline to the new access road" in paragraph 10 below.) But even if the sedimentation basins were not constructed, PWP would want the water lines under the new road so as to minimize disruption from any future digging in the area.

iii. The Project element "demolish a portion of the influent and effluent line from the Behner Water Treatment Plant" is related to removal of portions of existing pipelines no longer in use.

iv. The Project element "Remove sludge lines" is simply removal of unnecessary piping and general cleaning up of the area.

9. For sake of clarity, the Project does not propose any new or increased piping capacity between Areas 2 and 3 that would eventually be of utility should PWP receive all

necessary regulatory and court approvals to increase its capacity to take water from the Arroyo Seco.

10. PWP did undertake some physical work in Area 3 during the pendency of this litigation as there was no court order to the contrary. Specifically, PWP constructed pipelines within the alignment of the proposed new road, including: a new 12-inch pipeline to serve a future groundwater well beside Basin F; a 16-inch utility line to serve existing offsite wells in the Arroyo and the existing Monk Hill Treatment Plant, a 12-inch discharge main for the existing Arroyo Booster located south of the site (this work was undertaken in place of "Relocate the 12-inch diameter Arroyo Booster pipeline to the new access road"), and relocation of the 12-inch potable water service to the NASA/JPL property. None of this work would enable an increase in the capacity to take stream water.

11. Finally, it is important to note that certain construction activity assumptions were included in the Project, and are set forth in Exhibit A in Table 3.2-1. The assumptions would remain the same in general, but scaled back in any particular Project Area consistent with any judgment issued by this court.

12. The City is facing delay costs associated with its inability to move forward with elements of the Project unrelated to additional capacity to take water out of the stream. Temporary bridges along the trail to Areas 1 and 2 must be installed to support the movement of construction equipment. The City began that work during the pendency of this litigation, but stopped once the court issued its Statement of Decision. Because the City does not yet know whether it can proceed with any part of the Project, it must extend the contract for the temporary bridges, at an additional cost of $30,000 over the original contract amount. On Monday, June 19, 2017, the City Council approved that additional expense. Attached hereto as Exhibit B is the staff report upon which Council acted, and which explains the delay costs.

13. I am personally familiar with the facts stated herein and if called upon to testify, I could and would competently testify thereto.

I declare under penalty of perjury that the foregoing is true and correct.

Gary Takara

EXHIBIT A

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)	Arroyo Seco Canyon Project
JPL East Parking Lot	Relocate JPL parking, remove southern ¾ of parking lot and convert northern ¼ into public parking.	6-story, 1,200-space parking structure on JPL west parking lot (2.3.1.11.1 and 3.1.4.1.1).	*(Note: This parking structure is under construction by JPL and is not part of the Project.)*
		Convert JPL parking to 200-space public parking (2.3.1.15.1).	Up to 100-space decomposed granite recreational parking lot. *(Note: This is 100 parking spaces fewer than the parking lot analyzed in the Master EIR.)*
New public restroom	New restroom (with 1 urinal and 1 stall for men and 2 stalls for women) at northern end of parking lot, with storage area, public telephone, underground power connection, and sewage lift station and force main leading to the JPL line across the JPL bridge.	New restroom (with 1 urinal and 1 stall for men and 2 stalls for women) at northern end of parking lot, with storage area, trash enclosure, emergency phone, sewage lift station, and force main leading to the sewer line at the JPL campus through JPL bridge (2.3.1.15.2).	New restroom at northern end of parking lot with 2 gender-neutral stalls and sewage lift station and sewer connection leading to the JPL sewer line across JPL bridge. *(Note: This is 1 urinal and 1 stall fewer than the restroom analyzed in the Master EIR.)*
Bridge Crossing	New bridge crossing for the North Perimeter Trail, vehicles, and utilities.	Northern Bridge Crossing across Arroyo Seco that is 12 feet wide and 150 feet long (2.3.1.16.3).	Not proposed, but the existing pedestrian access path across the JPL bridge will be maintained and will connect to the new parking lot.
Spreading Basins	Expand 4 existing basins.	Expand 4 existing basins into the JPL parking lot (2.3.1.4.5).	Expand 4 existing basins.
	Relocate 2 sludge ponds.	Relocate and expand 2 sludge basins (2.3.1.4.5).	Replace 2 sludge ponds with 2 new spreading basins.
	Build 2 new basins.	Build 2 new basins (2.3.1.4.5).	Construct 2 sedimentation basins and 2 spreading basins. *(Note: This is 2 basins more than analyzed in the Master EIR. While the basins would be located in the same area, the area would have a different basin configuration.)*
		Convert 2 basins into a lake (2.3.1.4.5 and 2.3.1.13).	Not proposed.

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)	Arroyo Seco Canyon Project
Trails	New trail that runs from the north end of the JPL parking lot to the Gabrielino Trail.	4 trail connections from East Rim Trail to Perimeter Trail, including a new trail at the north end of the parking lot (2.3.1.16.5).	Potential future pedestrian pathway from the north end of the parking lot through the slope area to Gabrielino Trail
	Extend East Rim Trail from Arroyo Well to VOC Water Treatment Plant and from Arroyo Well to both the Altadena Crest Trail and the Gabrielino Trail (along back of JPL parking lot).	East Rim Trail is approximately 2,600 linear feet of new trail that runs from the VOC Water Treatment Plant through Johnson Field to the Arroyo Well before ending at the Altacrest Trail on backside of the existing parking lot (2.3.1.16.4).	Pedestrian pathway/trail along the eastern edge of the parking lot, with a potential future extension north to join the Gabrielino Trail north of Area 3.
	Relocate existing trail to the maintenance road.	Relocate the existing trail to the maintenance road (2.3.1.18.2).	Proposed maintenance roads around new spreading basins will be open for public use.
Trailhead	Gabrielino Trailhead area with a new restroom, picnic tables, public parking, and interpretive signage.	Interpretive and picnic area at the intersection of the Arroyo Well and Johnson Field Road, with parking spaces (2.3.1.12.7).	Restroom, pet waste station, and signage proposed at the Gabrielino Trailhead area.
Habitat restoration	Realign stream corridor and restore habitat on banks west of the parking lot and basins.	Move, expand, and restore the stream corridor by the Altadena drain (2.3.1.18.1.1).	No improvements are proposed on the banks west of the parking lot.
	Establish habitat at spreading basins.	Habitat establishment at spreading basins (2.3.1.18.1.3).	Not proposed.
	Establish habitat at the East Entrance.	Habitat establishment at the East Entrance and at Sunset Overlook (2.3.1.18.1.5).	Not proposed.
Pipeline Relocation and Demolition	None specified.	None specified.	Replace and realign Hume line from the north end of parking lot to the spreading basins.
			Relocate the JPL water line to the new access road.
			Demolish a portion of the influent and effluent line from the Behner Water Treatment Plant
			Relocate the 12-inch diameter Arroyo Booster pipeline to the new access road.
			Remove sludge lines.

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	Final Master EIR for Arroyo Seco Master Plan (Master EIR section)	Arroyo Seco Canyon Project
Storm Drain Improvements	Shorten the Altadena storm drain and armor embankment to reduce erosion and restore habitat.	Shorten the Altadena drain and restore the stream corridor (2.3.1.4.6).	Not proposed.
	Extend the Altacrest storm drain as an underground pipe into the stream with inlets from the access road and the parking lot.	Extend the Altacrest drain as an underground drain between basins and that empties into the stream, with inlets to receive runoff from the parking lot (2.3.1.4.7).	Altacrest drain extension is not proposed
			County Storm Drain remains in place.
Overlook	Construct Sunset Overlook with interpretive signage and park amenities north of the East entrance.	Construct Sunset Overlook with picnic tables, seating, signage, and parking near east park entrance (2.3.1.14).	Not proposed.
Park Entrance	Relocate and improve the park entrance at Windsor/Explorer/Ventura intersection to Windsor/Mountain View.	Relocate the park entrance to Windsor/Mountain View, add a retaining wall, and restore habitat (2.3.1.3.1).	Not proposed.
	Relocate the parking area south of the entrance to the JPL parking lot	Relocate the parking area to the northern end of the JPL parking lot (2.3.1.3.1).	Not proposed.
		Reconstruct Windsor/Ventura intersection; add an interpretive area and a parking area (2.3.1.3.3)	Not proposed.
Access Road	Realign to the east side of the basins.	Realign along eastern edge of the parking lot (2.3.1.3.2).	Realign along eastern side of the basins and south and west of the new parking lot.
	Widen the road to Johnson Field.	Widen the Johnson Field Road to 2 lanes (2.3.1.3.3).	Not proposed.
Pump-Back system	Inlet at dam; pipe at the bottom eastern slope; and outlet at the highest east side basin and across the new bridge to the west side basins	Inlet, pump, and pipes to basins and lakes (2.3.1.4.2).	Not proposed.
Water line	Water line connections to new restrooms, campsite sinks, drinking fountains, and buildings.	None specified.	Connect the restroom and parking lot irrigation system to a metered service from the relocated JPL water main.

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)	Arroyo Seco Canyon Project
Overhead power and communication lines	Relocate to the North Bridge crossing or within the utility easement.	Relocate power and communication lines.	Not proposed.
	Power connections to new restrooms and pump-back system.	None specified.	Connect the restroom, irrigation controls, and basin metering structure to a new service drop using an existing overhead line in Area 3 (where the biggest load will come from the lift station).
	Underground PWP overhead distribution lines from the VOC Water Treatment Plant to Arroyo Well and from the VOC Water Treatment Plant to Johnson Field.	Underground 3,000 feet of power and communication lines from the VOC Water Treatment Plant to Arroyo Well and from the VOC Water Treatment Plant to Johnson Field (2.3.1.19.1).	Not proposed.
	Relocate SCE lines running from the JPL substation to the Windsor/Ventura intersection.	Realign the SCE power line across the basins to the North Bridge, Gabrielino Trail, Ventura Street, and ultimately to the existing line on Altadena Drive (2.3.1.19.2).	Not proposed.
Septic Tanks and Sewer lines	Abandon all septic tanks and construct a sewer collection system.	Connect a new restroom near Johnson Field to the sewer line on Lehigh Street (2.3.1.12.3) and connect a new restroom at the JPL parking lot to the sewer line in JPL campus (2.3.1.15.2).	Connect a restroom to sewer line in JPL campus.
Security gates	Add security gates at all vehicular entries and at the tunnel from the dam parking lot.	Add gates and fencing at the East Entrance and along west side of Windsor Avenue (2.3.1.20).	Not proposed.
		Add fencing at end of Altadena Drive (2.3.1.20).	Not proposed.
			Add security gates at the north end of the parking lot, with a roundabout and a guard house

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)	Arroyo Seco Canyon Project
Lighting	Add lighting on built structures and at major park entrances only.	Add safety lights at the new parking lots and at the new restrooms (3.1.4.1.1).	Add restroom interior and exterior lighting.
Public telephones	Add near improved restrooms and recreation amenities.	Add at the new restroom at north end of the public parking lot (2.3.1.15.2).	Not proposed.

JPL: Jet Propulsion Laboratory; VOC: volatile organic compounds; PWP: City of Pasadena Water and Power; SCE: Southern California Edison.

* Based on the Final Master EIR that includes Draft Master EIR and Clarifications and Revisions to Draft Master EIR (Section 12.0 of the Final Master EIR).

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As shown, the Project would implement some of the improvements proposed by the HWMP and analyzed in the Final Master EIR for the Arroyo Seco Master Plan. However, the Project proposes a recreational parking lot and a restroom that are smaller than those analyzed in the Final Master EIR. There is also a variation to the spreading basin configuration within the same location and area. Other proposed improvements in Area 3 (e.g., proposed trails, walkway, hume line relocation, JPL water line relocation, utility line demolition in the proposed basin area, water line connection, security gates, roundabout, and guard station at north end of parking lot) are not discussed in the HWMP or the Final Master EIR. At the same time, the Project does not preclude the future implementation of other improvements in Area 3 (e.g., storm drain improvements, trail relocation, pumpback system, and utility line relocations) as contained in the HWMP or analyzed by the Final Master EIR but not proposed by the Project. Accordingly, this IS/MND is a stand-alone document and does not tier off of the Master EIR.

3.2 PROJECT DEMOLITION AND CONSTRUCTION

Construction of the permanent Project improvements is anticipated to take approximately 16 months, starting in Summer 2015 with construction of the temporary bridges beginning one month before the start of construction activities in Areas 1 and 2. Designated staging areas will be fenced to prevent safety hazards, as well as deter to vandalism and theft. Project completion is expected by Fall 2016, with temporary bridge demolition occurring at the end of construction activities in Areas 1 and 2. Planned construction activities are broken out by Area below.

During grading activities in Area 3, a total of approximately 23,000 cy of cut materials is anticipated. In the interest of minimizing export from the Project site, the City may implement a mechanical shaker to sort and sift through excavated soils. The shaker would separate finer soils from larger rocks, thereby allowing for the beneficial reuse of the excavated soils as engineered fill materials during the construction of the spreading basins. The shaker would be in operation for 8-hour days over the last 2 months of grading activities. If the City utilizes the shaker option, approximately 23,000 cy of cut materials would be processed through the shaker, resulting in approximately 21,000 cy of material for fill (to be used on-site) and approximately 2,000 cy of larger rock materials. These 2,000 cy of rock materials may be used on-site for decorative/landscaping purposes throughout the Project study area, or may be exported off-site. For the sake of providing a conservative analysis, both the Air Quality, Noise and Traffic sections of the IS/MND assume export of these materials.

Table 3.2-1, Construction Activity Assumptions, summarizes the anticipated construction activities for each area.

TABLE 3.2-1
CONSTRUCTION ACTIVITY ASSUMPTIONS

	Area 1	Area 2	Area 3
Temporary Bridge Construction[a]			
Start	Summer 2015	Summer 2015	N/A
Length of activity	4 weeks	4 weeks	N/A
Equipment in use[b]	1 crane, 1 welder, 1 forklift	1 crane, 1 welder, 1 forklift	
Number of truckloads	10 truckloads	10 truckloads	N/A
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	N/A

TABLE 3.2-1
CONSTRUCTION ACTIVITY ASSUMPTIONS

	Area 1	Area 2	Area 3
Site Preparation – Clearing and Grubbing			
Start	Summer 2015	Summer 2015	Summer 2015
Length of activity	3 weeks	2 weeks	1 month
Equipment in use[b]	1 dozer, 2 dump trucks	1 dump truck	1 dozer, 1 excavator, 2 dump trucks
Amount of export	80 cy of debris	80 cy of debris	2,400 cy of debris
Number of truckloads for export	10 truckloads (16 cy truck- half loads)	10 truckloads (16 cy truck- half loads)	150 truckloads (16 cy trucks)
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	Scholl Canyon Landfill
Demolition			
Start	Fall 2015	Fall 2015	Fall 2015
Structures to be demolished	Headworks structure (1,800 sf)	Portions of diversion and weir structures and the retaining wall (500 sf)	Maintenance shed (100 sf), concrete vaults, head gates (300 sf), and paving on temporary access road (a portion of the 7 ac. Parking lot)
Length of activity	1 month	1 month	2 weeks
Equipment in use[b]	2 saws, 1 excavator with hammer, 2 dump trucks	2 saws, 1 excavator with hammer, 2 dump trucks	2 saws, 1 excavator with hammer, 2 dump trucks
Cubic Yards of Export	64 cy Demo wastes	16 cy of Demo wastes	4,000 cy of Demo wastes
Number of truckloads for export	8 truckloads (16 cy truck- half loads)	2 truckloads (16 cy truck- half loads)	250 truckloads (16 cy trucks)
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	Scholl Canyon Landfill
Grading			
Start	Fall 2015	Fall 2015	Fall 2015
Length of activity	4 months	1 month	5 months
Area to be graded	8 ac	9,000 sf	20 ac
Cut and fill	0	180 cy cut (road base)	23,000 cy cut and 21,000 cy fill (net cut of 2,000 cy)
Equipment in use[b]	1 excavator, 1 dump truck	1 excavator, 1 dump truck	2 excavators, 2 front-end loaders, 2 dump trucks For 2 months: 1 shaker and 1 front-end loader
Amount of export	0	180 cy	2,000 cy (rocks)
Number of truckloads[c]	0	36 truckloads (10 cy trucks half-load)	210 truckloads (10 cy trucks)
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	Scholl Canyon Landfill
Length of hauling	0	3 days	4 weeks
Underground Infrastructure/Utilities			
Start	N/A	Winter 2015	Fall 2015
Length of activity	N/A	3 months	4 months
Equipment in use[b]	N/A	1 excavator, 1 concrete truck, 1 concrete pumper truck, 1 crane	1 excavator, 2 dump trucks, 1 plate compactor

TABLE 3.2-1
CONSTRUCTION ACTIVITY ASSUMPTIONS

	Area 1	Area 2	Area 3
Paving			
Start	N/A	Spring 2016	Spring 2016
Length of activity	N/A	1 month	2 months
Pavement	N/A	asphalt	asphalt and DG
Area to be paved	N/A	5,000 sf	67,000 sf asphalt and 72,000 sf DG
Equipment in use[b]	N/A	1 vibratory roller, 1 paver, 1 grader, 1 belly dump, 1 dump truck	1 vibratory roller, 1 curb builder, 1 paver, 1 grader, 1 road striping machine, 1 belly dump, 1 dump truck
Building Construction			
Start	N/A	Summer 2016	Summer 2016
Length of activity	N/A	1 month	3 months
Equipment in use[b]	N/A	1 crane, 1 concrete truck	1 crane, 1 concrete truck, 1 concrete pumper truck
Architectural Coatings			
Length of activity	N/A	1 day interior	5 days interior
Temporary Bridge Demolition[a]	Fall 2016	Fall 2016	N/A
Start	Fall 2016	Fall 2016	N/A
Length of activity	4 weeks	4 weeks	N/A
Equipment in use[b]	1 crane, 1 welder, 1 forklift	1 crane, 1 welder, 1 forklift	
Number of truckloads	10 truckloads	10 truckloads	N/A
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	N/A

sf: square feet; ac: acres; cy: cubic yards; N/A: not applicable.

[a] Assumes 2 temporary bridges will be built, with a temporary bridge over Bridge No. 1 and another temporary bridge over Bridge No. 3.

[b] In addition to the listed equipment, the following equipment would be shared among any 1 of the 3 work areas: medium-duty trucks (<10), all-terrain forklift (1), front-end loader (1), water truck, portable generator, and hand tools (e.g., grinders, drills, compressors).

[c] In order to provide a conservative assessment to account for the unknown variation in the amount of soil that could be re-used onsite for engineered fill versus exported off-site, the number of truck trips was increased by assuming the use of 10 cy trucks instead of the standard 16 cy trucks.

Source: Carollo 2013.

Trucks hauling soils and debris to Scholl Canyon Landfill are expected to come to the site from I-210 at the Windsor Avenue off-ramp and head north on Windsor Avenue to Explorer Road into Area 3. From Area 3, trucks would turn southeast and north to the access road (North Arroyo Boulevard) to reach Areas 1 and 2. From these areas, the trucks would head south and pass through Area 3, Explorer Road, Windsor Avenue, and onto the westbound on-ramp on I-210. From I-210, trucks would head west on SR-134; exit at the Figueroa Street/Scholl Canyon Road off-ramp; head north-northeast toward the landfill. Trucks would come back from the landfill entering the eastbound on-ramp on the SR-134 at Figueroa Street and head east; trucks would then go west on I-210 to Windsor Avenue to Explorer Road and, ultimately, to the site.

EXHIBIT B

Agenda Report

June 19, 2017

TO: Honorable Mayor and City Council

FROM: Water and Power Department

SUBJECT: **AUTHORIZE THE CITY MANAGER TO AMEND CONTRACT NO. 30723 WITH TOBY B. HAYWARD, INC. TO FURNISH LABOR AND MATERIALS FOR CONSTRUCTION OF TEMPORARY BRIDGES AT ARROYO SECO CANYON**

RECOMMENDATION:

It is recommended that the City Council:

1. Acknowledge that a lawsuit was filed against the City seeking to invalidate the City's approval of the Initial Study Mitigated Negative Declaration ("IS/MND") for the underlying Arroyo Seco Canyon Project, the court issued a decision in March 2017 partially against the City, the City is currently awaiting the terms of a final judgment which may allow the work proposed herein to move forward, and such work will only move forward if in compliance with the judgment; and

2. Authorize the City Manager to amend Contract No. 30,723 with Toby B. Hayward, Inc. to extend the contract duration by an additional one year with an option for three additional one-year terms subject to the approval of the City Manager, and increase the contract not-to-exceed amount from $440,000 to $470,000 to provide labor and materials for the construction of the temporary bridges at Arroyo Seco Canyon.

3. To the extent this could be considered a separate procurement subject to the Competitive Selection process, grant the contract an exemption pursuant to Pasadena Municipal Code (PMC) Section 4.08.049(B), contracts for which the City's best interests are served.

BACKGROUND:

The Water and Power Department ("PWP") is proposing to repair and replace facilities within the Arroyo Seco Canyon area that were damaged by events related to the 2009 Station Fire. Through enhancements located in three areas of the Arroyo Seco, the project will also allow for the increased utilization of existing surface water rights held by the City, improve water quality in the canyon, improve biological habitats, restore hydrological

function, and improve ecosystem health. The proposed improvements are collectively referred to as the Arroyo Seco Canyon Project ("ASCP") and are scheduled for construction in 2017.

Two existing bridges in the Arroyo Seco Canyon do not have the capacity to support loads from construction equipment that will be needed for the ASCP. Specification WD-16-01 includes the construction of temporary structures that will allow transport of heavy equipment and materials over two existing bridges and provide protection to the railing of a third bridge in advance of the planned ASCP construction.

On September 12, 2016, City Council authorized the contract with Toby B. Hayward, Inc. to furnish labor and materials for construction of temporary bridges at Arroyo Seco Canyon based on competitive bid results. The contract was signed on November 21, 2016 for an amount not to exceed $440,000. Since the date of contract execution, Toby B. Hayward Inc. completed the construction of the first temporary bridge, and began procuring materials and fabrication for the construction of the second temporary bridge.

On July 2, 2015, two petitioners jointly filed a lawsuit against the City seeking to invalidate the City's approval of the California Environmental Quality Act ("CEQA") IS/MND. On March 23, 2017, the court issued a ruling that was unfavorable to the City; PWP instructed Toby B. Hayward Inc. to put the remaining construction of the second temporary bridge on hold, which otherwise would have been completed in approximately 45 days. On May 2, 2017, the City issued a proposed writ of mandate. However, as of May 30, 2017 the court had not issued the terms of the judgment, which would state which components of the ASCP, including the temporary bridges, will be allowed for construction.

Contract 30,723 with Toby B. Hayward Inc. expires on June 30, 2017. Staff recommends that the City Council approve an initial one-year extension to June 30, 2018 with an option for three additional one-year terms, and increase the contract amount from $440,000 to $470,000. The increased amount will cover remobilization costs resulting from the hold placed on the project and the extension of its duration. The additional costs include lease of equipment and materials, storage of materials that have been fabricated or partially fabricated, but not yet installed, and labor expenses representing the short period when the work was placed on hold, but believed to resume before contract expiration.

Staff's recommendation to extend the contract by at least one year will allow for a thorough evaluation of the City's options, which include permanent repair and strengthening of the bridge or to proceed with the temporary bridge as the preferred alternative. If the final ruling allows the work to move forward, and the evaluation of options leads to the conclusion that a continuation of the current contract remains in the best interest of the City, then the extension will also provide sufficient time to complete the second temporary bridge. Depending on the outcome of the final judgment, PWP may opt not proceed with the work, in which case staff will negotiate contract termination terms with the contractor. The optional one-year extensions may be needed depending on the timing of the final judgment and resulting additional delays to the work.

The contract amount includes a 15% contingency of $57,400 to accommodate any necessary change orders as a result of unforeseen conditions, including environmental mitigation and logistical challenges due to the location of the work in the Arroyo Seco. To date, $5,295 of this contingency has been committed. Not including contingency, the balance remaining on the contract for authorized work and retainage is $227,609.

COUNCIL POLICY CONSIDERATION:

The contract is consistent with the Public Facilities Element of the General Plan and supports the City Council's goal to improve, maintain and enhance public facilities infrastructure, and to implement capital improvements that will maintain and rehabilitate infrastructure.

ENVIRONMENTAL ANALYSIS:

In compliance with CEQA, an Initial Study ("IS") was prepared as documentation to support a Mitigated Negative Declaration ("MND") for the ASCP. The IS/MND was approved by the City's Hearing Officer at a public hearing on January 7, 2015. Subsequent appeals were filed challenging this decision, but ultimately City Council adopted the IS/MND after a public hearing on June 1, 2015. During the 30-day period set by filing the Notice of Determination, a lawsuit was filed against the City seeking to invalidate the City's approval of the IS/MND. The court issued a decision in March 2017, and the City is currently awaiting the terms of the judgment. The work provided for in this contract will only move forward in compliance with the terms of the judgment.

FISCAL IMPACT:

The cost of this action will be $309,720, which includes the balance of the contract amount of $227,609, plus remaining contingency of $52,105, plus additional costs of $30,000. Funding for this action will be addressed by the utilization of existing appropriations in the Water System Capital Improvement Program Budget Number 1040 – Arroyo Spreading Basins & Intake Structures. It is anticipated that 100% of the cost will be spent during fiscal year 2018. In addition, it is anticipated there will be $50,000 in additional costs for contract administration, and inspection as a result of this action. The total fiscal impact will be $359,720.

The following table presents the fiscal impact summary:

Remaining Authorized Work	$227,609
Proposed Increase	$30,000
Remaining Contingency	$52,105
Total FY18 Contract Amount	**$309,720**
Contract Administration	$ 30,000
Inspection	$ 20,000
Total Fiscal Impact	**$359,720**

The ASCP, including the temporary bridge work, is partially funded by a Proposition 84 grant from the California Department of Water Resources. It is not known at this time what effect the outcome of the lawsuit will have on reimbursement of temporary bridge costs. There is no anticipated impact to other operational programs or capital projects as a result of this action.

Respectfully submitted,

Gurcharan S. Bawa
General Manager
Water and Power Department

Prepared by:

Michael Tse
Associate Engineer

Approved by:

STEVE MERMELL
City Manager

PROOF OF SERVICE

STATE OF CALIFORNIA, COUNTY OF LOS ANGELES

I, CLAIRE A. VORHIS, hereby declare and state:

I am employed in the County of Los Angeles; I am over the age of eighteen years and not a party to the within entitled action. My business address is 100 North Garfield Avenue, Suite N210, Pasadena, California. My mailing address is PO Box 7115, Pasadena, CA 91109-7215.

On June 20, 2017, I served the foregoing document described as:

DECLARATION OF GARY TAKARA IN SUPPORT OF CITY OF PASADENA'S [PROPOSED] JUDGMENT

on the interested parties by placing a true copy thereof enclosed in a sealed envelope addressed as follows:

SEE ATTACHED SERVICE LIST

[ ] BY FACSIMILE: Based on an agreement of the parties to accept service by fax transmission, I faxed the documents to the persons at the fax number. No error was reported by the fax machine that I used. A copy of the record of the fax transmission, which I printed out is attached..

[ ] BY MAIL:

[ ] As follows: I am "readily familiar" with the City's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage thereon fully prepaid at Pasadena, California, in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

[ ] I deposited such envelope in the mail at Pasadena, California. The envelope was mailed with postage fully prepaid.

[ ] BY PERSONAL SERVICE:

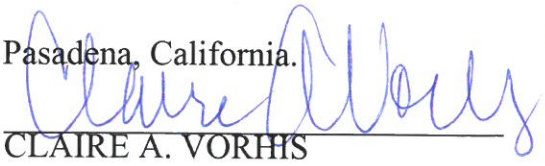
[ ] I delivered such envelope by hand to the offices of the addressee pursuant to CCP § 1011.

[X] BY EMAIL OR ELECTRONIC TRANSMISSION:

[X] Based on an agreement of the parties to accept service by e-mail or electronic transmission (with a courtesy hard copy should any document exceed 30 pages), I caused the documents to be sent to the persons at the e-mail addresses listed above. I did not receive, within a reasonable time after the transmission, any electronic message or other indication that the transmission was unsuccessful.

I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

EXECUTED on June 20, 2017, at Pasadena, California.



CLAIRE A. VORHIS

ATTORNEYS' SERVICE LIST

SPIRIT OF THE SAGE COUNCIL, a California Public Benefit Corporation; PROJECT SOLITON, a California Public Benefit Corporation, Petitioners v. CITY OF PASADENA, a public entity; CITY OF PASADENA WATER AND POWER; and DOES 1 through 25, inclusive, Respondents.

City Attorney File No. 7534
Case No. BS 156207

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and -

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302 Washington Street, Suite 404
San Diego, CA 92103
bryanpease@gmail.com

COPY

SUPERIOR COURT OF CALIFORNIA, COUNTY OF LOS ANGELES

DATE: 03/20/17			DEPT. 15
HONORABLE RICHARD FRUIN	JUDGE	E. GARCIA	DEPUTY CLERK
HONORABLE	JUDGE PRO TEM		ELECTRONIC RECORDING MONITOR
G. MACK, C.A.	Deputy Sheriff	NONE	Reporter

BS156207

Plaintiff Counsel

SPIRIT OF THE SAGE COUNCIL ET A
VS
CITY OF PASADENA ET AL

NO APPEARANCES

Defendant Counsel

CEQA
170.6 O'DONNELL - RESPONDENT

NATURE OF PROCEEDINGS:

RULING ON SUBMITTED MATTER;

The Court having taken the matter under submission on 1/18/17, now issues the following document:

STATEMENT OF DECISION ON PETITION FOR WRIT OF MANDATE;

Said document is served on both sides via U.S. Mail this date.

Notice by Clerk.

CLERK'S CERTIFICATE OF MAILING

I, the below-named Executive Officer/Clerk of the above-entitled court, do hereby certify that I am not a party to the cause herein, and that on this date I served the minute order dated 3/20/17, upon each party or counsel named below by placing the document for collection and mailing so as to cause it to be deposited in the United States mail at the courthouse in Los Angeles, California, one copy of the original filed/entered herein in a separate sealed envelope to each address as shown below with the postage thereon fully prepaid, in accordance with standard court practices.

MINUTES ENTERED
03/20/17
COUNTY CLERK

SUPERIOR COURT OF CALIFORNIA, COUNTY OF LOS ANGELES

DATE: 03/20/17			DEPT. 15
HONORABLE RICHARD FRUIN	JUDGE	E. GARCIA	DEPUTY CLERK
HONORABLE	JUDGE PRO TEM		ELECTRONIC RECORDING MONITOR
G. MACK, C.A.	Deputy Sheriff	NONE	Reporter

BS156207

SPIRIT OF THE SAGE COUNCIL ET A
VS
CITY OF PASADENA ET AL

CEQA
170.6 O'DONNELL - RESPONDENT

Plaintiff Counsel: NO APPEARANCES

Defendant Counsel:

NATURE OF PROCEEDINGS:

Dated: 3/20/17

Sherri R. Carter, Executive Officer/Clerk

By: _____
E. GARCIA, DEPUTY CLERK

TODD T. CARDIFF
LAW OFFICE OF TODD T. CARDIFF
1901 FIRST AVE., SUITE 219
SAN DIEGO, CA 92101

THERESA E. FUENTES
PASADENA CITY ATTORNEY'S OFFICE
100 N. GARFIELD AVE., ROOM N210
PASADENA, CA 91109

MINUTES ENTERED
03/20/17
COUNTY CLERK

CONFORMED COPY
ORIGINAL FILED
Superior Court of California
County of Los Angeles

MAR 20 2017

Sherri R. Carter, Executive Officer/Clerk
By E. Garcia, Deputy

STATEMENT OF DECISION ON PETITION FOR WRIT OF MANDATE

SPIRIT OF THE SAGE COUNCIL, PROJECT SOLITON v. CITY OF PASADENA, CITY OF PASADENA WATER AND POWER, Case No. BS 156207

Petitioners Spirit of Sage Council and Project Soliton ("petitioners") seek a writ of mandate to compel respondents City of Pasadena and the City of Pasadena Water and Power ("City") to set aside the June 1, 2015 approval of the Arroyo Seco Canyon Project (the "Project"). Petitioners allege the City approved the Project in violation of the California Environmental Quality Act ("CEQA"), Public Resources Code section 21000 et seq. because, petitioners argue, the City was required to prepare an environmental impact report ("EIR") for the Project. The City approved the Project with a mitigated negative declaration ("MND"), finding that the environmental impacts caused by the Project would be mitigated to a less than significant level by mitigation measures.

THE PROJECT IN AREA 2 WILL DIVERT WATER FROM THE ARROYO SECO:

Arroyo Seco Canyon channels a stream known as the Arroyo Seco. The Arroyo Seco carries rainwater runoff from the San Gabriel Mountains, north of Pasadena, to a reservoir created by Devil's Gate Dam, above the Rose Bowl. The City has legally adjudicated water rights permitting it to take water from the Arroyo Seco for City use.[1] The City diverts the water it takes from the Arroyo Seco through a pipeline to spreading basins that are located about 3,000 feet to the southeast, next to the JPL east parking lot. Water in the spreading ponds percolates into an aquifer (the Raymond Basin Aquifer) from which Pasadena draws well water. The recharging of the aquifer increases the safe yield that can be obtained from the aquifer, allowing Pasadena's municipally owned water system to obtain a greater share of its potable water from the local wells rather than by purchasing more expensive water from the Metropolitan Water District.

The City maintains a low dam (3 ft., 6 inches in height) across the Arroyo Seco to divert water into the pipeline for carriage to the spreading grounds. The proposed Project will install a weir that can be operated to raise the dam height

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[1] The City is authorized to take 18,096 acre feet of water per year from the Arroyo Seco, but the City's historical average diversion has been 2,532 acre feet per year.

and will upgrade the diversion intake so as to allow the City to take more water. The proposed Project will also expand the capacity of the spreading basins. These improvements are expected to increase the diversion from a current average of 2,532 acre feet/year by an additional 1,100 acre feet/year. (AR184.)

A major purpose of the Project is to repair and improve the City's water diversion facilities to "allow [for] the increased utilization of the surface water rights held by the City." (Quoted from the public hearing Notices, AR 8113, 8046, and 7966.)

The Arroyo Seco exits from the Canyon about a half mile below the diversion site, crosses alluvial soils for about another half mile and then is captured in the reservoir behind the Devil's Gate Dam. (AR 172.)

The Project proposes improvements in three geographical areas: in Area 1, at the Arroyo Seco headwaters; in Area 2, at the Arroyo Seco diversion intake; and in Area 3, at the spreading basins, as well as a temporary staging site. (AR 103.) The Project will also construct park amenities along the banks of the Arroyo Seco. The Project is not challenged as to the park amenities nor as to the improvements in Area 1.

Petitioners' principal challenge to the Project relates to Area 2. Petitioners challenge the Project because the improvements proposed at the dam site are intended to and will result in a greater water diversion from the Arroyo Seco. The diversion will reduce water availability downstream from Area 2 and will, as the City concedes, have significant impacts on the downstream biological communities.

SUMMARY OF COURT'S CONCLUSIONS:

CEQA requires the City to prepare an Initial Study to identify "potentially significant effects on the environment." Based on the Initial Study "[i]f there is substantial evidence, in light of the whole record ..., that the project may have a significant effect on the environment, an environmental impact report shall be prepared." However, a negative declaration is to be prepared if either: (1) there is no substantial evidence that the project will have a significant impact on the environment, or (2) the potentially significant environmental effects can be avoided or mitigated to a point "where clearly no significant effect on the environment would occur through mitigation measures agreed to by the applicant." Public Resources Code section 21080, subds. (c), (d) and (e).

Petitioners preliminarily argue that the notices for the public hearings did not "substantially comply" with Public Resources Code section 21092, subd. (b)(1) in requiring that the public notice shall contain "a brief description of the

proposed project and its location, the significant effects on the environment, if any, ..." The Court decides this issue in the City's favor.

Petitioners' main contention is that CEQA requires that the City prepare an EIR to evaluate the water diversion impacts caused by the improved dam/weir and enhanced ponding capacity. The court agrees that a "fair argument" is made that the reduced water flow caused by the improved diversion facility may have a significant and unmitigated effect on the environment. The Project, because it significantly reduces the water available to biological resources in the Arroyo Seco, requires the preparation of an EIR. Public Resources section 21151(a); Guidelines 15064(a)(1).

Petitioners argue that the mitigation measures required for the MND impermissibly defer the setting of mitigation standards to future actions and, therefore, are inadequate. The Court decides this issue in petitioners' favor.

ISSUE 1: CITY'S NOTICES OF PUBLIC HEARINGS SUBSTANTIALLY COMPLY:

Petitioners argue that the City's public notices for the Project hearings violated CEQA because they "omitted the construction of the Diversion Dam." Pet. Br. 7: 12-13. They further argue that the City's notices did not substantially comply "when it failed to inform the public the project would raise the height of the dam and increase diversions, potentially resulting in the downstream impacts to habitat and wildlife." Reply 2: 14-15. The Court rejects these contentions because the City's public notices substantially complied with the notice content required by CEQA.

A. The Substantial Compliance Standard.

CEQA specifies the content required for notices of public hearings for projects requiring CEQA compliance. Public Resources section 21092 provides:

> "(a) A lead agency that is preparing an environmental impact report or a negative declaration ... shall provide public notice of that fact ... prior to the certification of the... adoption of the negative declaration ....
>
> "(b) (1) The notice ... include the date, time, and place of any public meetings or hearings on the proposed project, **a brief description of the proposed project and its location, the significant effects on the environment, if any, anticipated as a result of the project** ....
>
> "(2) This section shall not be construed in any manner that results in the invalidation of an action because of the alleged inadequacy of the notice content **if there has been substantial compliance with the notice content requirements of this section**." [bolding added.]

The City's Notices challenged by the petitioners are the Notice of Public Hearing (before a hearing officer) on November 19, 2014 (AR 8113); the Notice of Public Hearing before the Board of Zoning Appeals on March 4, 2015 (AR 8046); and the Notice of Public Hearing before the City Council on June 1, 2015 (AR 7966). These three Notices use the same language to describe the physical Project, saying:

> "The applicant ... submitted a Conditional Use Permit application to allow the repair and replacement of facilities within the Arroyo Seco Canyon Area that were damaged or destroyed by Station Fire-related events of 2009. The improvements will also allow the increased utilization of surface water rights held by the City, and will improve water quality in the canyon; improve biological habitats ... through the following enhancements: [ ] 1) Naturalize the Arroyo Seco streambed; 2) Remove exposed portions of existing infrastructure designed for sediment removal; 3) Restore and improve intake facilities; 4) Expand recharge operations by creating additional spreading basins...."

The three Notices also refer readers who want more information to the City's website to view the Project documents. The City mailed the Notices to more than 90 organizations and to about 450 individuals and also posted the Notices in and around the Project sites. (SAR 22, 30-50.)

The Notices provided a sufficient description that the project would include water diversion from the Arroyo Seco and would repair existing structures in the stream bed for that purpose. The Project, the Notices said, would "Restore and improve the intake facilities" and "Expand recharge operations by creating additional spreading basins" so as to increase the City "utilization of surface water rights."

The Notices that were mailed to Pasadena organizations and residents, moreover, state: "The improvements will also allow the increased utilization of surface water rights held by the City" and to do that the Project would "restore and improve intake facilities." Pasadena readers can be assumed to have been aware of structures in the Arroyo Seco stream bed that were used in conjunction with the City's water system. It was not necessary that the Notices advise that the Project would include what petitioners refer to as "the construction of a Diversion Dam" because the diversion dam already existed. The Project will add a weir to the dam and, thus, heighten the barrier.

Petitioners correctly state that the repaired dam plus the new weir when raised will increase the height of the diversion structure by three feet, to approximately 5 feet, 10 inches above the stream bed. (SAR 147.) Petitioners appear to argue that this fact should have been included in the information

provided in the Notices. See, Reply 4:14. There is no evidence that the diversion structure will be significantly more visible, however. The record indicates that the dam and proposed weir are at the bottom of a narrow, steep-sided canyon and will be attached to an existing 9 foot high retaining wall. (AR 105, 80 and 8666.) The Initial study finds: "The Project will not lead to major permanent changes in the visual quality of the Arroyo Seco Canyon." AR (293.) The height of the weir at the bottom of the Canyon is a detail that was not required to mentioned specifically in the public Notices.

The Court concludes that petitioners do not establish that the public Notices violate Public Resources Code section 21092 (b)(1).

B. Exhaustion of Administrative Remedies Defense.

The City also raised the exhaustion of administrative remedies defense. Ans.,1st Aff. Defense; Opp. p. 9. "No action or proceeding may be brought ... unless the alleged grounds for noncompliance with this division were presented to the public agency orally or in writing during the public comment period ... or prior to the close of the public hearing on the project before the issuance of the notice of determination." Pub. Resources Code section 21177(a). The exhaustion of administrative remedies is jurisdictional. *Sierra Club v. City of Orange* (2008) 163 Cal.App.4th 523, 535.

The issue raised by petitioners—the asserted inadequacy of the public notices to state the height and purposes of the weir that was to be added to the existing dam—was not preserved for trial. No objection on this basis was made before the Project was approved. The California Department of Fish and Wildlife in a letter suggested that the description be clarified (SAR 128), but its recommendation does not establish that the Notices lacked the "substantial compliance" required by statute. Petitioner Spirit of the Sage Council complained about the project description but that concerned a different issue, namely the removal of native sage at the spreading basins. (AR 4132.) The issue of the height or the purposes of the dam and weir structure not having been raised, the issue was not preserved for this proceeding. "The petitioner bears the burden of demonstrating that the issues raised in the judicial proceeding were first raised at the administrative level." *Ibid.* at 536.

ISSUE 2: THE PROJECT DESCRIPTION IN THE MND IS NOT INADEQUATE:

Petitioners similarly argue that the MND violates CEQA because it fails to the highlight the height of the dam plus the weir (when raised) will be three feet higher than the existing dam. See, Reply 4:14, citing AR 124. This argument is not persuasive. The entire thrust of petitioners' argument is that because the weir will add to the height of the dam more water can be captured and diverted

by the Project. That the Project will capture more water because of the added weir is thoroughly discussed under other headings by the MND.

The Court also agrees with the City's argument that the issue has not been administratively adjudicated because it was not raised in the administrative record. Opp. p. 9. Petitioners in their reply refer to various statements that they argue could have alerted the City to revise its description in the MND/IS. Reply p. 4. The purpose of raising the issue during the review period is to notify the City of something that an objector thinks is important. *Sierra Club v. City of Orange*, 163 Cal.App.4th, *supra*, at 535 ("The exact issue must have been presented to the administrative agency ....") Petitioners failed to do this, and thus waived the argument.

BIOLOGCIAL RESOURCES WILL BE IMPACTED BY REDUCED STREAM WATER:

The City in its Initial Study made findings that the Project would have "potentially significant effects on the environment" in the stream bed below Area 2.

> "Project objectives include restoring the diversion capacity to its pre storm-drainage level, as well as increasing diversions to capture an additional 1,100 acre-feet annually. As a result, Project flows downstream from the diversion point in Area 2 will be reduced to some degree relative to both current and historic conditions." (AR 183.)

The Initial Study indicates the effect of the reduced water flow below Area 2 will continue until the Arroyo reaches "the riparian woodland of the [Devil Gate] reservoir [where] the species richness and population size is expected to increase substantially." (AR 183.) The Initial Study states that the stream bed leaves the Canyon near the JPL site, thereafter flowing "across alluvial deposits with limited vegetation until reaching a large (0.25 mile by 0.40 mile) riparian woodland that occupies the occasionally flooded alluvial deposits behind Devil's Gate Dam." Id. The court concludes from this description that the section of the stream bed where vegetation and species are potentially affected by the reduced flows after the diversion point is limited to a linear distance of about one-half mile, e.g. the distance between Area 2, where the diversion occurs, to location where the stream bed exits the Canyon and enters a "sandy wash" with sparser vegetation is about 0.40 of a mile.

The biological resources downstream of Area 2 in the Canyon are described as "abundant" and "rich." The Arroyo Seco supports a variety of plants and many wildlife species. (AR 109-110.) The Initial Study states:

> "Plant and wildlife resources between the diversion point and the canyon mouth are expected to be very similar to those described for Areas 1 and

2. Due to the abundance of native vegetation, undeveloped lands, and riparian resources, the area is generally rich in native wildlife species diversity and abundance. A large portion of these species is likely to be dependent specifically on the stream and riparian habitat as a core resource. Exiting the canyon and crossing approximately 0.75 mile of mostly unvegetated sandy wash, plant and wildlife diversity is expected to drop off substantially as the area is suitable for fewer species and lower numbers of individuals." (AR 183.)

(About one quarter mile downstream from the diversion site, another, smaller stream known as Millard Creek joins the Arroyo Seco and contributes new water to the Arroyo Seco stream. (AR 105.) The Court did not find data in the administrative record as to the significance of the quantity of water that Millard Creek adds to the Arroyo Seco downstream from the diversion site.)

THE ARROYO SECO STREAM IS SUBJECT TO VARIABLE WATER FLOWS:

The quantity of water flowing through the Arroyo Seco depends solely on rainfall runoff from its catchment area. The rainfall, as typical in Southern California, is seasonal (concentrated in the winter months) and cyclical (highly variable year by year). The City for its Initial Study hired the preparation of a hydrology study (AR 6359 et seq.) and, earlier, a conceptual design report.

The record at AR 8613 provides a hydrology chart showing, for a 22 year period (1990-2011), the historic water volumes and diversion volumes for the Arroyo Seco. The City then, from this 22 years of data, prepared a bar chart titled "Average Year Stream Volume and Diversion Volume" that reports the average volume of water by month that is (a) received in the Arroyo Seco and (b) diverted for City use. (AR 763.)

As the bar chart demonstrates, the Arroyo Seco receives most of its rain runoff from winter storms in December, January, February and March. The City, in those months, diverts only about a quarter of the water flow. That is because the rain runoff from storm events in the winter months often carries heavy sediment, and the City deems such water as unsuitable for deposit in the spreading basins. (See, AR 8613, bottom.)

The Arroyo Seco receives little runoff water in the months of July, August, September, October and November. The City diverts little or no water in those months, according to the bar chart.

The greatest diversion from existing water flow caused by the Project improvement will occur in the months of April, May and June. According to the averages shown on the bar chart (again, AR 763), when the diversion facility is

completed and operating, it will permit the City to take for City use most of the Arroyo water flow in April and May and all of the water flow in June.

The data permits these conclusions based on 22-year averaging. At present the Arroyo Seco downstream from Area 2 receives no stream water flow because the City diverts the available water in the months of July, August, September, October and November. And, when the Project is complete and put into its planned operation to allow greater diversion, the Arroyo Seco below Area 2 will, additionally, receive no stream water in June and substantially less stream water in April and May. The City will then impound and divert all stream water reaching Area 2 during the months of June, July, August, September, October and November, depriving the downstream of any replenishment water in those months. (AR 7630.)

These conclusions, it should be cautioned, are based on rainfall runoff and diversion quantities that have been averaged from 22 years of data. There is significant variability in the underlying data. (See, AR 8613.) The average will not predict what will occur in any given year, and it is what occurs in particular years that will impose actual impacts on the downstream habitats. Species, and, to a lesser degree, plants, rely upon the moisture that is available when needed rather than on average moisture calculations that may be derived from multi-year data.

The plants and species in the Arroyo have experienced dry years in which water flow below the diversion site has been limited to the winter months with most of that flow occurring in the single month of February. And, with the increased diversion allowed by proposed Project, there will be no water flow past the diversion site except for February in those dry years. See bar chart titled "Average Dry Year Volume and Diversion Volume" showing water flow and diversion by month for the water years 1990, 2002, 2004 and 2007. (AR 759.)

ISSUE 3: BASELINE WATER AVAILABILITY IS PROPERLY BASED ON AVERAGE RAINFALL DATA:

The determination of the baseline water flow in the Arroyo Seco is critical to evaluating the degree to which an increase in the water diversion at the intake facility will produce impacts downstream from Area 2. The parties dispute the manner in which the baseline should be determined.

The City's MND used water data over a 22 year period to determine average water flows in the Arroyo Seco, as well as to determine water flow averages in "dry," "average" and "wet" years. Petitioners argue that the City improperly utilized historical water data to obtain water flow averages rather than using the actual flow from a single year (which petitioners claim will establish "existing conditions"). Pet. Br., Part D, pp. 12-13.

The Court finds that there is substantial evidence supporting the City's averaging methodology because the environmental impacts being measured are influenced by factors such as rainfall that vary significantly year to year. The environmental impacts downstream from Area 2 on biological resources will be determined initially from the rainfall in the catchment areas. The City describes the diversion amounts taken from the water flow as "highly variable through the years" and states that such variability is affected by "available stream flows, season of availability, recharge basin saturation, flow volume, water rights thresholds, and other [factors]." (AR 183-184.) As a result:

> "The effect of these reduced flows on biological communities downstream is difficult to measure. Reduced flows in general can cause shorter distances of available surface water; short duration of pooling; reduced extent of moist soils moving away from the stream bed and reduced stream velocities resulting in reduced sediment transport. These and other effects may impact species and vegetation communities depending on such resources and processes." (AR 184.)

As the downstream habitats of the biological resources are greatly affected by water availability, and that availability varies significantly year to year (AR 6369 et seq.), the best evidence of water availability is derived from multi-year records.

The California Department of Fish and Wildlife Services ("CDFW") recognizes the variability of water flow in the Arroyo Seco over time and for that reason recommended that the City obtain data over a multi-year period. The Service, in its letter to the City dated November 14, 2014, cautioned against relying on single site visits and recommended:

> "The Department recommends that Post-project riparian impact monitoring be conducted over a period of time that includes a wide range of expected precipitation cycles (drought, average and above average) during which the riparian vegetation response can be evaluated to represent a more accurate response to reduced flows from the Project." (SAR 121.)

This CDFW recommendation refers to the monitoring that is to occur after the Project is completed, but the CDFW letter nonetheless recognizes that Southern California rainfall is highly variable, and, therefore, requires consideration of physical conditions that are affected by the water available from such rainfall over a period of time.

The Guidelines recognize this issue through the insertion of the word "normally" when referring to obtaining data for baseline purposes. Guidelines section15125 provides that in the preparation of an EIR a description of the

physical environmental conditions must be prepared "as they exist at the time the notice of preparation is published." This direction, however, is qualified by the assumption that that baseline "will normally constitute the baseline physical conditions [to] determine whether an impact is significant." Here, because the water flows in Arroyo Seco are determined by rainfall, and annual rainfall varies significantly, the Guidelines allow that the baseline may be established over a suitable period of time to reflect the variable rainfall conditions. The Court concludes that the City has appropriately used a multi-year period to determine the water flow in the Arroyo Seco.

ISSUE 4: THE INCREASED WATER DIVERSION CAUSED BY THE PROJECT REQUIRES THE PREPARATION OF AN ENVIRONMENTAL IMPACT REPORT:

A. The Non-Deferential "Fair Argument" Standard Applies:

The preparation of an EIR is required when a project "may have a significant effect on the environment." Public Resources sections 21080(d) and 21151(a); Guidelines 15064(a)(1). Conversely, an agency may adopt a negative declaration only if there is no substantial evidence that the project "may have a significant effect on the environment." Public Resources section 21080(c)(1) and (2); Guidelines 15070(a).

The City concedes that the project will have a significant environmental impact because the proposed dam/intake facility will divert significantly more water than at present and, thus, will decrease the water availability downstream, particularly during the summer and fall months, causing impacts to biological resources. (AR 183-184.) The City argues that the preparation of an EIR is not required because with the implementation of specified mitigation measures the adverse environmental impact will be reduced to a level that is not significant. Opp., p. 17, citing AR 6365-6366, relying on Public Resources section 21080(c); Guidelines 15070(b).

This Court is to review the agency's decision to adopt a negative declaration using the "fair argument" test, under which the agency is to prepare an environmental impact report if substantial evidence supports a fair argument that the proposed project "may have a significant effect on the environment." If such evidence is found, it cannot be rebutted or overcome by substantial evidence to the contrary. *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359, 1399-1400.

Whether the agency's record contains substantial evidence that would support a fair argument that the project may have a significant effect on the environment is a question of law. See, *Consolidated Irrig. Dist. v. City of Selma* (2012) 204 Cal. App.4th 187, 207. Where there is a genuine dispute as to the sufficiency of mitigation measures approved in an MND, an EIR is required

because it is the function of an EIR, and not a negative declaration, to resolve conflicting claims as to the environmental effects of a project. *Pocket Protectors v. City of Sacramento* (2004) 124 Cal.App.4th 903, 935; see also, *Friends of "B" Street v. City of Hayward* (1980) 106 Cal.App.3d 998, 1002.

An agency that approves a project with a negative declaration or a mitigated negative declaration in the face of substantial evidence supporting a fair argument that the project may have a significant environmental effect abuses its discretion under the law, requiring the court to void the approval of the MND. *Gentry v. City of Murrieta*, 36 Cal.App.4th *supra* at 1412.

B. **There Are "Fair Arguments" that Reduced Water Flow Will Adversely Impact the Downstream Biological Communities:**

The City's Project will reduce water flows in the Arroyo Seco below Area 2. While it is agreed that diminished water flows will have impacts on the biological communities downstream of Area 2, the extent of those impacts and their significance to the biological communities are not explained in the administrative record. The significance of those impacts to the biological communities, therefore, is open to "fair arguments" that, if supported by substantial evidence, require the preparation of an EIR.

Petitioners argue that the effects on the downstream habitats from the Project will be significant. Pet. Br., pp.17-18. This argument is supported by substantial evidence. Arroyo Seco's habitat downstream from Area 2, like the upstream habitat, is abundant in native plants and wildlife. (AR 183.) "A large portion of these species is likely to be dependent specifically on the stream and riparian habitat as a core resource." (AR 183.) "The effect of these reduced flows on biological communities downstream is difficult to measure. ... These and other effects may impact species and vegetation communities dependent on such resources and effects." (AR 184.) The MND does not provide a baseline from which any adverse impacts on the biological communities caused by the reduction in water flows can be measured. Given the uncertainty of the Project's effect, the impact on biological resources including vegetation and wildlife species that may occur, must be considered potentially significant. (AR 184.)

The preservation of fish and wildlife, in all of its variety, is a CEQA goal. Public Resources section 21001(c). Petitioners argue that the Project may have significant impacts on special status species. Pet. Br., pp. 18-19. This argument is supported by substantial evidence. Adverse impacts are predictable due to reduced water flows for particular wildlife species that may be present in the Arroyo Seco. The MND states that habitat currently exists for southwestern pond turtle. (S120, S483.) Live trapping surveys are needed to confirm or deny the presence of pond turtles in the Arroyo Seco. (S120.) Loss of individual

southwestern pond turtles would be considered significant because of a recent decline in their range and populations. (S120.) Reduced stream flow can impact the habitat for southwestern pond turtles and other special species of concern. (S120.)

The MND identifies habitat and potential presence of two special status bird species: the Least Bell's Vireo and the Southwestern Willow Flycatcher. (AR 178, 182.) According to the federal and state resource agencies, the Least Bell Vireo has been observed nesting behind the dam and depends on riverine system for their habitat. (S96, S119.) Southwestern Willow Flycatcher is dependent on surface water to support insect life. (S96.) Water diversion can reduce both vegetation and aquatic habitat. (S96.)

Petitioners argue that the diversion of greater water flows will cause a further fragmentation of wildlife habitat. Pet. Br., pp. 20-21. The current dam is low and passable by wildlife. (AR 1934.) The proposed structure will be 5 ft., 10 inches on the upstream with a 12 foot drop on the downstream when the weir is up. (AR 124.) There may be a significant impact to fish and wildlife movement. The opinion of the U.S. Fish and Wildlife Service is that realistic pathways for fish and wildlife movement should be designed and included in the project. (S140.) The Project may create a physical divide of the Arroyo Seco at Area 2, with the upper reaches retaining their historic environmental habitat fostered by a natural water flow and the lower areas having an impacted habitat because of the greater diversion caused by the Project.

C. There Is No Substantial Evidence that the Mitigation Measures Will Reduce the Adverse Impacts to a Level Less than Significant:

The City proposed seven biological mitigation measures to mitigate the downstream impacts from the additional water diversions from the Project. These mitigation measures are found at AR 197-210. The City finding required for the MND states:

> "Given the uncertainty in the Project's level of effect, the impact on biological resources, including vegetation types and special status species potentially occurring, is considered potentially significant. Implementation of MM BIO-6, which requires monitoring the Arroyo Seco stream and associated riparian habitat from the intake structure (i.e. diversion point) downstream to Devil's Gate Dam and subsequent compensatory mitigation or corrective action to avoid or reduce any identified downstream impacts of the Project, would reduce this impact to a level considered less than significant." (AR 184)

MM-BIO-1, 2 and 3 apply to protect the special status bird species during the construction phases. MM BIO-4 requires a restoration project for any special

status vegetation that is affected. MM-BIO-5 provides that the restoration plan for jurisdictional resources "shall be prepared in accordance with the requirements specified in permits/agreements issued by the USACE, the RWQCB, and the CDFW." MM BIO-5 provides that any mitigation for loss of "jurisdictional resources" shall be negotiated with the resources agencies and shall "ensure that mitigation to compensate for permanent impacts on jurisdictional resources is equivalent or superior to biological functions and values impacted by the Project." The compensating mitigation options may include relocation of special status species; payment into a mitigation bank; and/or restoration of a riparian habitat on site or at a different site.

The major mitigation measure is MM BIO-6, and it reads in part as follows:

> "A team of qualified specialists in hydrology and plant and wildlife biology will monitor the Arroyo Seco stream and associated riparian habitat from the intake structure (i.e. the diversion point) downstream to Devil's Gate Dam....Monitoring will begin with an initial baseline assessment to be conducted within six months prior to the start of increased diversions. Thereafter, monitoring will continue quarterly for a duration of five years....Data will include surface flow measurements; surface water extent mapping; vegetation mapping; a vegetation health assessment; active channel location mapping; and a plant and wildlife habitat suitability assessment. Data will be compiled into an annual report...."

The annual report shall be submitted to the City. The annual report "will provide recommendations for corrective actions, if deemed necessary to avoid or reduce downstream impacts attributable to the Project. Reports will be submitted to the City of Pasadena for review and approval of recommended corrective actions, if any." The City is not required to take the recommended corrective actions, but, if the City does not, it must "mitigate any loss of vegetation at a minimum 1:1 replacement ratio."

MM-BIO-6 improperly defers the formulation of a mitigation plan until after the Project is approved. No specific standards are imposed to be achieved for mitigation. The baseline itself against which the Project's environmental impacts are to be measured are to be established by an "assessment to be conducted within six months prior to the start of increased diversions." This proposal does not provide a specific plan for mitigation and, therefore, defers commitment to any mitigation plan.

The City, moreover, proposes to mitigate only to the extent that diversions it attributes to its Project have adversely affected the biological

communities. BIO-6 provides that: "The City shall only be required to mitigate for those impacts attributable to the City's increased diversions." The City does not indicate how impacts "attributable to the City's increased diversions" are to be determined. The City concedes "the effect of these reduced flows on biological communities is difficult to measure." (AR 184.) The mitigation plan cannot be evaluated until the City specifies the manner in which it will calculate under a variety of rainfall conditions the downstream water reduction attributable to the Project.

For instance, the City in the MND estimated the Project will "result in an average increase of 17 percent under average year hydrologic conditions." (AR 184.) If the City, in its mitigation plan, is proposing that the water reduction "attributable to the City's increased diversions" will be a set percentage, maybe the 17 percent figure, that metric would not reflect the variability of the rain water flow into the Arroyo Seco. In the drier years, the increased diversion permitted by the Project will divert 100% of the water flow received by the downstream habitats for ten out of 12 months of the calendar year. (AR 144, 184.)

More than that, MM BIO-6 does not commit the City to take effective responsive action. BIO-6 requires only that the City decision-makers shall be made aware of the annual reports. "Reports will be submitted to the City of Pasadena for review and approval of recommended corrective measures, if any." (AR 201.) The City assumes no commitment other than to replace lost vegetation on a 1:1 basis at another location. There is no provision for trapping and relocating species that are harmed. The California Department of Fish and Wildlife recommend trapping and relocating. (S120.)

Finally, there is no public process to hold the City accountable for performance of the proposed mitigation measures.

This mitigation measure--MM-BIO-6 is the core of the City's promised mitigation—improperly defers the formulation of any mitigation plan and prescribes no standards to measure whether there will be any mitigation accomplished (apart from relocation of vegetation). The City abused its discretion in adopting the mitigated negative declaration in reliance on that condition. The City's abuse of discretion would be prejudicial but for the Court's independent finding that the MND is void due to the existence of "fair arguments" supported by substantial evidence that the Project will have significant environmental effects that require under CEQA the preparation of an environmental impact report.

ISSUE 5: THERE IS NO SUBSTANTIAL EVIDENCE THAT CONTAIMINATION IN AREA 3 REQUIRES THE CITY TO PREPARE AN EIR:

The Initial Study noted that JPL from 1941 to 1960 had disposed of solid and liquid chemical waste in pits on JPL property "and off property in Arroyo Seco Wash." (AR 487.) These locations are designated a Superfund site but the concern is the remediation of groundwater contamination in a zone 300 feet or more below the surface. JPL reported to the City that JPL's past practices did not result in ground contamination even where the chemicals had been buried. (AR 942.) JPL campus is located on the west side of the Arroyo Seco, while Area 3 is on the east side of the Arroyo Seco. (AR 103.) There is no evidence of ground contamination in Area 3, where the City as part of the Project will use construction equipment to enlarge the spreading basins. The City, nonetheless, has approved a hazard mitigation measure to caution its construction workers to watch for discolored soil. See, MM HAZ-2 at AR 234.

Petitioners make an argument that the fact that locations on the JPL property are being remediated for below ground contamination requires that the City prepare an EIR before commencing construction work in Area 3. Petitioners' argument does not satisfy the fair argument standard because they point to no substantial evidence that Area 3 has ground contamination or even that hazardous chemicals were deposited there. That the City approved a mitigation measure in the event the construction workers find discolored soil—a measure that petitioners characterize as a "scratch and sniff test"--is not evidence that dangerous contamination likely exists where the City's construction crews will be enlarging the spreading basins. Petitioner rests its argument on the fact that not all of the locations of the JPL waste chemical pits were adequately documented (Reply, p. 14 citing AR 472), but, even so, an argument that contamination likely exists in Area 3 is a supposition. No evidence for it is cited in the record. Petitioners' argument is unavailing because it is not supported by substantial evidence in the record.

PREPARATION OF JUDGMENT AND WRIT OF MANDATE:

The Court concludes the City abused its discretion in adopting a mitigated negative declaration for the Project in the face of substantial evidence supporting a fair argument that the Project, even as mitigated, may have significant adverse environmental effects on biological resources in the Arroyo Seco that are downstream from the proposed water diversion facility.

The Court shall grant Judgment for the petitioners on their First Amended Petition and issue a Peremptory Writ of Mandate to reverse the approval of the Arroyo Seco Canyon Project, the adoption of the Mitigated Negative Declaration, Conditional Use Permit # 6222 and other approvals granted for the Project. The

Project has separate components and petitioners have not challenged the City's approvals as to certain parts of the Project. The parties may consider whether a severance is appropriate under Public Resources Code section 21168.9(b) and submit a Writ providing for an appropriate severance. Any severance, however, must not prejudice full compliance with CEQA.

The Court requests that the petitioners' counsel prepare, serve, and lodge a form of Judgment and Peremptory Writ of Mandate that is consistent with the Court's Statement of Decision within five court days. The City shall have ten days to serve and file objections to the proposed Writ and Judgment. The City, if it wishes, may prepare an alternate form of Judgment and Writ.

Promptly after a Judgment is signed and the Writ issued, the parties are to retrieve (and retain in their offices for any post-judgment proceeding) the administrative record and any binders that have been provided to the Court.

The Clerk is directed to serve this STATEMENT OF DECISION ON PETITION FOR WRIT OF MANDATE on the parties by U.S. Mail this date.

DATED: March 20, 2017

Richard L. Fruin Jr.

RICHARD L. FRUIN, JR.
Superior Court of California
County of Los Angeles

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CITY OF PASADENA
CITY ATTORNEY
CIVIL DIVISION

SETTLEMENT AGREEMENT AND RELEASE
SPIRIT OF THE SAGE COUNCIL ET. AL V. CITY OF PASADENA ET. AL.
LA SUPERIOR COURT CASE NO. BS156207

Whereas, on July 2, 2015, Spirit of the Sage Council and Project Soliton (together, Petitioners) filed a CEQA action against the City of Pasadena and Pasadena Department of Water and Power ("City" or Respondents) challenging the approval of what is commonly known as the Arroyo Seco Canyon Project;

Whereas, on March 20, 2017, after extensive briefing and oral argument, the Court issued a Statement of Decision granting the writ of mandamus and ordering the preparation of an EIR for the project, but proposing severance of certain portions of the project;

Whereas, on June 26, 2017, after further briefing, objections, oral argument, and additional evidence, the Court granted severance under Public Resources Code section 21168.9(c), in the manner proposed by the City of Pasadena;

Whereas, Petitioners object to the order severing certain portions of the project and the Court's consideration of additional evidence without the opportunity for Petitioners to formally respond; and

Whereas, all parties wish to resolve the remaining issues, and obtain certain assurances as to future actions of the parties, and have agreed to the following:

1. IMPLEMENTATION OF THE WRIT

The Writ (along with the Judgment, attached hereto as Exhibit A) shall be implemented as ordered by the Court with the following modifications:

a. **No new ponds or basins in Area 3**: The City will not perform any of the tasks described in Table 3.1-1 of the IS/MND ("MND") under the heading "spreading basins", until fully analyzed, and mitigated to the extent feasible, in an EIR

b. **Maintenance activities permitted**: The City shall have the right to perform maintenance activities, including tilling and grading of existing spreading basins and sludge ponds to re-establish historical percolation rates.

i. Petitioners waive the right to challenge maintenance activities that involve "negligible or no expansion of use" as described in the Class 1 exemption from CEQA. (Cal. Code of Regs. Title 14, § 15301.) Petitioners expressly do not waive the right to challenge activities that do not fall within this limitation.

ii. Prior to performance of maintenance activities, the City shall describe the work in a written document in a manner that allows Petitioners or the public to determine whether the activity falls within the CEQA Class 1 exemption, including an estimate of the quantity of any soil to be removed. Nothing in this section requires additional public notice, except as required by law.

iii. The City shall not perform work that enlarges any of the ponds or increases its ability to take surface water above and beyond its historical withdrawal, unless an EIR is prepared consistent with the Judgment/Writ.

c. The City shall remove the temporary bridges within six months of completion of the Arroyo Seco Canyon Project, unless the City decides to make such bridges permanent structures. If the City determines to make the bridges permanent structures, it must describe the bridge construction in the future EIR for the Arroyo Seco Canyon Project and analyze, and mitigate to the extent feasible, the environmental impacts of such construction.

2. NO WIDENING OF TRAILS FOR HEAVY EQUIPMENT ACCESS TO AREA 1

The City shall not widen the trail, raise the trail above ground level, pave trails (but may replace/repair any existing or damaged pavement), or allow habitat loss for the movement of heavy equipment to Area 1 (including no grading or cutting of slope). The City may perform the road work, including the slope improvements described in Area 2 and excavation and grading necessary for the temporary bridges as described in Table 3.2-1 of the MND. Trails, roads and bridges shall not be used to redirect natural surface water flows (hydrology). Nothing in this section prohibits the trail work in Area 1.

3. WAIVER OF FUTURE LEGAL CHALLENGES

In exchange for the consideration described in Paragraph 4 below, Petitioners agree to the following:

a. Petitioners waive the right to file an appeal or otherwise challenge the Judgment and Writ in *Spirit of the Sage Council et al v. City of Pasadena* (BS156207).

b. Petitioners waive the right to file any legal challenges to the EIR that will be prepared for the Arroyo Seco Canyon Project.

c. Petitioners waive the right to legally challenge the Streambed Alteration Agreement or any future permits that are granted in favor of the City for the Arroyo Seco Canyon Project.

d. Petitioners reserve the right to fully participate in the CEQA process, including submitting scoping comments and commenting on any draft or final EIR and submitting objections to the Arroyo Seco Canyon Project , including submitting objections to the draft or final Streambed Alteration Agreement.

e. Spirit of the Sage Council and Project Soliton, including their respective board members, shall be prohibited from providing any monetary or nonmonetary support to any legal actions challenging the EIR or future permits for the Arroyo Seco Canyon Project. The board members of Spirit of the Sage Council and Project Soliton are specifically prohibited from forming new organizations to mount challenges to the EIR, Streambed Alteration Agreement or future permits for the Arroyo Seco Canyon Project.

4. CONSIDERATION

a. The City shall pay $25,000 to Spirit of the Sage Council within 30 days of execution of this agreement.

b. The City shall pay $25,000 to Project Soliton within 30 days of execution of this agreement.

c. The City shall not speak or communicate any negative commentary about Petitioners, the Judgment/Writ, or this agreement. Likewise, Petitioners and their board members shall not speak or communicate any negative commentary about the City, the Judgment/Writ, or this agreement.

These payments shall be issued in the name of each petitioner and mailed to the Law Office of Todd Cardiff. These payments are non-refundable if the City decides to not move forward on the Arroyo Seco Canyon Project.

5. PAYMENT OF ATTORNEYS FEES AND COSTS

Nothing in this agreement is intended to waive or impact Petitioners' Attorneys right to move for attorneys' fees and costs, unless otherwise agreed to in a separate agreement.

6. NO WAIVER OF THE RIGHT TO ENFORCE 2004 SETTLEMENT AGREEMENT

This agreement is not intended to waive or impact, in any manner, the right to enforce the 2004 settlement agreement between Spirit of the Sage Council and the City of Pasadena.

7. NO WAIVER OF RIGHT TO OBJECT TO RETURN TO WRIT

Petitioners reserve the right to object to the return of the writ and discharge if the City fails to comply or has not fully complied with the writ.

8. PERSONS BOUND

This agreement shall be binding on all parties, their principles, agents, successors, assigns, board members, officers and employees. This agreement is specifically enforceable against Petitioners' board members who are: Leeona Klippstein, Sharee Hemphill, Ilse Asplund, Doug Doepke and Doug Lewis.

9. GENERAL PROVISIONS

a. **Integration and Interpretation**: This agreement shall constitute the entire agreement between the parties and shall supersede any prior promises or agreements whether oral or in writing. This agreement may only be amended in a writing signed by the party against whom enforcement is sought. This agreement was jointly negotiated and drafted by the parties. Any judicial interpretation of this agreement shall be in favor of the mutual intent of the parties and not in favor of or against any particular party. The parties warrant that they have had a chance to discuss the language of the agreement with their attorneys.

b. **Severance**: This agreement shall be interpreted in manner that renders it enforceable to the extent allowed by law. If any portion of this agreement is ruled to be unenforceable, the remainder of the agreement shall remain in effect.

c. **Authority**: The signatories to this agreement warrant that they have obtained the necessary authority to bind their respective organizations.

d. **Counterparts**: This agreement may be signed in counterparts, which may be faxed or delivered electronically. A copy of this agreement, with all signatures, whether original or electronic, shall be considered enforceable as if it was an original.

DATE:

SPIRIT OF THE SAGE COUNCIL

Leona Klippstein
President

DATE:

PROJECT SOLITON

Sharee Hemphill
President

DATE: 7/31/17

CITY OF PASADENA

Steve Mermell
City Manager

Approved as to form:

DATE: 7/28/2017

LAW OFFICE OF TODD T. CARDIFF

Todd T. Cardiff, Esq.
On behalf of Petitioners
Spirit of the Sage Council
Project Soliton

DATE: 7-28-17

ASSISTANT CITY ATTORNEY
CITY OF PASADENA

Theresa Fuentes, Esq.
On behalf of Respondents
City of Pasadena and its
Department of Water and Power

DATE: 7/28/2017

SPIRIT OF THE SAGE COUNCIL

Leona Klippstein
President

DATE:

PROJECT SOLITON

Sharee Hemphill
President

DATE:

CITY OF PASADENA

[NAME]
[TITLE]

DATE:

PASADENA DEPT. OF WATER AND POWER

[NAME]
[TITLE]

Approved as to form:

DATE:

LAW OFFICE OF TODD T. CARDIFF

Todd T. Cardiff, Esq.
On behalf of Petitioners
Spirit of the Sage Council
Project Soliton

DATE:

DEPUTY CITY ATTORNEY OF PASADENA

Theresa Fuentes, Esq.
On behalf of Respondents
City of Pasadena
Pasadena Dept. of Power and Water

DATE:

SPIRIT OF THE SAGE COUNCIL

_____
Leona Klippstein
President

DATE: 7/27/2017

PROJECT SOLITON

_____
Sharee Hemphill
President

DATE:

CITY OF PASADENA

_____
[NAME]
[TITLE]

DATE:

PASADENA DEPT. OF WATER AND POWER

_____
[NAME]
[TITLE]

Approved as to form:

DATE:

LAW OFFICE OF TODD T. CARDIFF

_____
Todd T. Cardiff, Esq.
On behalf of Petitioners
Spirit of the Sage Council
Project Soliton

DATE:

DEPUTY CITY ATTORNEY OF PASADENA

_____
Theresa Fuentes, Esq.
On behalf of Respondents
City of Pasadena
Pasadena Dept. of Power and Water

Appendix B

Geotechnical Feasibility Study Report

Converse Consultants
Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

GEOTECHNICAL FEASIBLITY STUDY REPORT
Proposed Public Restroom, Roadway Improvement and Stormwater Sediment Basin Project
Arroyo Seco Canyon
Pasadena, California

Converse Project No. 13-31-199-01

August 23, 2013

PREPARED FOR

Carollo Engineers, Inc.
199 South Los Robles Avenue, Suite 530
Pasadena, CA 91101

222 East Huntington Drive, Suite 211, Monrovia, California 91016-3500
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Printed on Recycled Paper

Converse Consultants
Geotechnical Engineering, Environmental & Groundwater Science, Inspection & Testing Services

August 23, 2013

Ms. Inge Wiersema
Carollo Engineers, Inc.
199 South Los Robles Avenue, Suite 530
Pasadena, CA 91101

Subject: **GEOTECHNICAL FEASIBILITY STUDY REPORT**
Proposed Public Restroom, Roadway Improvement, and Stormwater Sediment Basins Project
Arroyo Seco Canyon
Pasadena, California
Converse Project No. 13-31-199-01

Dear Ms. Wiersema:

Converse Consultants (Converse) is pleased to present this Geotechnical Feasibility Study Report for the proposed Public Restroom, Roadway Improvement, and Stormwater Sediment Basins Project located at Arroyo Seco Canyon in Pasadena, California. Our services were performed in accordance with our proposal dated June 10, 2013.

The purpose of this study is to perform preliminary engineering geologic and geotechnical explorations to characterize the project sites, evaluate the feasibility of on-site wastewater treatment system at the planned public restroom sites, and provide geotechnical recommendations for restroom foundations and roadway improvement. Please be advised that our geotechnical recommendations for foundations and roadway improvement can be used for structural design. However, the preliminary percolation study for OWTS will not be sufficient for actual design and submission for the LA County review because the design-level information is not available to us at this time.

We appreciate the opportunity to be of service to the Carollo Engineers, Inc. If you should have any questions, please do not hesitate to contact us at (626) 930-1200.

CONVERSE CONSULTANTS

William H. Chu, P.E., G.E.
Senior Vice President/Principal Engineer

Dist: 4/Addressee
MM/SCL/WHC/amm

Printed on Recycled Paper

222 East Huntington Drive, Suite 211, Monrovia, California 91016-3500
Telephone: (626) 930-1200 ♦ Facsimile: (626) 930-1212 ♦ e-mail: converse@converseconsultants.com

PROFESSIONAL CERTIFICATION

This feasibility report for the proposed Improvement, and Stormwater Sediment Basins Project located at Arroyo Seco Canyon in Pasadena, California has been prepared by the staff of Converse under the professional supervision of the individuals whose seals and signatures appear hereon. This feasibility report may require additional geotechnical studies and may not contain sufficient information for design and construction.

The findings, recommendations, specifications or professional opinions contained in this report were prepared in accordance with generally accepted professional engineering and engineering geologic principles and practice in this area of Southern California. There is no warranty, either expressed or implied.

In the event that changes to the property occur, or additional, relevant information about the property is brought to our attention, the conclusions contained in this report may not be valid unless these changes and additional relevant information are reviewed and the recommendations of this report are modified or verified in writing.

_____ _____

Sean C. Lin, P.E., G.E. Mark Schluter, P.G., C.E.G.
Senior Engineer Senior Geologist

_____

William H. Chu, G.E.
Principal Engineer, Senior Vice President

EXECUTIVE SUMMARY

The following is the summary of our geotechnical study, findings, conclusions, and recommendations, as presented in the body of this report. Please refer to the appropriate sections of the report for complete conclusions and recommendations. In the event of a conflict between this summary and the report, or an omission in the summary, the report shall prevail.

- The project consists of three separate areas within a 2-mile stretch along the Arroyo Seco Canyon in the City of Pasadena, California. The elements that require geotechnical analyses consist of a public restroom with onsite wastewater treatment system (OWTS), roadway improvement and associated retaining wall, and stormwater sediment basins.

- Site No. 1 and Site No. 2C are the potential candidate sites for the planned public restroom and OWTS. The planned roadway improvement is located at Site No. 2A. The planned stormwater sediment basins are located at Site No. 3.

- Fourteen (14) exploratory borings (BH-1 through BH-14) were drilled within the project sites from July 8 to July 12, 2013. The borings were advanced using a limited access rig with 12-inch and 24-inch diameter bucket augers, and truck mounted 8-inch diameter hollow stem auger drill rig to depths ranging from 2.5 to 21 feet below the existing ground surface (bgs).

- Borings BH-2, BH-5 and BH-9 through BH-14 were utilized for percolation tests prior to backfill. Percolation test results are presented in Appendix C, *Percolation Testing Data*.

- Site No. 1 is acceptable to construct the leach lines as onsite wastewater treatment system in accordance with the Los Angeles County requirements based on our preliminary percolation testing.

- Site No. 1 is located in close proximity of a 50-year floodplain. The Arroyo Seco Canyon is subject to periodic flooding following periods of heavy rainfall. Drilled caissons with grade beam system should be used as the restroom foundation. Flood protection measures are recommended for new structures.

- Roadway improvement at Site No. 2A should be supported by a retaining wall with cast-in-drill-hole pile foundations. The original roadway section was washed away by flooding in the Arroyo Seco Canyon. Flood protection measures are recommended for new structures.

- Site No. 2C is not feasible to construct the onsite wastewater treatment system based on our preliminary percolation testing. The site is underlain by shallow hard bedrock.

- The upper 5 feet of soils within Site No. 3 have high to very high percolation rates. It is our opinion that the percolation rates presented on our table demonstrate the good percolation capacity of the onsite soils without considering fine sediment clogging. For planning or design purposes, it is recommended to consider the lowest percolation rates among the tests because the percolation test holes are located at only a few scattered points over a fairly large area. Fine sediment clogging should be also considered into the design and maintenance plan.

- Based on the slope stability analyses, the proposed new Sediment Basin A is located in the area having 1.5 factor of safety or greater for slope stability, and the slope near the creek has factor of safety greater than 1.25, which exceed the minimum required factor of safety in common geotechnical practice.

- At all of the project sites studied in this report, the onsite materials will contain large amounts of gravels, cobbles and boulders. Based on our field exploration, the earth materials at the site may be excavated with conventional heavy-duty earth moving and trenching equipment in general. Difficult drilling and excavation conditions will be encountered during construction and should be anticipated and other suitable equipment and methods should be used.

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1.0 INTRODUCTION

The project consists of four separate areas within a 2-mile stretch along the Arroyo Seco Canyon in the City of Pasadena, California. The elements that require geotechnical analyses consist of a public restroom with onsite wastewater treatment system (OWTS), roadway improvement and associated retaining wall, and stormwater sediment basins. An aerial view of the site is illustrated on Drawing No. 1, *Overall Project Site Plan.*

Based on the information provided to us, the Site No. 1 and Site No. 2C are the potential candidate sites for the planned public restroom and OWTS. The planned roadway improvement is located at Site No. 2A. The planned stormwater sediment basins are located at Site No. 3. The enlarged maps for these four sites are shown on Drawing Nos. 2a thru 2d.

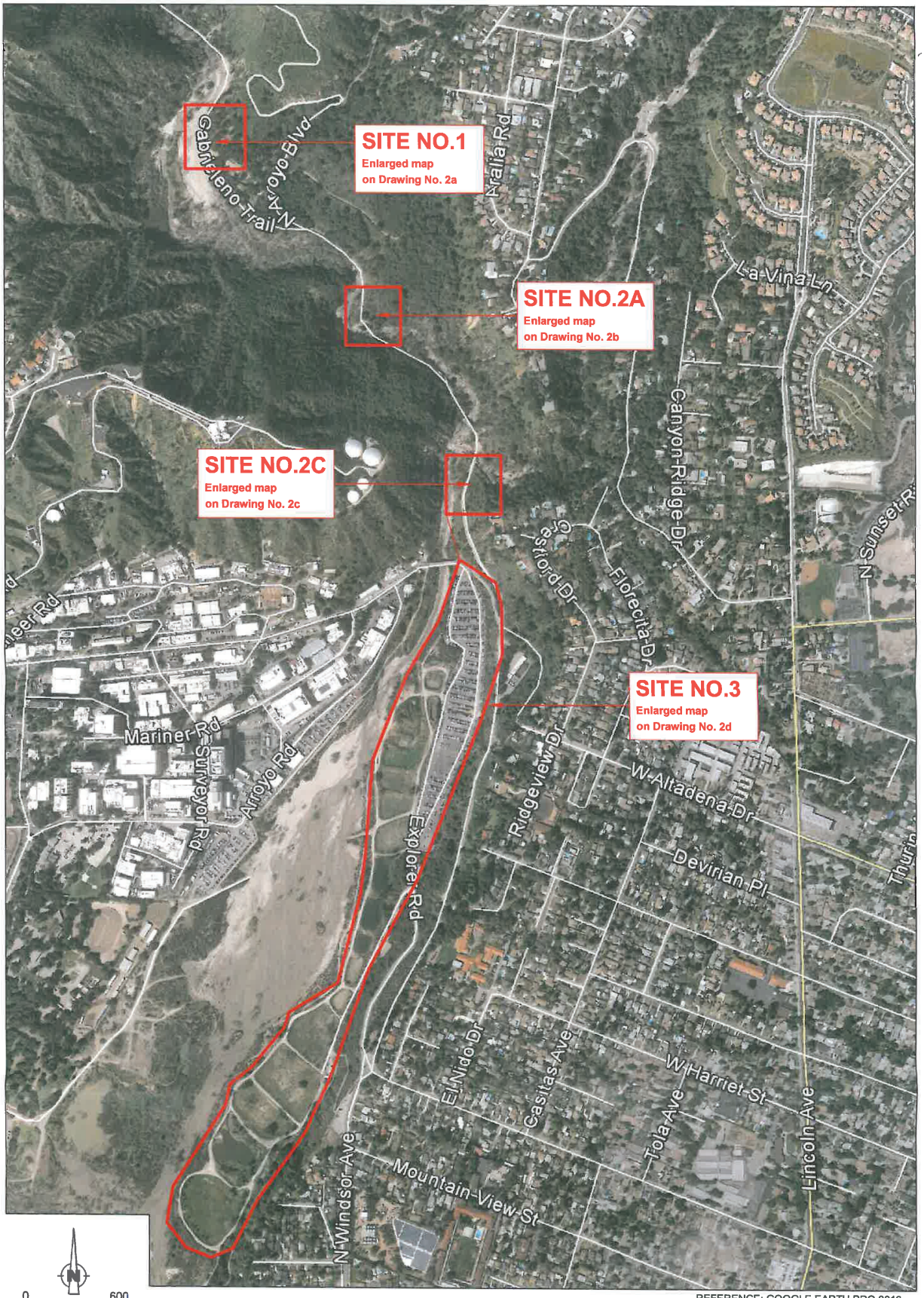
The purpose of this study is to perform preliminary engineering geologic and geotechnical explorations to characterize the project sites, evaluate the feasibility of on-site wastewater treatment system at the planned public restroom sites, and provide geotechnical recommendations for restroom foundations and roadway improvement. Please be advised that our geotechnical recommendations for foundations and roadway improvement can be used for structural design. However, the preliminary percolation study for OWTS will not be sufficient for actual design and submission for the LA County review because the design-level information is not available to us at this time.

This report for geologic and geotechnical design parameters for the project described herein and is intended for use solely by the Carollo Engineers, Inc. This report should not be used as a bidding document but may be made available to the potential contractors for information on faculty data only. For bidding purposes, the contractors should be responsible for making their own interpretation of the data contained in this report.

2.0 SITE NO. 1 – 1ST CANDIDATE SITE FOR PUBLIC RESTROOM

2.1 Site Description

Site No. 1 is located at the northernmost part of the project, near the National Forest Ranger's Station. The planned restroom building site is located at a flat ground on the east side of the Gabrieleno Trail near an existing trail monument at the toe of an approximate 20 feet high ascending 2H:1V slope to a terrace pad .



REFERENCE: GOOGLE EARTH PRO 2013

OVERALL PROJECT SITE PLAN

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.	Drawing No.
13-31-199-01	1



REFERENCE: GOOGLE EARTH PRO 2013

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APPROXIMATE SCALE IN FEET

LEGEND

APPROXIMATE LOCATION OF BORING

SITE NO. 1 BORING LOCATION MAP

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.	Drawing No.
13-31-199-01	2a



REFERENCE: GOOGLE EARTH PRO 2013

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APPROXIMATE SCALE IN FEET

LEGEND

APPROXIMATE LOCATION OF BORING		Qoa	OLDER ALLUVIAL SOIL
APPROXIMATE LIMIT OF ROAD EROSION		gr	GRANITIC BEDROCK
GEOLOGIC CONTACT			

SITE NO. 2A BORING LOCATION MAP

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. 2b



REFERENCE: GOOGLE EARTH PRO 2013

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APPROXIMATE SCALE IN FEET

LEGEND

APPROXIMATE LOCATION OF BORING

SITE NO. 2C BORING LOCATION MAP

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.	Drawing No.
13-31-199-01	2c



SITE NO. 3 BORING LOCATION MAP

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
2d

The planned restroom building site is located on the edge of the Arroyo Seco Canyon floodplain and is subject to potential flooding following periods of heavy rainfall.

The planned onsite wastewater treatment system (seepage pit or leach field) area is located on the upper terrace pad east of the planned restroom and north of the Ranger's Station. The surface conditions consist of unpaved trail, grass and some mature trees.

The restroom site elevation is about 1233 feet above Mean Sea Level (MSL). The onsite wastewater treatment system site elevation is about 1262 feet MSL. The coordinates for the project site are: North latitude: 34.2102 degrees and West longitude: 118.1713 degrees. The project site is depicted on Drawing No. 2a, *Site No. 1, Boring Location Map*.

2.2 Scope of Work

The scope of our present study includes site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analysis, and preparation of this report. Details of the tasks are addressed in the following sections:

2.2.1 Project Setup and Site Reconnaissance

A Converse geologist conducted a site reconnaissance on June 20, 2013. The purpose of the reconnaissance was to evaluate site conditions with respect to the location of the borings and drill rig accessibility. The Underground Services Alert (USA) was notified on June 28, 2013 within 14 calendar days prior to field exploration

2.2.2 Subsurface Exploration and Percolation Testing

Three (3) borings, including one boring (BH-1) within the planned restroom area and two borings (BH-2 and BH-2A) within the planned wastewater treatment system area, were drilled to a maximum depth of 7 feet below existing ground surface on July 8 and 9, 2013. The borings were drilled with a limited access drill rig equipped with 12-inch and 24-inch diameter bucket augers for soil sampling. Each boring was visually logged and sampled at regular depth intervals and at changes in subsurface soils. The borings were backfilled with soil cuttings . All three borings encountered refusals at shallow depths due to numerous cobbles, and boulders larger than 12 inches in diameter. The boring BH-2A was an additional attempt after refusal at BH-2. The locations of borings are shown on the attached *Drawing No. 2a, Site No. 1, Boring Location Map.*

California Modified Sampler (Ring samples), and bulk soil samples were obtained for laboratory testing. The bore holes were backfilled and compacted with soil cuttings after the completion of field testing.

Boring BH-2 was utilized for percolation tests prior to backfill. Percolation test procedures and test results are further discussed in Section 2.6.1, Preliminary OWTS Feasibility Evaluation. The raw data of percolation testing is presented in Appendix C, *Percolation Testing Data*.

2.2.3 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in the classification and to evaluate relevant engineering properties. The tests performed included:

- *In situ* moisture contents and dry densities (ASTM Standard D2216)
- Grain-Size Analysis (ASTM D422)
- Maximum dry density and optimum-moisture content relationship (ASTM Standard D1557)
- Direct shear (ASTM Standard D3080)
- Consolidation (ASTM Standard D2435)
- Soil corrosivity tests (Caltrans 643, 422, 417 and 532)

The detailed description of the laboratory test methods and test results are presented in Appendix B, *Laboratory Testing Program*.

2.2.4 Analyses and Report

Data obtained from the exploratory fieldwork and laboratory-testing program were analyzed and evaluated with respect to the proposed development. Recommendations for foundations, earthwork, and feasibility evaluation of OWTS are provided.

2.3 Subsurface Conditions

2.3.1 Subsurface Soil Profile of Project Site

Based on our exploratory soil boring (BH-1) at the restroom site, stream deposits (Map symbol: Qg) consisting of primarily light brown silty sand with some cobbles and boulders were encountered to a maximum explored depth of 7 feet below existing ground surface (bgs). The stream deposits are generally moderately dense to very dense.

Based on our exploratory soil borings (BH-2 and BH-2A) at the wastewater treatment system site, older alluvium (Map symbol: Qoa) consisting of primarily brown silty sand with some cobbles and boulders was encountered to a maximum explored depth of 5 feet below existing ground surface (bgs). The older alluvium is generally moderately dense to dense. The detailed descriptions of the borings are presented in Appendix A, Field Exploration.

Based on large amount of cobbles and boulders encountered during our exploratory borings, difficult drilling conditions are expected during construction. Therefore it is our opinion that leach lines are more feasible than seepage pits for the onsite wastewater treatment system.

2.3.2 Groundwater

Groundwater was not encountered in our exploratory borings to a maximum depth of 7 feet. In accordance with the Seismic Hazard Zone Report for the Pasadena Quadrangle (CDMG, 1998), the historic highest groundwater level contours are not defined at this location. However, the restroom site is adjacent to existing creek. Seasonal high groundwater is anticipated to be shallow.

2.3.3 Subsurface Variations

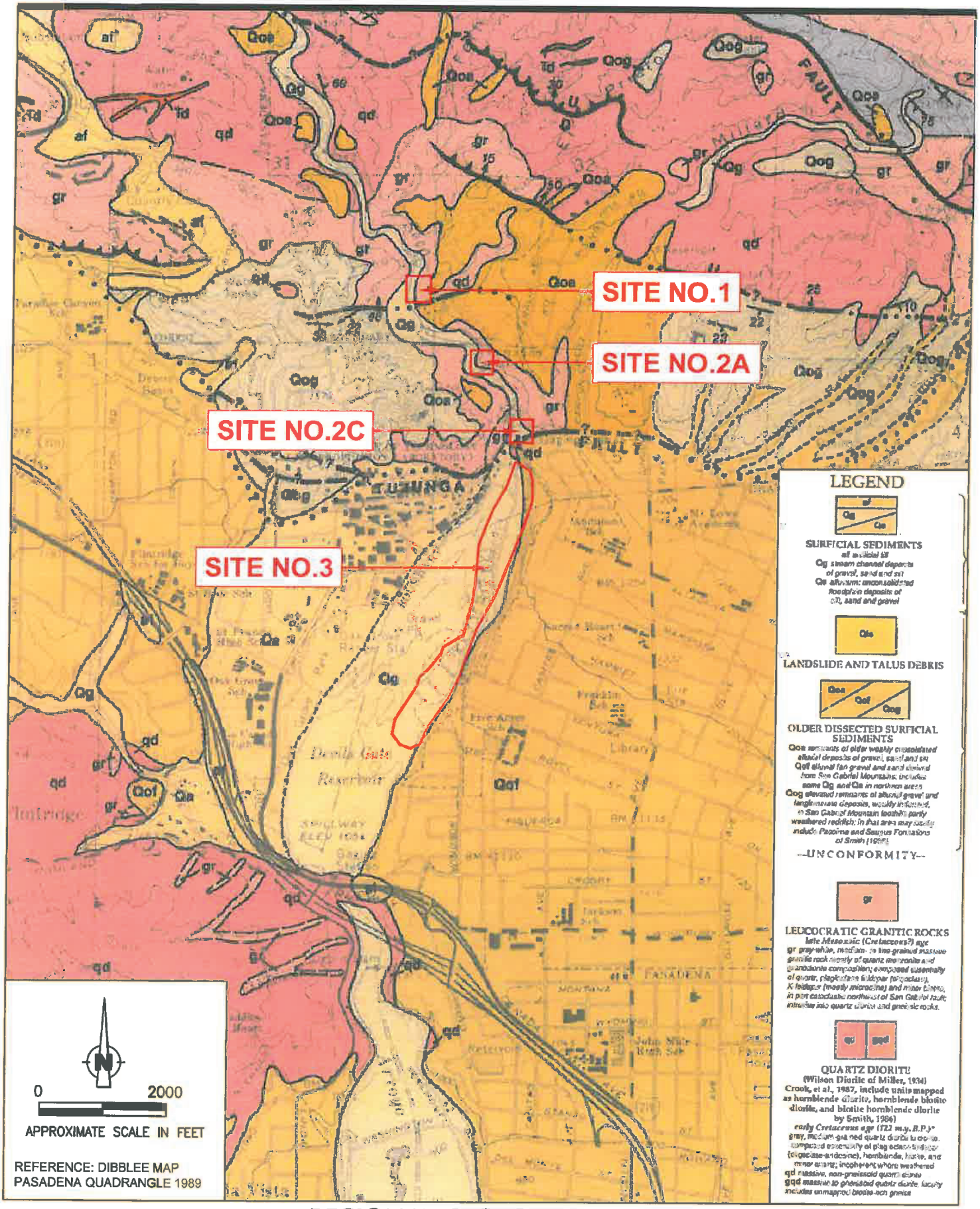
Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and geologic characteristics of the earth material at the site, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring locations. If during construction, subsurface conditions differ significantly from those presented in this report, this office should be notified immediately so that recommendations can be modified, if necessary.

2.4 Faulting and Geologic Hazards

Geologic hazards are defined as geologically related conditions that may present a potential danger to life and property. Typical geologic hazards in Southern California include earthquake ground shaking, fault surface rupture, landslides, and liquefaction.

2.4.1 Fault Surface Rupture and Active Faults

The project site is not located within a currently designated State of California Earthquake Fault Zone (formerly Alquist-Priolo Special Studies Zones) for surface fault rupture. Based on Drawing No. 3, *Regional Geologic Map (Dibblee, 1989)*, a splay of Tujunga Fault is



REGIONAL GEOLOGIC MAP

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.	Drawing No.
13-31-199-01	3

located at approximate 100 feet south of the project site.

2.4.2 Liquefaction

Liquefaction is the sudden decrease in the strength of cohesionless soils due to dynamic or cyclic shaking. Saturated soils behave temporarily as a viscous fluid (liquefaction) and, consequently, lose their capacity to support the structures founded on them. The potential for liquefaction decreases with increasing clay and gravel content, but increases as the ground acceleration and duration of shaking increase. Liquefaction potential has been found to be the greatest where the groundwater level and loose sands occur within 50 feet of the ground surface. The site is located within a mapped Seismic Hazard Zone for liquefaction (CDMG, 1998) as shown in Drawing No. 4, *Seismic Hazard Zones Map*.

Based on the results of our subsurface exploration, very dense gravelly sand with cobbles and boulders was encountered underneath the proposed restroom site, it is our professional opinion that the site is not susceptible to liquefaction and seismically-induced settlement to be negligible.

2.4.3 Landslides

The site is not located within a Seismic Hazard Zone for required investigation for earthquake-induced landsliding (CDMG, 1999). The restroom site is relatively flat and the ascending 2H:1V, 20-foot-high slope at the east is covered by well developed vegetation. Based on our field explorations and gradient of slope, it is our opinion that this ascending slope is considered stable statically and seismically. The proposed restroom building should be set back at least 10 feet away from the toe of slope in accordance with CBC 2010.

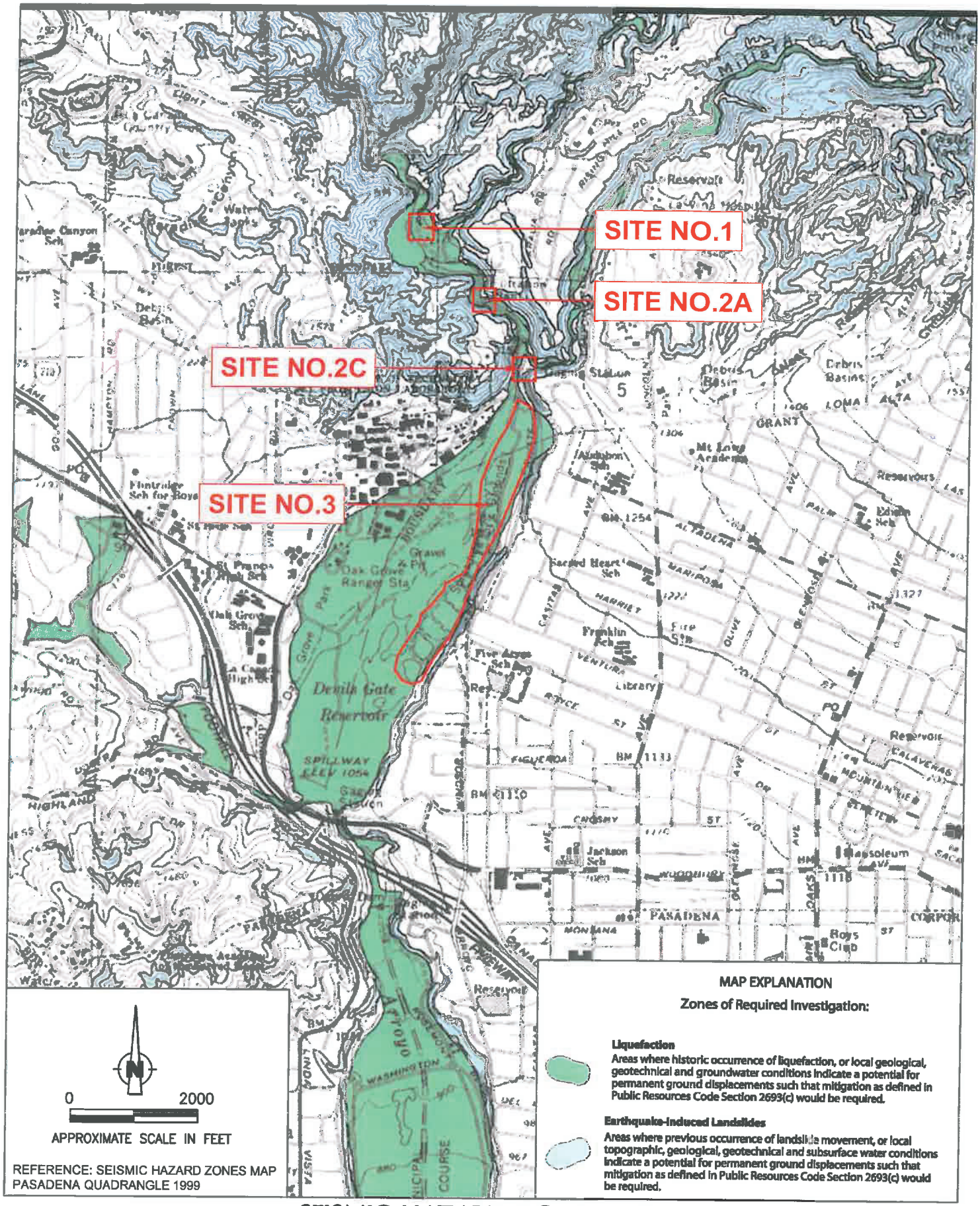
2.4.4 Flood Zone

Based on the information provided by Carollo Engineers, the restroom site is located near a 50-year floodplain. The effects of flood should be considered in the design of restroom building. Flood protection measures are recommended for new structures.

2.5 Seismic Analysis

2.5.1 CBC Seismic Design Parameters

Seismic parameters based on the 2010 California Building Code are calculated using the United States Geological Survey computer program *Seismic Hazards Curves,*



SEISMIC HAZARD ZONE MAP

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.	Drawing No.
13-31-199-01	4

Response Parameters and Design Parameters, Version 5.1.0a. The seismic parameters are presented below.

Table No. 1, 2010 CBC Seismic Parameters For Site No. 1

Seismic Parameters	
Site Class	D
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_S	2.660g
Mapped 1-second Spectral Response Acceleration, S_1	0.976g
Site Coefficient (from Table 1613.5.3(1)), F_a	1.0
Site Coefficient (from Table 1613.5.3(2)), F_v	1.5
MCE 0.2-sec period Spectral Response Acceleration, S_{MS}	2.660g
MCE 1-second period Spectral Response Acceleration, S_{M1}	1.464g
Design Spectral Response Acceleration for short period, S_{DS}	1.773g
Design Spectral Response Acceleration for 1-second period, S_{D1}	0.976g
Seismic Design Category	D

2.5.2 Deaggregated Seismic Source Parameters

Based on our analyses utilizing the USGS 2008 NSHM PSHA Interactive Deaggregation web site, the mean and modal earthquake magnitudes for a return time of 2475 years are calculated to be 6.68 and 7.02, respectively. The earthquake magnitude of 7.02 should be considered for seismic analyses at the project site.

2.6 Conclusions and Recommendations

2.6.1 Preliminary OWTS Feasibility Evaluation

Based on large amounts of cobbles and boulders encountered during our exploratory borings, difficult drilling conditions are expected during construction. Therefore it is our opinion that leach lines are more feasible than seepage pits for the onsite wastewater treatment system.

Boring BH-2 at Site No. 1 was utilized to perform percolation testing on July 8 and 9 to evaluate the feasibility of onsite wastewater treatment system (OWTS). The bored hole was cased using a four-inch diameter perforated PVC casing surrounded with filter gravel pack. Water was added to the borehole until the water level was at the ground surface and allowed to pre-soak for one day. After pre-soak, the hole was filled with water again to 12 inches above the bottom, and allowed adequate time for the water level to drop. As the water level drops, each one inch of drop was recorded. The percolation data was presented in Appendix C, Percolation Testing Data.

In accordance with the LA County guidelines, the size of the dis persal field shall be determined by the Ryon Formula utilizing the slowest elapsed time required for the water to drop form th e 5th to the 6th inch. We have performed a preliminary capacity estimation based on our percolation test results as presented below:

Assume:
A 50' x 50' leach field is planned for 100% design capacity
Leach line consists of 3-foot wide trench wit h 1 foot of filter material below the perforated pipe
Five 50-foot long leach lines are installed within leach field

Ryon Formula: A = (T+6.24)*C/58
where A = square feet of leach lines = 3'*50'*5 = 750 ft^2
T = time for the 6th inch of water to drain =11 minutes

Therefore, the calculated maximum septic tank capacity, C = 2523 gal

Site No. 1 is acceptable to construct t he leach lines near Borings 2 for onsite wastewater treatment system in accordance with the LA County requirements. It should be advised that percolation testing was perfo rmed at only one location for the current feasibility study, which is not fully in compliance with the minimum three testing locations required by the LA County. A comprehensive percolation testing program should be conducted once the site is selected for the planned public restroom.

2.6.2 Foundation Recommendations for Public Restroom

Based on the results of our liter ature review, subsurface explor ation, laboratory testing, geotechnical analyses, and understandi ng of the planned site im provements, it is our opinion that the proposed public restroom is feasible fr om a geotechnical standpoint, provided the following conclus ions and reco mmendations are incorporated into the project plans, specifications, and are followed during site construction.

The restroom site is located in close proximity of a 50-year floodplain. The effects of base flood elevation should be c onsidered in the des ign of restroom building. W e recommended the restroom build ing be supported by drilled caissons with grade beam system. Caissons should be at least founded at least 4 feet below lowest adjacent final grade into dense soils and at least 24 inches in diameter. Bearing capacity of caisson can be calculated by an allowable skin friction of 350 psf. The allowable value indicated above is obtained by apply ing a factor of safety of 2.0 to the ultimate value. The actual reinforcement of caisson should be determined by the structural engineer.

As an alternative, conventional spread footings can be used. Isolated footing should be at least 24 inches square, and continuous footings should be 12 inches wide. Footings should be embedded at least 4 feet below the lowest adjacent grade into dense native soil. Conventional footings with the minimum sizes can be designed for a net allowable bearing pressure of 3,500 psf for dead-plus-live loads.

Resistance to lateral loads can be provided by friction acting at the base of the foundation and by passive earth pressure. A coefficient of friction of 0.35 may be assumed with normal dead load forces. An allowable passive earth pressure of 350 psf per foot of depth up to a maximum of 3,500 psf may be used. The values of coefficient of friction and allowable passive earth pressure include a factor of safety of 1.5.

The static settlement is anticipated to be less than 0.5 inch. Differential settlement is expected to be up to one-half of the total settlement over a 30-foot span.

The above vertical bearing may be increased by 33% for short durations of loading which will include the effect of wind or seismic forces. The allowable passive pressure may be increased by 33% for lateral loading due to wind or seismic forces.

2.6.3 Slab-on-grade

Slabs-on-grade should be supported on compacted fill and have a minimum thickness of four (4) inches nominal for support of normal ground-floor live loads. Minimum reinforcement for slabs-on-grade should be No. 3 reinforcing bars, spaced at 18 inches on-center each way. The thickness and reinforcement of more heavily-loaded slabs will be dependent upon the anticipated loads and should be designed by a structural engineer. A static modulus of subgrade reaction equal to 150 pounds per square inch per inch may be used in structural design of concrete slabs-on-grade.

It is critical that the exposed subgrade soils should not be allowed to desiccate prior to the slab pour. Care should be taken during concrete placement to avoid slab curling. Slabs should be designed and constructed as promulgated by the ACI and Portland Cement Association (PCA). Prior to the slab pour, all utility trenches should be properly backfilled and compacted.

In areas where a moisture-sensitive floor covering (such as vinyl tile or carpet) is used, a 10-mil-thick moisture retarder/barrier between the bottom of slab and subgrade that meets the performance criteria of ASTM E 1745 Class A material. Retarder/barrier sheets should be overlapped a minimum of six inches, and should be taped or otherwise sealed per the product specifications.

2.6.4 Earth Pressures for Retaining Walls

The following design values can be used for the proposed retaining walls, if any. The earth pressure behind any buried wall depends primarily on the allowable wall movement, type of soil behind the wall, backfill slopes, wall inclination, surcharges, and any hydrostatic pressure. The following earth pressures are recommended for vertical walls with no hydrostatic pressure.

Table No. 2, Lateral Earth Pressures for Retaining Wall Design

Backfill Slope (H:V)	**Cantilever Wall** (triangular pressure distribution) **Equivalent Fluid Pressure (pcf)**	**Restrained Wall** (uniform pressure distribution) **(psf)**
Level	32	23H
2:1	45	30H

The recommended lateral pressures assume that the walls are fully back-drained to prevent build-up of hydrostatic pressure. Adequate drainage could be provided by means of permeable drainage materials wrapped in filter fabric installed behind the walls. The drainage system should consist of perforated pipe surrounded by a minimum one (1) square feet per lineal feet of free draining, uniformly graded, ¾-inch washed, crushed aggregate, and wrapped in filter fabric such as Mirafi 140N or equivalent. The filter fabric should overlap approximately 12 inches or more at the joints. The subdrain pipe should consist of perforated, four-inch diameter, rigid ABS (SDR-35) or PVC A-2000, or equivalent, with perforations placed down. Alternatively, a prefabricated drainage composite system such as the Miradrain G100N or equivalent can be used. The subdrain should be connected to solid pipe outlets, with a maximum outlet spacing of 100 feet.

Walls subjected to surcharge loads located within a distance equal to the height of the wall should be designed for an additional uniform lateral pressure equal to one-third or one-half the anticipated surcharge load for unrestrained or restrained walls, respectively. These values are applicable for backfill placed between the wall stem and an imaginary plane rising 45 degrees from below the edge (heel) of the wall footings.

Although not anticipated, retaining walls greater than 12 feet should be designed to resist additional earth pressure caused by seismic ground shaking. A seismic earth pressure of 15H (psf), based on an inverted triangular distribution, can be used for design of wall.

2.6.5 Soil Corrosivity Evaluation

Based on our review of soil corrosivity test results (see Appendix B), the pH, chloride content and saturated resistivity are not in the corrosive range to ferrous metal. The soluble sulfate concentration is not in the corrosive range to concrete. Mitigation measures to protect concrete in contact with the soils are not anticipated.

A corrosion engineer may be consulted for appropriate mitigation procedures and construction design, if needed. General considerations for corrosion mitigation measures may include the following:

- Steel and wire concrete reinforcement should have at least three inches of concrete cover where cast against soil, unformed.
- Below-grade ferrous metals should be given a high-quality protective coating, such as 18-mil plastic tape, extruded polyethylene, coal-tar enamel, or Portland cement mortar.
- Below-grade metals should be electrically insulated (isolated) from above-grade metals by means of dielectric fittings in ferrous utilities and/or exposed metal structures breaking grade.

2.6.6 Site Drainage

Adequate positive drainage should be provided away from the structure foundations to prevent ponding and to reduce percolation of water into the foundation soils. We recommend that any landscape areas immediately adjacent to the foundation shall be designed sloped away from the foundation with a minimum 2 percent slope gradient for at least 10 feet measured perpendicular to the face of the foundation. Impervious surfaces within 10 feet of the structure foundation shall be sloped a minimum of 1 percent away from the structure.

2.6.7 Earthwork and Site Grading

The earthwork anticipated for the restroom building includes foundation excavations and subgrade preparation. To prepare the subgrade underneath the slab, we recommend scarify the subgrade at least 6 inches, moisture conditioned as needed to near optimum moisture content, and compacted to 90 percent relative compaction for slab support. Deeper removal will be needed if soft soil conditions expose at the excavation bottom.

All engineered fill should be placed on competent, scarified and compacted bottom as evaluated by the geotechnical engineer and in accordance with the recommendations presented in this section. Excavated site soils, free of deleterious materials and rock

particles larger than three (3) inches in the l argest dimension, should be sui table for placement as compacted fill. Any proposed import fill should be evaluated and approved by Converse prior to import to the site. Import fill material should have an expansion index less than 20.

The onsite materials will contain large amount of gravels, cobbles and boulders. Based on our field exploration, t he earth materials at the site may be excavated wit h conventional heavy-duty earth moving and tr enching equipment in general. Difficult drilling and excav ation conditions should be also anticipated and other suitable equipment and methods should be used.

Prior to compaction, fill materials should be thoroughly mixed and moisture conditio ned within two (2) percent above the optimum moisture content. Fill soils sha ll be evenly spread in maximum 8-inch lifts, watered or dried as necessary, mixed and compacted to at least the density specified b elow. Th e fill sha ll be placed a nd compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. All fill, if not specified otherwise elsewhere in this report, should be compacted to at least 90 percent of the laboratory dry density in accordance with the ASTM Standard D1557 test method. The upper 12 inches of subgrade below pavem ent areas should be compacted to 95 percent relative compaction.

2.6.8 Expansive Soil

The near surface soils have a “Very Low” expans ive potential. Mitigation for expansiv e soil is not considered necessary.

2.6.9 Pipeline Backfill

Any soft and/or unsuitable material encount ered at the pipe invert should be removed and replaced with an adequate bedding material. Th e pipe s ubgrade should be leve l, firm, uniform, free of loose materials and properly graded to provide unifor m bearing and support to the entire se ction of the pi pe placed on beddi ng material. Protruding oversize particles larger than tw o (2) inches in the largest dimension, if any, should be removed from the trench bottom and replac ed with compacted materials. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its fu ll length as is practicable. The bedding zone is defined as that portion of the pipe tr ench from four inches below the pipe invert to one foot above the top of pipe, in acco rdance with Section 306-1.2.1 of the Latest Edition of the *Standard Specifications for Public Works Construction* (SSPWC).

The following specifications are recommended to provide a basis for quality control during the placement of trench backfill.

Trench excavations to receive backfill shall be free of trash, debris or other unsatisfactory materials at the time of backfill placement. Excavated on-site soils free of oversize particles, defined as larger than one (1) inch in maximum dimension in the upper 12 inches of subgrade soils and larger than three (3) inches in the largest dimension in the trench backfill below, and deleterious matter after proper processing may be used to backfill the trench zone. Imported trench backfill, if used, should be approved by the project soils consultant prior to delivery at the site. No more than 30 percent of the backfill volume should be larger than ¾ inch in the largest dimension.

Trench backfill shall be compacted to 90 percent of the laboratory maximum dry density as per ASTM Standard D1557 test method. At least the upper twelve (12) inches of trench underlying pavements should be compacted to at least 95 percent of the laboratory maximum dry density.

Trench backfill shall be compacted by mechanical methods, such as sheepsfoot, vibrating or pneumatic rollers, or mechanical tampers, to achieve the density specified herein. The backfill materials shall be brought to within two (2) percent of optimum moisture content and then placed in horizontal layers. The thickness of uncompacted layers should not exceed eight (8) inches. Each layer shall be evenly spread, moistened or dried as necessary, and then tamped or rolled until the specified density has been achieved.

The contractor shall select the equipment and processes to be used to achieve the specified density without damage to adjacent ground and completed work. The field density of the compacted soils shall be measured by the ASTM Standard D1556 or ASTM Standard D2922 test methods or equivalent. Observation and field tests should be performed by Converse during construction to confirm that the required degree of compaction has been obtained. Where compaction is less than that specified, additional compactive effort shall be made with adjustment of the moisture content as necessary, until the specified compaction is obtained. It should be the responsibility of the contractor to maintain safe conditions during cut and/or fill operations. Trench backfill shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the project's geotechnical consultant indicate that the moisture content and density of the fill are as previously specified.

Imported soils, if any, used as compacted trench backfill should be predominantly granular and meet the following criteria:

- Expansion Index less than 20
- Free of all deleterious materials
- Contain no particles larger than 3 inches in the largest dimension
- Contain less than 30 percent by weight retained on ¾-inch sieve
- Contain at least 15 percent fines (passing #200 sieve)
- Have a Plasticity Index of 10 or less

Any import fill should be tested and approved by the geotechnical representative prior to delivery to the site.

2.6.10 Temporary Excavations

Based on the materials encountered in the exploratory borings, sloped temporary excavations may be constructed according to the slope ratios presented in the following table:

Table No. 3, Slope Ratios for Temporary Excavation

Maximum Depth of Cut (feet)	Maximum Slope Ratio* (horizontal: vertical)
0 – 4	vertical
4 – 8	1:1
>8	1.5:1

*Slope ratio assumed to be uniform from top to toe of slope.

Any loose utility trench backfill or other fill encountered in excavations will be less stable than the native soils. Temporary cuts encountering loose fill or loose dry sand should be constructed at a flatter gradient than presented in the table above. Surfaces exposed in slope excavations should be kept moist but not saturated to minimize raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods of rainfall. Surcharge loads, including construction, should not be placed within five (5) feet of the unsupported excavation edge.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act of 1987 and current amendments, and the Construction Safety Act should be met. The soils exposed in cuts should be

observed during exc avation by the project's geotechnical consultant. If potentially unstable soil conditions are enc ountered, modifications of slope ratios for temporary cuts may be required.

3.0 SITE NO. 2A – ROADWAY REPAIR SITE

3.1 Site Description

Site No. 2A is located at about 1,000 feet s outheast of Site No. 1, just south of the Behner Intake. It is our understanding that the existing asphalt paved roadway (Arroyo Seco Canyon Road/Gabrieleno Trail) was er oded for approxim ate 145 feet in length along the westerly shoulder during 2009-2010 storms and subsequent canyon floods. K-rails are currently in place along the western edge of the roadway. The northern segment of road erosion scarp is about 4 to 5 feet in vertical height and about 90 feet in length along roadway. The scarp exposed older alluvial soil consisting of brown silty sand with cobbles and boulders. The southern segment of road erosion scarp is about 1 foot in height and about 55 feet in length. The southern scarp exposed soil layer about 6 inches in height underlain by very hard, massive grantic rock.

The site is situated at about 1192 feet MSL. The site coor dinates are: North latitude: 34.2075 degrees and West longi tude: 118.1681 degrees. The project site is depicted on Drawing No. 2b, *Site No. 2A, Boring Location Map*.

3.2 Scope of Work

The scope of our pres ent study includes site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering anal ysis, and preparat ion of this report. Details of the tasks are addressed in the following sections:

3.2.1 Project Setup and Site Reconnaissance

A Converse geologist conducted a site reconnaissance on June 20, 2013. The purpose of the reconnaissance was to evalua te site conditions with respect to the lo cation of th e borings and drill rig accessibility. The Underground Services Alert (USA) was notified on June 28, 2013 within 14 calendar days prior to field exploration.

3.2.2 Subsurface Exploration

One boring (BH-3) was drilled to 5 feet below existing r oadway ground surface on July 9, 2013. The borings were drilled with a limited access drill rig equip ped with 12-inc h diameter bucket augers for soil sampling. The boring was visually logg ed

and sampled at regular depth intervals and at changes in subsurface soils. The boring was backfilled and compacted with soil cuttings and patched with asphalt after completion of drilling. The boring encountered refusal at shallow depths due to very hard grantic bedrock. The locations of borings are shown on the attached *Drawing No. 2b, Site No. 2A, Boring Location Map*.

California Modified Sampler (Ring samples), and bulk soil samples were obtained for laboratory testing. The bore holes were backfilled and compacted with soil cuttings after the completion of field testing.

3.2.3 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in the classification and to evaluate relevant engineering properties. The tests performed included:

- *In situ* moisture contents and dry densities (ASTM Standard D2216)
- Grain-Size Analysis (ASTM D422)
- Soil corrosivity tests (Caltrans 643, 422, 417 and 532)

The detailed description of the laboratory test methods and test results are presented in Appendix B, *Laboratory Testing Program*.

3.2.4 Analyses and Report

Data obtained from the exploratory fieldwork and laboratory-testing program were analyzed and evaluated with respect to the proposed development. Recommendations for retaining walls, foundations, earthwork, and pavement structural section are provided.

3.3 Subsurface Conditions

3.3.1 Subsurface Soil Profile of Project Site

Based on our field observations, older alluvial soil (Map symbol: Qoa) and grantic bedrock (Map symbol: gr) were exposed on the erosion scarps underneath the roadway. Based on our exploratory soil boring (BH-3), the explored location is underlain by about 3-foot thick sandy soils over by grantic bedrock. The upper 1 foot of bedrock was highly weathered. The bedrock below the weather zone is massive and very hard. The detailed descriptions of the borings are presented in Appendix A, Field Exploration.

3.3.2 Groundwater

Groundwater was not encountered in our exploratory borings to a maximum depth of 3.5 feet. In accordance with the Seismic Hazard Zone Report for the Pasadena Quadrangle (CDMG, 1998), the historic highest groundwater level contours are not defined at this location. However, the roadway is adjacent to existing stream channel, seasonal high groundwater is anticipated to be shallow.

3.3.3 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and geologic characteristics of the earth material at the site, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring locations. If during construction, subsurface conditions differ significantly from those presented in this report, this office should be notified immediately so that recommendations can be modified, if necessary.

3.4 Faulting and Geologic Hazards

Geologic hazards are defined as geologically related conditions that may present a potential danger to life and property. Typical geologic hazards in Southern California include earthquake ground shaking, fault surface rupture, landslides, and liquefaction.

3.4.1 Fault Surface Rupture and Active Faults

The project site is not located within a currently designated State of California Earthquake Fault Zone (formerly Alquist-Priolo Special Studies Zones) for surface fault rupture. Based on Drawing No. 3, Regional Geologic Map (Dibblee, 1989), the trace of Tujunga Fault is located at approximate 1,000 feet south of the project site.

3.4.2 Liquefaction

Liquefaction is the sudden decrease in the strength of cohesionless soils due to dynamic or cyclic shaking. Saturated soils behave temporarily as a viscous fluid (liquefaction) and, consequently, lose their capacity to support the structures founded on them. The potential for liquefaction decreases with increasing clay and gravel content, but increases as the ground acceleration and duration of shaking increase. Liquefaction potential has been found to be the greatest where the groundwater level and loose sands occur within 50 feet of the ground surface. The site is not located

within a mapped Seismic Hazard Zone for liquefaction (CDMG, 1998) as shown in Drawing No. 4, *Seismic Hazard Zones Map*.

Based on the results of our subsurface exploration, the site has shallow grantic bedrock, it is our professional opinion that the site is not susceptible to liquefaction and seismically-induced settlement to be negligible.

3.4.3 Landslides

The Grantic bedrock slope east of the site is located within a Seismic Hazard Zone for required investigation for earthquake-induced landsliding (CDMG, 1999). Based on our field observations of bedrock slope, it is our opinion the slope is stable at its current condition. However, small rock fall hazard should be expected due to steepness of the slope.

3.4.4 Flood Zone

Based on the information provided by Carollo Engineers, the roadway repair site is located within a 5-year floodplain. The roadway is located along the Arroyo Seco Canyon floodplain and is subject to potential flooding following periods of heavy rainfall. The retaining wall should be designed considering the inundation and scour by flood events. Flood protection measures are recommended for new structures. Channel armor may be necessary to protect the retaining wall. Maintenance of roadway will be required after flood events.

3.5 Seismic Analysis

3.5.1 CBC Seismic Design Parameters

Seismic parameters based on the 2010 California Building Code are calculated using the United States Geological Survey computer program *Seismic Hazards Curves, Response Parameters and Design Parameters, Version 5.1.0a.* The seismic parameters are presented below.

Table No. 4, 2010 CBC Seismic Parameters For Site No. 2A

Seismic Parameters	
Site Class	C
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_S	2.636g
Mapped 1-second Spectral Response Acceleration, S_1	0.973g
Site Coefficient (from Table 1613.5.3(1)), F_a	1.0
Site Coefficient (from Table 1613.5.3(2)), F_v	1.3
MCE 0.2-sec period Spectral Response Acceleration, S_{MS}	2.636g
MCE 1-second period Spectral Response Acceleration, S_{M1}	1.265g
Design Spectral Response Acceleration for short period, S_{DS}	1.757g
Design Spectral Response Acceleration for 1-second period, S_{D1}	0.843g
Seismic Design Category	D

3.5.2 Deaggregated Seismic Source Parameters

Based on our analyses utilizing the USGS 2008 NSHM P PSHA Interactive Deaggregation website, the mean and modal ear thquake magnitudes for a return ti me of 2475 years are calculated to be 6.89 and 7.02, respectively. The earthquake magnitude of 7.02 should be considered for seismic analyses at the project site.

3.6 Conclusions and Recommendations

3.6.1 Retaining Wall Recommendations

We recommend a training wall along the west shoulder of the roadway be constructed to support and restore the existing roadway. T he training wail is expected to be from 3 to 6 feet in height and should be designed for an active pressure in terms of equivalen t fluid pressure of 90 pcf, considering both earth and hydrostatic pr essure behind the wall.

Walls subjected to surcharge loads located wit hin a dis tance equal to the height of the wall should be designed for an additional unifo rm lateral pressure equal to one-third or one-half the anticipated surcharge load fo r unrestrained or restrained walls, respectively. These values are applic able for backfill placed between the wall stem and an imaginary plane rising 45 degrees from below the edge (heel) of the wall footings.

Retaining wall should be supp orted by ca st-in-drilled-hole (CIDH) piles embedded at least 8 feet into older alluvial soils (nort hern segment) or at least 3 feet into grantic bedrock (southern segment). CIDH piles s hould be at least 18 inches in diameter with 8 feet center-to-center spacing. Pile bearing capacities c an be calculated using allowable

skin friction of 400 psf and 800 psf for older alluvium and competent grantic bedrock, respectively. Uplift capacity can be taken as one-half of the downward pile capacity.

A coefficient of friction of 0.4 can be assumed for concrete in contact with firm older alluvium and bedrock. An allowable passive earth pressure in terms of equivalent fluid pressure of 300 pcf and 500 pcf up to a maximum of 4,000 psf can be used for firm older alluvial soils and bedrock, respectively. If pile spacing is greater than 3 times pile diameter, the passive pressure can be doubled.

For any backfills, excavated site soils, free of deleterious materials and rock particles larger than three (3) inches in the largest dimension, are suitable for placement as compacted fill. Any proposed import fill should be evaluated and approved by Converse prior to import to the site. Import fill material should have an expansion index less than 20. Prior to compaction, fill materials should be thoroughly mixed and moisture conditioned within two (2) percent above the optimum moisture content. Fill soils shall be evenly spread in maximum 8-inch lifts, watered or dried as necessary, mixed and compacted to at least the density specified below. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. All fill, if not specified otherwise elsewhere, should be compacted to at least 90 percent of the laboratory dry density in accordance with the ASTM Standard D1557 test method.

3.6.2 Flexible Pavement Recommendations

The flexible pavement structural section design recommendations were performed in accordance with the method contained in the *CALTRANS Highway Design Manual*, Chapter 630 without the factor of safety. No specific traffic study was performed to determine the Traffic Index (TI) for the proposed project. The recommended flexible pavement structural sections for various TI conditions are presented in the following table:

Table No. 5, Flexible Pavement Structural Sections

Design Subgrade R-value	Design TI	PAVEMENT STRUCTURAL SECTIONS		FULL AC STRUCTURAL SECTION
		AC (inches)	AB (inches)	AC (inches)
50*	4	2	2	3
	5	3	2	4
	6	3	4	5

* maximum allowable R-value for design

Actual traffic index and traffic load should be determined by either Civil Engineer or Traffic Engineer. The above pavement sections are recommended as a guideline for basic usage of the indicated TI values, and may not be sufficient for actual traffic loading.

Base material shall conform to requirements for a Class 2 Crushed Aggregate Base (CAB) or equivalent (such as crushed miscellaneous base - CMB) and should be placed in accordance with the requirements of the Standard Specifications for Public Works Construction (SSPWC, Latest Edition). Asphaltic materials should conform to Section 203-1, "*Paving Asphalt*," and should be placed in accordance with Section 302-5, "*Asphalt Concrete Pavement*," of the SSPWC.

3.6.3 Earthwork

The earthwork anticipated for the roadway improvement includes CIDH pile excavations and subgrade preparation. To prepare the subgrade underneath the pavement, we recommend scarify the subgrade at least 6 inches, moisture conditioned as needed to near optimum moisture content, and compacted to 90 percent relative compaction for slab support. Deeper removal will be needed if soft soil conditions expose at the excavation bottom.

All engineered fill should be placed on competent, scarified and compacted bottom as evaluated by the geotechnical engineer and in accordance with the recommendations presented in this section. Excavated site soils, free of deleterious materials and rock particles larger than three (3) inches in the largest dimension, should be suitable for placement as compacted fill. Any proposed import fill should be evaluated and approved by Converse prior to import to the site. Import fill material should have an expansion index less than 20.

The onsite materials will contain large amount of gravels, cobbles, boulders and very hard grantic bedrock. Based on our field exploration, the earth materials at the site may be excavated with conventional heavy-duty earth moving and trenching equipment in general. Difficult drilling and excavation conditions shall be also anticipated and other suitable equipment and methods should be used.

Prior to compaction, fill materials should be thoroughly mixed and moisture conditioned within two (2) percent above the optimum moisture content. Fill soils shall be evenly spread in maximum 8-inch lifts, watered or dried as necessary, mixed and compacted to at least the density specified below. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. All fill, if not specified otherwise elsewhere in this report, should be compacted to at least 90 percent of the laboratory dry density in accordance with the ASTM Standard D1557 test method.

4.0 SITE NO. 2C – 2nd CANDIDATE SITE FOR PUBLIC RESTROOM

4.1 Site Description

Site No. 2C is located at a relative flat area on the east side of Gabrieleno Trail just north of the JPL parking area south of a junction of two stream channels. The preliminarily planned restroom building is located on the northern portion of the site, and the onsite wastewater treatment system (OWTS) is located on the southern portion. The site is about 3 feet higher than the existing road and the surface conditions consist of bushes and some mature trees. An approximate 120 feet high ascending grantic bedrock slope to a building pad is located about 60 feet east of boring BH-5. The slope is steeper than 1H:1V.

The site is situated at about 1162 feet MSL. The site coordinates are: North latitude: 34.2102 degrees and West longitude: 118.1713 degrees. The project site is depicted on Drawing No. 2c, *Site No. 2C, Boring Location Map*.

4.2 Scope of Work

The scope of our present study includes site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analysis, and preparation of this report. Details of the tasks are addressed in the following sections:

4.2.1 Project Setup and Site Reconnaissance

A Converse geologist conducted a site reconnaissance on June 20, 2013. The purpose of the reconnaissance was to evaluate site conditions with respect to the location of the borings and drill rig accessibility. The Underground Services Alert (USA) was notified on June 28, 2013 within 14 calendar days prior to field exploration.

4.2.2 Subsurface Exploration and Percolation Testing

Three (3) borings, including two borings (BH-4 and BH-4A) within the planned restroom area and one boring (BH-5) within the planned wastewater treatment system (leach lines) area, were drilled a maximum 3.5 feet below existing ground surface on July 10, 2013. The borings were drilled with a limited access drill rig equipped with 12-inch and 24-inch diameter bucket augers for soil sampling. Each boring was visually logged and sampled at changes in subsurface soils. The borings were backfilled with soil cuttings after completion of testing. All three borings encountered refusals at shallow depths due to very hard grantic bedrock. The boring BH-4A was an additional attempt after

refusal at BH-4. The locations of borings are shown on the attached Drawing No. 2c, Site No. 2C, Boring Location Map.

California Modified Sampler (Ring samples), and bulk soil samples were obtained for laboratory testing. The bore holes were backfilled and compacted with soil cuttings after the completion of field testing.

Boring BH-5 was utilized for percolation tests prior to backfill. Percolation test procedures and test results are further discussed in Section 4.6.1, Preliminary OWTS Feasibility Evaluation. The raw data of percolation testing is presented in Appendix C, *Percolation Testing Data*.

4.2.3 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in the classification and to evaluate relevant engineering properties. The tests performed included:

- *In situ* moisture contents and dry densities (ASTM Standard D2216)
- Grain-Size Analysis (ASTM D422)
- Soil corrosivity tests (Caltrans 643, 422, 417 and 532)
- R-value

The detailed description of the laboratory test methods and test results are presented in Appendix B, *Laboratory Testing Program*.

4.2.4 Analyses and Report

Data obtained from the exploratory fieldwork and laboratory-testing program were analyzed and evaluated with respect to the proposed development. Feasibility evaluation of OWTS are provided.

4.3 Subsurface Conditions

4.3.1 Subsurface Soil Profile of Project Site

Based on our exploratory soil borings (BH-4, BH-4A and BH-5) at the site, the site is underlain by thin sandy soils over very hard grantic bedrock (Map symbol: gr). The bedrock was encountered at about 6 inches to 2.5 feet below the ground surface. The detailed descriptions of the borings are presented in Appendix A, Field Exploration.

Although the bedrock is considered as an excellent material to support the building foundation, however, it is impermeable and not suitable for the planned leach field.

4.3.2 Groundwater

Groundwater was not encountered in our exploratory borings to a maximum depth of 2.5 feet. In accordance with the Seismic Hazard Zone Report for the Pasadena Quadrangle (CDMG, 1998), the historic highest groundwater level is reportedly at depth of approximately 20 feet at the site.

4.3.3 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and geologic characteristics of the earth material at the site, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring locations. If during construction, subsurface conditions differ significantly from those presented in this report, this office should be notified immediately so that recommendations can be modified, if necessary.

4.4 Faulting and Geologic Hazards

Geologic hazards are defined as geologically related conditions that may present a potential danger to life and property. Typical geologic hazards in Southern California include earthquake ground shaking, fault surface rupture, landslides, and liquefaction.

4.4.1 Fault Surface Rupture and Active Faults

The project site is not located within a currently designated State of California Earthquake Fault Zone (formerly Alquist-Priolo Special Studies Zones) for surface fault rupture. Based on Drawing No. 3, Regional Geologic Map (Dibblee, 1989), the trace of Tujunga Fault is located at approximate 80 feet south of the project site.

4.4.2 Liquefaction

Liquefaction is the sudden decrease in the strength of cohesionless soils due to dynamic or cyclic shaking. Saturated soils behave temporarily as a viscous fluid (liquefaction) and, consequently, lose their capacity to support the structures founded on them. The potential for liquefaction decreases with increasing clay and gravel content, but increases as the ground acceleration and duration of shaking increase. Liquefaction potential has been found to be the greatest where the groundwater level

and loose sands occur within 50 feet of the ground surface. The site is not located within a mapped Seismic Hazard Zone for liquefaction (CDMG, 1998) as shown in Drawing No. 4, *Seismic Hazard Zones Map*.

Based on the results of our subsurface exploration, the site has shallow Grantic bedrock, it is our professional opinion that the site is not susceptible to liquefaction and seismically-induced settlement to be negligible.

4.4.3 Landslides

The grantic bedrock slope east of the site is located within a Seismic Hazard Zone for required investigation for earthquake-induced landsliding (CDMG, 1999). Based on our field observations of bedrock slope, it is our opinion the slope is stable at its current condition. However, small rock fall hazard should be expected due to steepness of the slope.

4.4.4 Flood Zone

The proposed restroom site is located in the Arroyo Seco Canyon near the confluence to two tributary drainage canyons. The site is subject to potential flooding following major storm events and/or wildfires.

4.5 Seismic Analysis

4.5.1 CBC Seismic Design Parameters

Seismic parameters based on the 2010 California Building Code are calculated using the United States Geological Survey computer program *Seismic Hazards Curves, Response Parameters and Design Parameters, Version 5.1.0a.* The seismic parameters are presented below.

Table No. 6, 2010 CBC Seismic Parameters For Site No. 2C

Seismic Parameters	
Site Class	B
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_S	2.656g
Mapped 1-second Spectral Response Acceleration, S_1	0.979g
Site Coefficient (from Table 1613.5.3(1)), F_a	1.0
Site Coefficient (from Table 1613.5.3(2)), F_v	1.0
MCE 0.2-sec period Spectral Response Acceleration, S_{MS}	2.656g
MCE 1-second period Spectral Response Acceleration, S_{M1}	0.979g

Design Spectral Response Acceleration for short period, S_{DS}	1.771g
Design Spectral Response Acceleration for 1-second period, S_{D1}	0.953g
Seismic Design Category	D

4.5.2 Deaggregated Seismic Source Parameters

Based on our analyses utilizing the USGS 2008 NSHM P PSHA Interactive Deaggregation website, the mean and modal ear thquake magnitudes for a return ti me of 2475 years are calculated to be 6.89 and 7.02, respectively. The earthquake magnitude of 7.02 should be considered for seismic analyses at the project site.

4.6 Conclusions and Recommendations

4.6.1 Preliminary OWTS Feasibility Evaluation

The boring BH-5 was utilized to perform percolation t ests on July 10 and 1 1, 2013 to evaluate the feasibility of onsite wastewater treatment system. Water was a dded to the bore hole until the water level was at the ground surface on July 10, 2013 and allowed to pre-soak for one day. Based on our obs ervations on July 11, 2013, water still remained in the borehole after the one-day pre-soak. In accordance with the LA County guidelines, **Site No. 2C is not feasible for the construction of onsite wastewater treatment system.** The site is underlain by shallow, hard bedrock with littl e permeability.

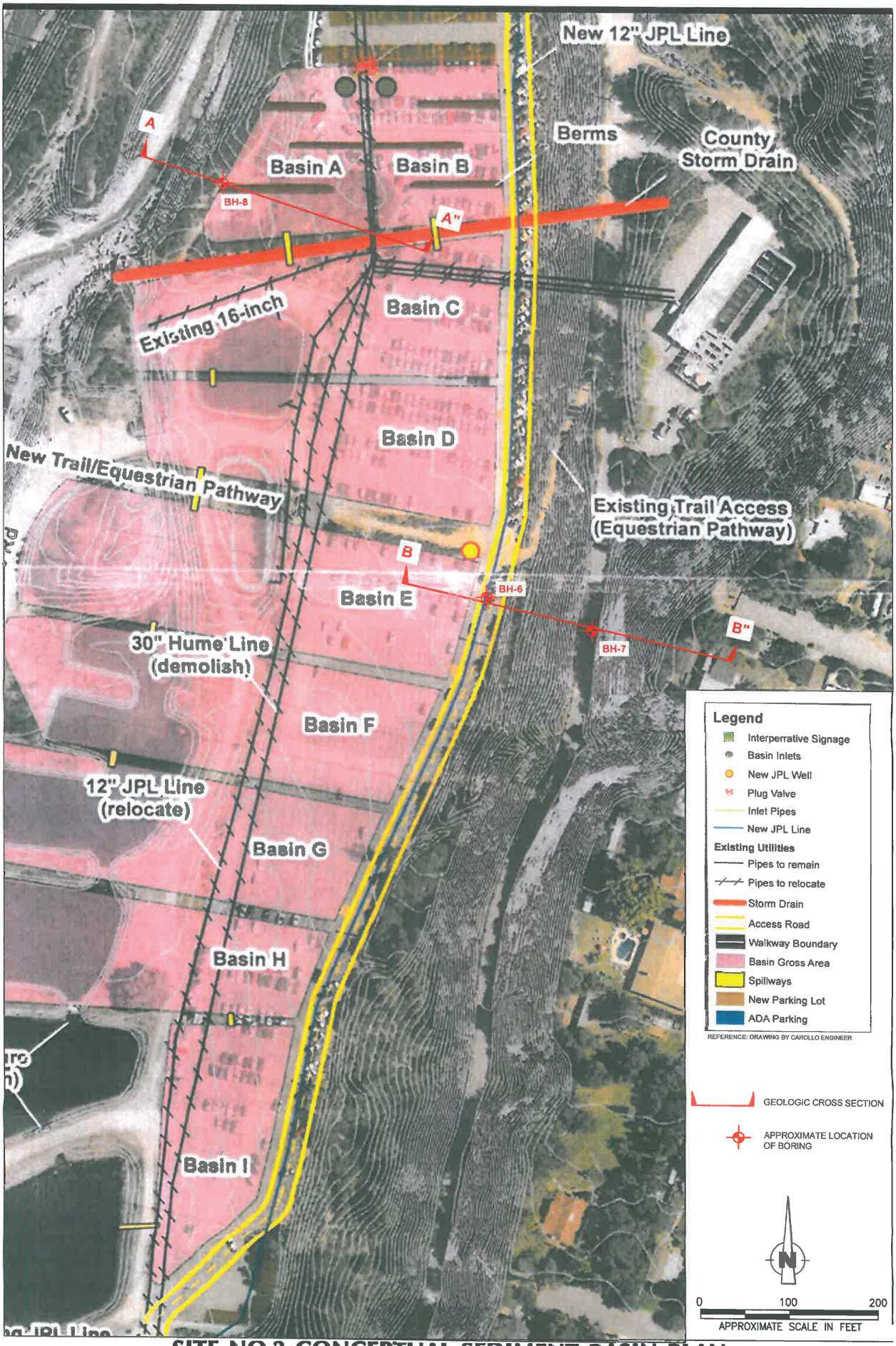
Since this site is not suitable for the public restroom, further geotechnical recommendation is not provided.

5.0 SITE NO. 3 – STORMWATER SEDIMENT BASIN SITE

5.1 Site Description

Site No. 3 is located at the southernmost part of the proj ect, including the existing JPL parking area and existing sediment basins. The surface conditions consis t of asphalt concrete pavement and unpaved ground.

It is understood that the southern portion of the existing JPL parking area will be demolished for the future sediment basin ex pansion. The construction of basins will consist of excav ating approximate 1 foot below the existing grade and constructing about 2-foot-high berms around th e basins. Although not fina lized, the conceptual plan provided by Carollo is illustrated on Drawing No. 5, *Site No. 3, Conceptual Sediment Basin Plan* for reference.



SITE NO.3 CONCEPTUAL SEDIMENT BASIN PLAN

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
5

5.2 Scope of Work

The scope of our present study includes site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analysis, and preparation of this report. Details of the tasks are addressed in the following sections:

5.2.1 Project Setup and Site Reconnaissance

A Converse geologist conducted a site reconnaissance on June 20, 2013. The purpose of the reconnaissance was to evaluate site conditions with respect to the location of the borings and drill rig accessibility. The Underground Services Alert (USA) was notified on June 28, 2013 within 14 calendar days prior to field exploration.

5.2.2 Subsurface Exploration and Percolation Testing

A total of nine (9) borings were drilled, including 3 borings (BH-6 through BH-8) to a maximum depth of 21 feet near the slopes, 3 borings (BH-9 through BH-11) to about 5 feet within the existing paved parking lot, and 3 borings (BH-12 though BH-14) to about 5 feet within the existing sediment basins. The locations of borings are shown on the attached Drawing No. 2d, *Site No. 3, Boring Location Map.*

The borings were drilled with a truck-mounted drill rig equipped with 8-inch diameter hollow-stem auger and a 4-inch diameter hand auger for soil sampling and/or percolation testing. Each boring will be visually logged and sampled at regular depth intervals and at changes in subsurface soils. The borings will be backfilled with soil cuttings and patched with asphalt where needed.

During our drilling at Boring BH-7 location, the driller hit a 16-inch water main pipe on July 12, 2013. Prior to using drill rig, the driller attempted to hand auger the upper 5 feet below ground surface (bgs). However, the hand augering encountered refusal due to big cobbles at about 3 feet bgs. The driller started to use drill rig to drill the boring, and then hit the water main at about 4 to 5 feet bgs.

This incident created a cavity on the existing roadway and erosion scarps on both sides of roadway. Based on our visual observations, the cavity was about maximum 15 feet in width and 10 feet in depth. The erosion scarp on the east side of roadway created a near vertical ascending slope up to approximate 20 feet in height. This slope exposed terrance deposits consisting of silty sand with cobbles and boulders. Some cobbles and boulders were exposed on the slope that may cause potential rock fall hazard.

Converse revisited the site on July 23, 2013. Based on our observations, the cavity on the road had been backfilled with slurry to about 80% of road width and the road was accessible to the recreational traffic.

5.2.3 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in the classification and to evaluate relevant engineering properties. The tests performed included:

- *In situ* moisture contents and dry densities (ASTM Standard D2216)
- Grain-Size Analysis (ASTM D422)
- Maximum dry density and optimum-moisture content relationship (ASTM Standard D1557)
- Direct shear (ASTM Standard D3080)
- Consolidation (ASTM Standard D2435)
- Soil corrosivity tests (Caltrans 643, 422, 417 and 532)

The detailed description of the laboratory test methods and test results are presented in Appendix B, *Laboratory Testing Program*.

5.2.4 Analyses and Report

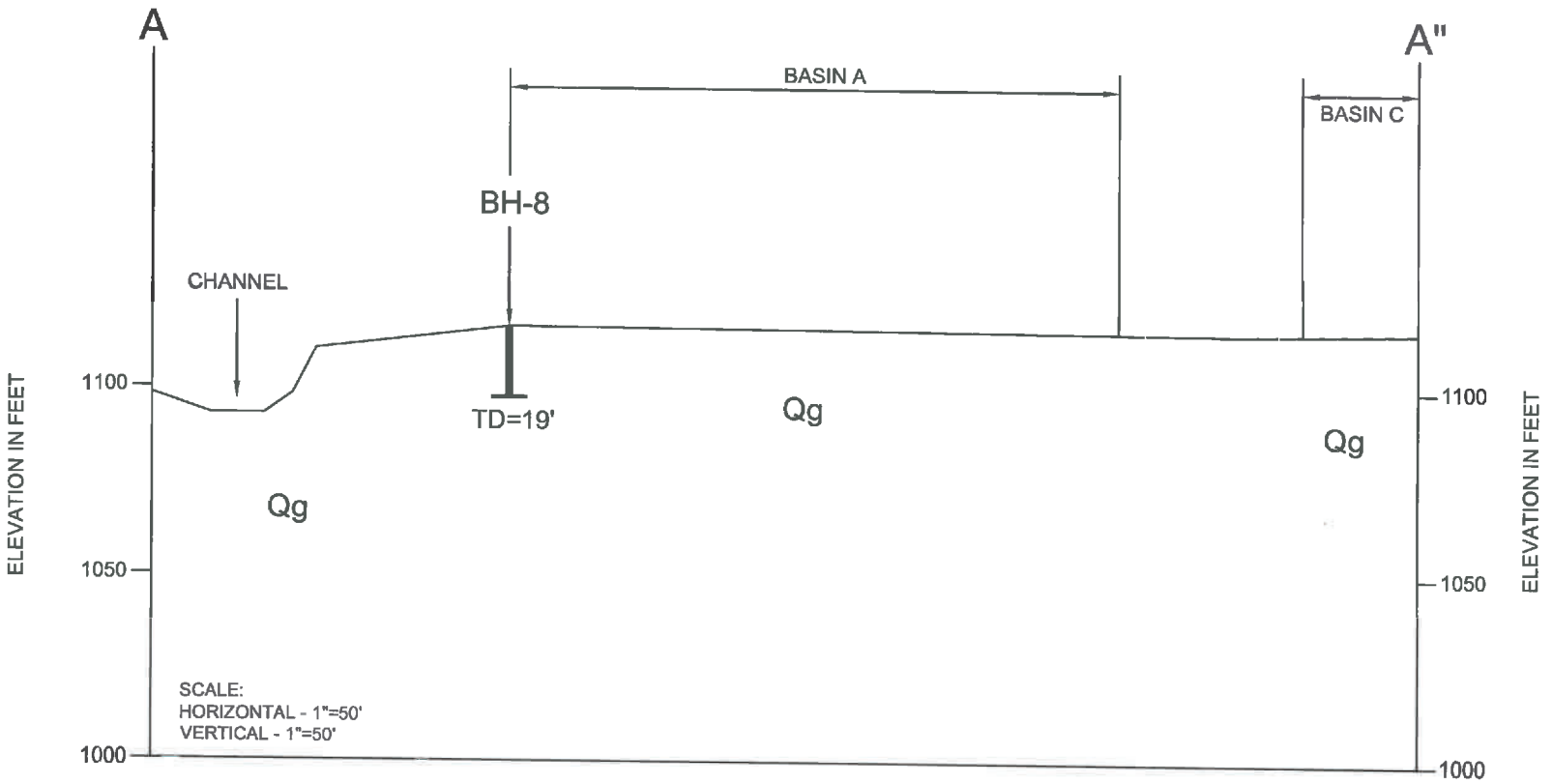
Percolation test results and slope stability were analyzed and evaluated with respect to the proposed development. Preliminary earthwork recommendations are presented.

5.3 Subsurface Conditions

5.3.1 Subsurface Soil Profile of Project Site

Based on our exploratory soil borings, stream deposits (Map symbol: Qg) and terrace deposits (Map symbol: Qof) both consisting of primarily light brown silty sand with numerous cobbles and boulders were encountered to a maximum explored depth of 21 feet below existing ground surface (bgs). The stream deposits and terrace deposits are both moderately dense to very dense. The detailed descriptions of the borings are presented in Appendix A, Field Exploration.

Drawing No. 6a and 6b are prepared to illustrate the geologic cross sections of A-A' and B-B' for slope stability analyses.



EXPLANATION

Qg - STREAM DEPOSIT

TD - TOTAL DEPTH

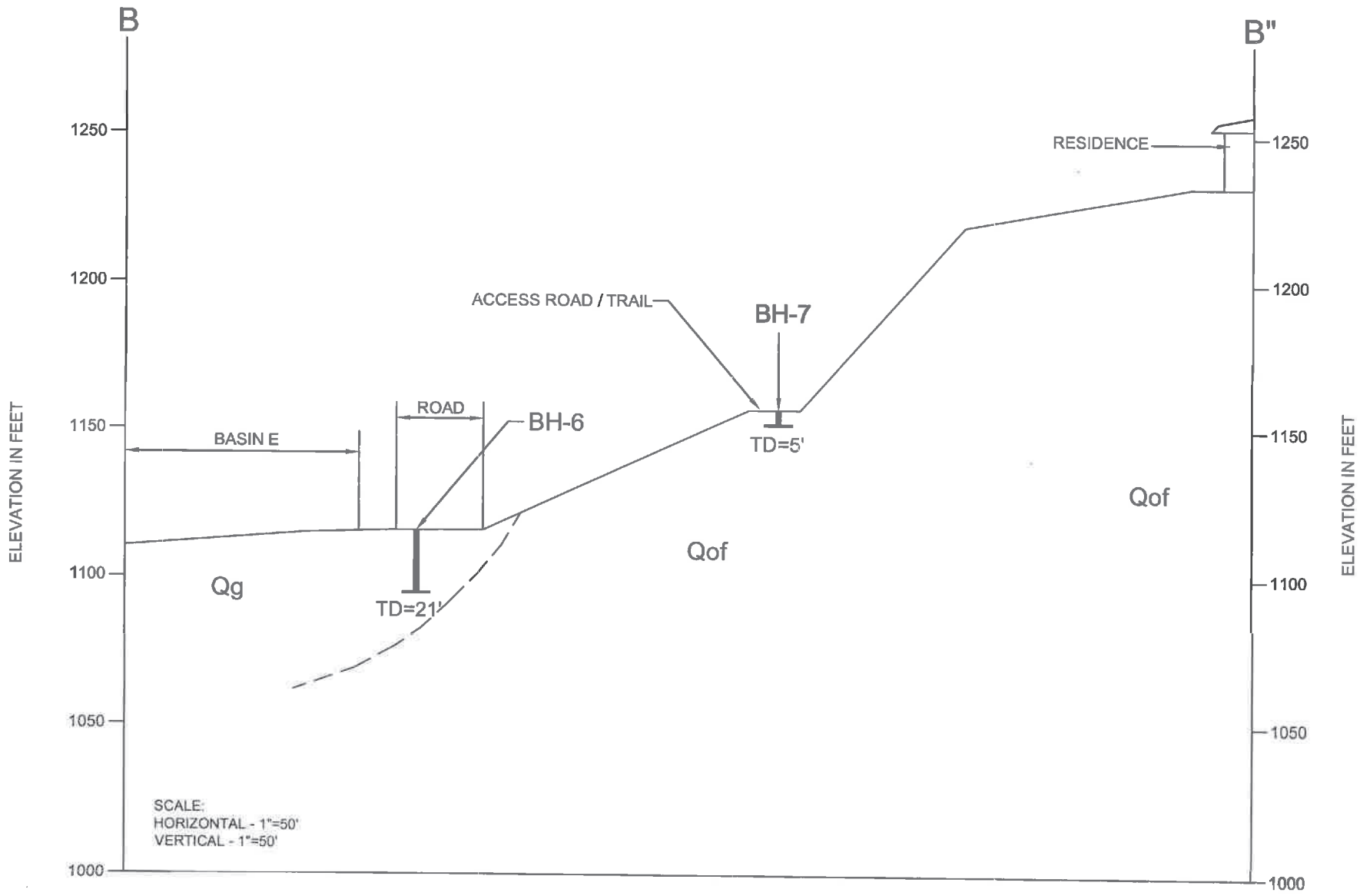
GEOLOGIC CROSS SECTION A-A"

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ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. 6a



EXPLANATION

Qg - STREAM DEPOSIT

TD - TOTAL DEPTH

GEOLOGIC CROSS SECTION B-B"

Converse Consultants

ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. 6b

5.3.2 Groundwater

Groundwater was not encountered in our exploratory borings to a maximum depth of 21 feet. In accordance with the Seismic Hazard Zone Report for the Pasadena Quadrangle (CDMG, 1998), the historic highest groundwater level is reportedly at depths of approximately 20 feet.

5.3.3 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and geologic characteristics of the earth material at the site, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring locations. If during construction, subsurface conditions differ significantly from those presented in this report, this office should be notified immediately so that recommendations can be modified, if necessary.

5.4 Percolation Testing Results

The borings BH-9 through BH-14 were utilized to perform percolation tests on July 11 and 12 to evaluate the percolation rates for the design of future sediment basins. Tests were performed using the falling head test method in accordance with Los Angeles County "Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting"

The bored hole was cased using a two-inch diameter perforated PVC casing surrounded with filter gravel pack. Water was added to the bore hole until the water level was at the ground surface and allowed to pre-soak for at least 2 hours. After pre-soak, water was added to the bore hole until the water level was at the ground surface. The water level was measured to the nearest 1/100-foot and recorded every 10-minute interval. The results of the percolation tests are tabulated below and in Appendix C, Percolation Testing Data.

Table No. 7, Percolation Test Results at Site No. 3

Boring No.	Location	Depth of Test Hole* (feet)	Lowest Percolation Rate (inches/hour)	Average Percolation Rate (inches/hour)
BH-9	JPL Parking	5.0	6.58	7.87
BH-10	JPL Parking	5.0	11.52	15.90

BH-11	JPL Parking	5.0	4.50	6.65
BH-12	Sludge Basin 2	5.0	4.70	24.09
BH-13	Basin 8	3.0	27.51	58.65
BH-14	Basin 13	5.0	16.96	28.07

*approximate

The upper 5 feet of soils within Site No. 3 have high to very high percolation rates. Converse has reviewed a literature entitled "Seepage, Drainage and Flow Nets" by Cedregren (1989) to verify the percolation results and provide our opinions to the high percolation rates. The followings are some reasons to explain the high percolation rates.

- Young stream deposits from the river channel naturally have higher permeability than other alluvial soils. These sediments are generally loose and unconsolidated.
- Percolation test holes did not have fine sediments.
- Clean water was used for percolation tests.
- The soils surrounding the test holes (especially near surface soil) may be disturbed or loosened during drilling.
- The higher percolation rates near surface increased the average rates.

The soils encountered in the JPL parking lot and existing sediment basins are "Stream Deposits" from the Arroyo Seco Canyon, consisting of primarily gravelly sands with cobbles and boulders, which are excellent permeable materials. The typical permeability rates of gravelly sands range from 2.8 to 280 ft/day, however, the percent of fine sediments accumulated in soil will reduce the permeability down to 0.2 to 3 ft/day according to Cedergren (1989). Our test results are within the typical percolation rate range.

It is our opinion that the percolation rates presented on our table demonstrate the good percolation capacity of the onsite soils without considering fine sediment clogging. For planning or design purposes, it is recommended consider the lowest percolation rates among the tests because the percolation test holes are located at only a few scattered points over a fairly large area. Fine sediment clogging should be also considered into the design and maintenance plan for the stormwater spreading and recharge of the basins.

5.5 Slope Stability Analysis

Geologic cross sections A-A' and B-B' were analyzed for gross static slope stability by using a computer program SLOPE/W which utilizes various limiting equilibrium methods, including the ordinary slice, Bishop's, Jabu's, and Spencer's method.

To evaluate the influence of the future sediment basin expansion, groundwater level is assumed to be (1) at 20 feet below the ground surface, and (2) groundwater at ground surface, to simulate dry and saturated soil conditions underneath the sediment basins, respectively. The detailed analyses results are presented in Appendix D, Slope Stability Analyses. The summary of slope stability results are presented in the following table:

Table No. 8, Summary of Slope Factor of Safety

Cross Section	Groundwater Depth (feet)	Minimum Factor of Safety (Static)	Plate No.
A – A'	20	1.496	S-A1
	0	1.292	S-A2
B – B'	20	1.487	S-B1
	0	1.487	S-B2

As shown in the table above, the slope stability near the existing stream channel (Cross Section A-A') has a factor of safety greater than 1.496 at current condition. When the proposed new sediment basin with groundwater at surface is assumed, the factor of safety reduces to 1.292. The factors of safety in both cases remain above 1.0, which indicates this slope does not expose immediate instability. In general practices, most structures constructed on slopes require a minimum factor of safety of 1.5, and temporary grading requires a minimum factor of safety of 1.25. The proposed new Sediment Basin A is located in the area having 1.5 factor of safety, and the slope near the stream channel has factor of safety greater than 1.25 which meet the minimum requirements. It should be advised that this slope will be eroded by the stream from time to time, and the slope stability will be also changed by the slope profile.

The slope stability of the easterly slope (Cross Section B-B') has a factor of safety of 1.487 at current condition. When the proposed new sediment basin with groundwater at surface is assumed, the factor of safety remains the same, which suggests the saturation of subsurface soil will not impact the current slope stability.

5.6 Earthwork Recommendations

5.6.1 Earthwork and Site Grading

To construct the planned sediment basins, the anticipated earthwork and site grading includes excavations of basins and constructing berms. All berms should be constructed with a slope gradient less than 2H:1V.

All engineered fill should be placed on competent, scarified and compacted bottom as evaluated by the geotechnical engineer and in accordance with the recommendations presented in this section. Excavated site soils, free of deleterious materials and rock particles larger than three (3") inches in the largest dimension, should be suitable for placement as compacted fill. Any proposed import fill should be evaluated and approved by Converse prior to import to the site. Import fill material should have an expansion index less than 20.

The onsite materials will contain large amount of gravels, cobbles and boulders. Based on our field exploration, the earth materials at the site may be excavated with conventional heavy-duty earth moving and trenching equipment in general. Difficult drilling and excavation conditions should be also anticipated and other suitable equipment and methods should be used.

Prior to compaction, fill materials should be thoroughly mixed and moisture conditioned within two (2) percent above the optimum moisture content. Fill soils shall be evenly spread in maximum 8-inch lifts, watered or dried as necessary, mixed and compacted to at least the density specified below. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Engineer. All fill, if not specified otherwise elsewhere in this report, should be compacted to at least 90 percent of the laboratory dry density in accordance with the ASTM Standard D1557 test method. The upper 12 inches of subgrade below pavement areas should be compacted to 95 percent relative compaction.

5.6.2 Expansive Soil

The near surface soils have a "Very Low" expansive potential. Mitigation for expansive soil is not considered necessary.

5.6.3 Pipeline Backfill

Any soft and/or unsuitable material encountered at the pipe invert should be removed and replaced with an adequate bedding material. The pipe subgrade should be level, firm, uniform, free of loose materials and properly graded to provide uniform bearing

and support to the entire section of the pipe placed on bedding material. Protruding oversize particles larger than two (2) inches in the largest dimension, if any, should be removed from the trench bottom and replaced with compacted materials. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its full length as is practicable. The bedding zone is defined as that portion of the pipe trench from four inches below the pipe invert to one foot above the top of pipe, in accordance with Section 306-1.2.1 of the Latest Edition of the *Standard Specifications for Public Works Construction* (SSPWC).

The following specifications are recommended to provide a basis for quality control during the placement of trench backfill.

Trench excavations to receive backfill shall be free of trash, debris or other unsatisfactory materials at the time of backfill placement. Excavated on-site soils free of oversize particles, defined as larger than one (1) inch in maximum dimension in the upper 12 inches of subgrade soils and larger than three (3) inches in the largest dimension in the trench backfill below, and deleterious matter after proper processing may be used to backfill the trench zone. Imported trench backfill, if used, should be approved by the project soils consultant prior to delivery at the site. No more than 30 percent of the backfill volume should be larger than ¾ inch in the largest dimension.

Trench backfill shall be compacted to 90 percent of the laboratory maximum dry density as per ASTM Standard D1557 test method. At least the upper twelve (12) inches of trench underlying pavements should be compacted to at least 95 percent of the laboratory maximum dry density.

Trench backfill shall be compacted by mechanical methods, such as sheepsfoot, vibrating or pneumatic rollers, or mechanical tampers, to achieve the density specified herein. The backfill materials shall be brought to within two (2) percent of optimum moisture content and then placed in horizontal layers if the expansion index is less than or equal to 30. Should the expansion index be greater than 30, backfill materials shall be brought to approximately 2 percent above optimum moisture content. The thickness of uncompacted layers should not exceed eight (8) inches. Each layer shall be evenly spread, moistened or dried as necessary, and then tamped or rolled until the specified density has been achieved.

The contractor shall select the equipment and processes to be used to achieve the specified density without damage to adjacent ground and completed work. The field density of the compacted soils shall be measured by the ASTM Standard D1556 or ASTM Standard D2922 test methods or equivalent. Observation and field tests should be performed by Converse during construction to confirm that the required degree of

compaction has been obtained. Where compaction is less than that specified, additional compactive effort shall be made with adjustment of the moisture content as necessary, until the specified compaction is obtained. It should be the responsibility of the contractor to maintain safe conditions during cut and/or fill operations. Trench backfill shall not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the project's geotechnical consultant indicate that the moisture content and density of the fill are as previously specified.

Imported soils, if any, used as compacted trench backfill should be predominantly granular and meet the following criteria:

- Expansion Index less than 20
- Free of all deleterious materials
- Contain no particles larger than 3 inches in the largest dimension
- Contain less than 30 percent by weight retained on ¾-inch sieve
- Contain at least 15 percent fines (passing #200 sieve)
- Have a Plasticity Index of 10 or less

Any import fill should be tested and approved by the geotechnical representative prior to delivery to the site.

5.6.4 Temporary Excavations

Based on the materials encountered in the exploratory borings, sloped temporary excavations may be constructed according to the slope ratios presented in the following table:

Table No. 9, Slope Ratios for Temporary Excavation at Site No. 3

Maximum Depth of Cut (feet)	Maximum Slope Ratio* (horizontal: vertical)
0 – 4	vertical
4 – 8	1:1
>8	1.5:1

*Slope ratio assumed to be uniform from top to toe of slope.

Any loose utility trench backfill or other fill encountered in excavations will be less stable than the native soils. Temporary cuts encountering loose fill or loose dry sand should be constructed at a flatter gradient than presented in the table above. Surfaces exposed in slope excavations should be kept moist but not saturated to minimize raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods of rainfall. Surcharge loads, including construction, should not be placed within five (5) feet of the unsupported excavation edge.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act of 1987 and current amendments, and the Construction Safety Act should be met. The soils exposed in cuts should be observed during excavation by the project's geotechnical consultant. If potentially unstable soil conditions are encountered, modifications of slope ratios for temporary cuts may be required.

6.0 SLOPE REPAIR RECOMMENDATIONS

The erosion scarps caused by the broken water pipe incident on both sides of the existing roadway (Arroyo Seco Canyon Road) will require repairs to support the roadway.

For the erosion scarp below the roadway, we recommend soldier piles with wood lagging be used as the retaining system to support the roadway. The soldier piles should be embedded at least 8 feet below the lowest adjacent grade. The actual embedment depth should be determined by the design engineer. The pile capacity can be calculated using allowable skin friction of 350 psf. An allowable passive resistance in the terms of equivalent fluid pressure of 300 pcf can be used for lateral design. Passive resistance can be doubled if pile spacing is greater than 3 time diameter. The retaining wall should have proper subdrain or weepholes. Loose soils and debris washed down to the parking lot fence should be removed and cleared. Portions of the fence may have to be repaired and/or replaced.

For the erosion scarp on the ascending slope east of the roadway, we recommend a buttress system be constructed to increase the slope stability and reduce rock fall hazard. Gabions constructed to a 1H:1V slope ratio to a minimum height of 8 feet can be used as the buttress system, any oversized rocks with potential rock fall hazard should be removed from the slope face.

7.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

This report has been partially prepared to aid in the foundation plans and specifications, and to assist the architect, civil and structural engineers in the design of the proposed structures. It is recommended that this office be provided an opportunity to review final design drawings and specifications to verify that the recommendations of this report have been properly implemented.

Recommendations presented herein are based upon the assumption that adequate earthwork monitoring will be provided by the geotechnical engineer. Footing excavations should be observed by the geotechnical engineer prior to placement of steel and concrete so that footings are founded on satisfactory materials and excavations are free of loose and disturbed materials. Trench backfill should be placed and compacted with observation and field density testing provided by this office.

During construction, the geotechnical engineer and/or their authorized representatives should be present at the site to provide a source of advice to the client regarding the geotechnical aspects of the project and to observe and test the earthwork performed. Their presence should not be construed as an acceptance of responsibility for the performance of the completed work, since it is the sole responsibility of the contractor performing the work to ensure that it complies with all applicable plans, specifications, ordinances, etc.

This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and cannot be responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any recommended actions presented herein to be unsafe.

8.0 CLOSURE

The findings and recommendations of this report were prepared in accordance with generally accepted professional engineering and engineering geologic principles and practice. We make no other warranty, either expressed or implied. Our conclusions and recommendations are based on the results of the field and laboratory studies, combined with an interpolation and extrapolation of soil conditions between and beyond boring locations. If conditions encountered during construction appear to be different from those shown by the borings, this office should be notified.

Design recommendations given in this report are based on the assumption that the earthwork and site grading recommendations contained in this report are implemented.

Additional consultation may be prudent to interpret Converse's findings for contractors, or to possibly refine these recommendations based upon the review of the final site grading and actual site conditions encountered during construction. If the scope of the project changes, if project completion is to be delayed, or if the report is to be used for another purpose, this office should be consulted.

9.0 REFERENCES

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APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

Field exploration included a site reconnaissance and subsurface exploration program. During the site reconnaissance, the surface conditions were noted, and the approximate locations of the boring were determined. The exploratory borings were approximately located using existing boundary and other features as a guide and should be considered accurate only to the degree implied by the method used. The various field study methods performed are discussed below.

Exploratory Borings

Fourteen (14) exploratory borings (BH-1 through BH-14) were drilled within the project sites from July 8 to July 12, 2013. The borings were advanced using a limited access rig with 12-inch and 24-inch diameter bucket augers, and truck mounted 8-inch diameter hollow stem auger drill rig to depths ranging from 2.5 to 21 feet below the existing ground surface (bgs). Every boring was visually logged by a Converse engineer and sampled at regular intervals and at changes in subsurface soils.

California Modified Sampler (Ring samples), Standard Penetration Test samples, and bulk soil samples were obtained for laboratory testing. Standard Penetration Tests (SPTs) were performed in selected borings at selected intervals using a standard (1.4 inches inside diameter and 2.0 inches outside diameter) split-barrel sampler. The bore holes were backfilled and compacted with soil cuttings by reverse spinning of the auger following the completion of drilling and patched with asphalt.

Borings BH-2, BH-5, and BH-9 through BH-14 were utilized for percolation tests prior to backfill. Percolation test results are presented in Appendix C, *Percolation Testing Data*.

It should be noted that the exact depths at which material changes occur cannot always be established accurately. Changes in material conditions that occur between driven samples are indicated in the logs at the top of the next drive sample. A key to soil symbols and terms is presented as Drawing No. A-1, *Soil Classification Chart*. The log of the exploratory boring is presented in Drawing Nos. A-2 through A-15, *Log of Borings*.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINEC
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING LOG SYMBOLS

SAMPLE TYPE

- STANDARD PENETRATION TEST — Split barrel sampler in accordance with ASTM D-1586-84 Standard Test Method
- DRIVE SAMPLE 2.42" I.D. sampler.
- DRIVE SAMPLE No recovery
- BULK SAMPLE
- GROUNDWATER WHILE DRILLING
- GROUNDWATER AFTER DRILLING

LABORATORY TESTING ABBREVIATIONS

TEST TYPE (Results shown in Appendix B)

CLASSIFICATION

Plasticity	pi
Grain Size Analysis	ma
Passing No. 200 Sieve	wa
Sand Equivalent	se
Expansion Index	ei
Compaction Curve	max
Hydrometer	h

STRENGTH

Pocket Penetrometer	p
Direct Shear	ds
Direct Shear (single point)	ds*
Unconfined Compression	uc
Triaxial Compression	tx
Vane Shear	vs
Consolidation	c
Collapse Test	col
Resistance (R) Value	r
Chemical Analysis	ca
Electrical Resistivity	er

UNIFIED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

Project Name: ARROYO SECO CANYON PROJECT, PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-1

Log of Boring No. BH-1

Dates Drilled: 7/9/2013 Logged by: MDR Checked By: SCL

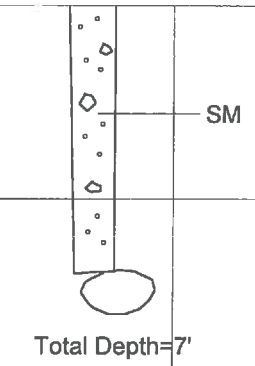
Equipment: 12" AUGER BUCKET Driving Weight and Drop: 866 lb Kelly Bar / 30"

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		STREAM DEPOSIT (Qg): **GRAVELLY SAND WITH SILT (SP-SM):** fine to medium-grained, some cobbles up to 12" in maximum dimension, light brown.						ca,er, max,ma
		-fine to coarse-grained, some gravels up to 3" in maximum dimension, light brown, cobbbles, boulders.			24	4	115	ds
5					32	12	117	c
		End of boring at 7 feet due to refusal of boulder. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings on 7-9-13.						

SKETCH

SCALE: 1"=5' (H=V)



Converse Consultants

Project Name: ARROYO SECO CANYON PROJECT PASADENA, CALIFORNIA

Project No.: 13-31-199-01

Drawing No.: A-2

Log of Boring No. BH-2

Dates Drilled: 7/8/2013 Logged by: MDR Checked By: SCL

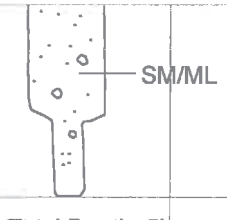
Equipment: 12" & 24" AUGER BUCKET Driving Weight and Drop: 866 lb Kelly Bar / 30"

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		OLDER ALLUVIUM (Qoa): **SILTY SAND TO SANDY SILT (SM/ML):** fine to coarse-grained, some gravels up to 3" in maximum dimension, brown. -at 3' encountered cobbles, changed to 12" diameter drill bit, difficult drilling with rocks.						ma
5		End of boring at 5 feet due to refusal of cobbles Groundwater not encountered during drilling. Borehole utilized for percolation testing Borehole backfilled with soil cuttings after completion of percolation testing on 7-9-13.						

SKETCH

SCALE: 1"=5' (H=V)



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Converse Consultants

Project Name: ARROYO SECO CANYON PROJECT PASADENA, CALIFORNIA

Project No.: 13-31-199-01

Drawing No.: A-3a

Log of Boring No. BH-2A

Dates Drilled: 7/9/2013 Logged by: MDR Checked By: SCL

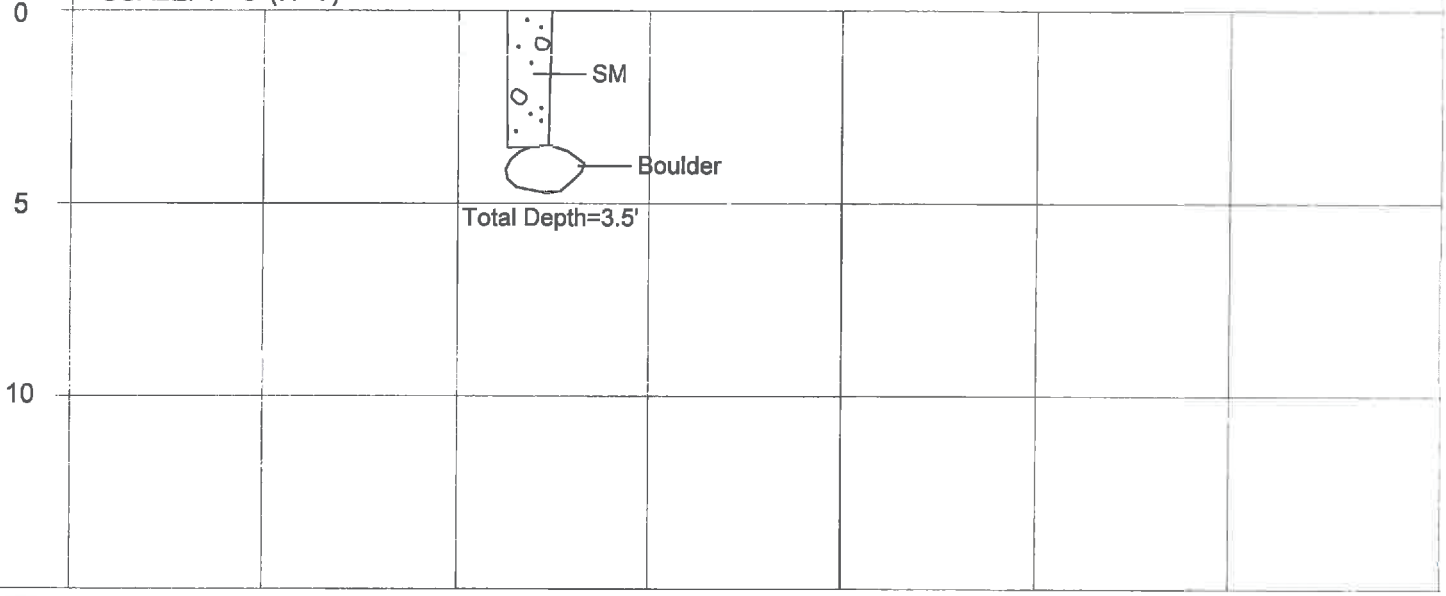
Equipment: 12" AUGER BUCKET Driving Weight and Drop: 866 lb Kelly Bar / 30"

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		OLDER ALLUVIUM (Qoa): **SILTY SAND(SM):** fine to coarse-grained, little gravels up to 3" in maximum dimension, few cobbles up to 2' in maximum dimension, brown.						
		End of boring at 3.5 feet due to refusal of bedrock Groundwater not encountered during drilling. Borehole utilized for percolation testing Borehole backfilled with soil cuttings after completion of drilling on 7-8-13.						

SKETCH

SCALE: 1"=5' (H=V)



Converse Consultants

Project Name: ARROYO SECO CANYON PROJECT PASADENA, CALIFORNIA

Project No.: 13-31-199-01

Drawing No.: A-3b

Log of Boring No. BH-3

Dates Drilled: 7/9/13 Logged by: MDR Checked By: SCL

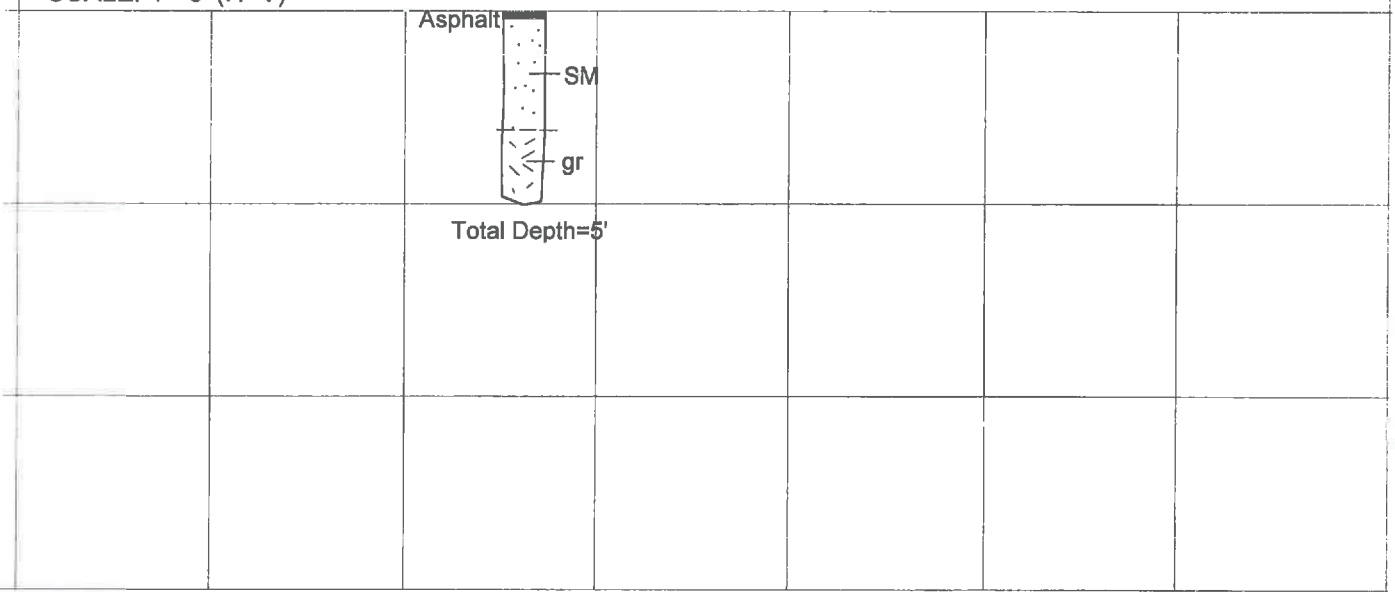
Equipment: 12" AUGER BUCKET Driving Weight and Drop: 866 lb Kelly Bar / 30"

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		3" ASPHALT WITH NO BASE						ca,er,r ma
		SILTY SAND(SM): fine-grained, gravels up to 2" in maximum dimension, brown.						
		GRANTIC BEDROCK (gr): weathered at upper 1 ft, very hard, gray, drilling refusal, hard, intact.			15	15	117	ds
5					50(2")			
		End of boring at 5 feet due to refusal of cobbles Groundwater not encountered during drilling. Borehole utilized for percolation testing Borehole backfilled with soil cuttings after completion of drilling on 7-9-13.						

SKETCH

SCALE: 1"=5' (H=V)



Converse Consultants

Project Name: ARROYO SECO CANYON PROJECT, PASADENA, CALIFORNIA

Project No.: 13-31-199-01

Drawing No.: A-4

Log of Boring No. BH-4A

Dates Drilled: 7/10/2013 Logged by: MDR Checked By: SCL

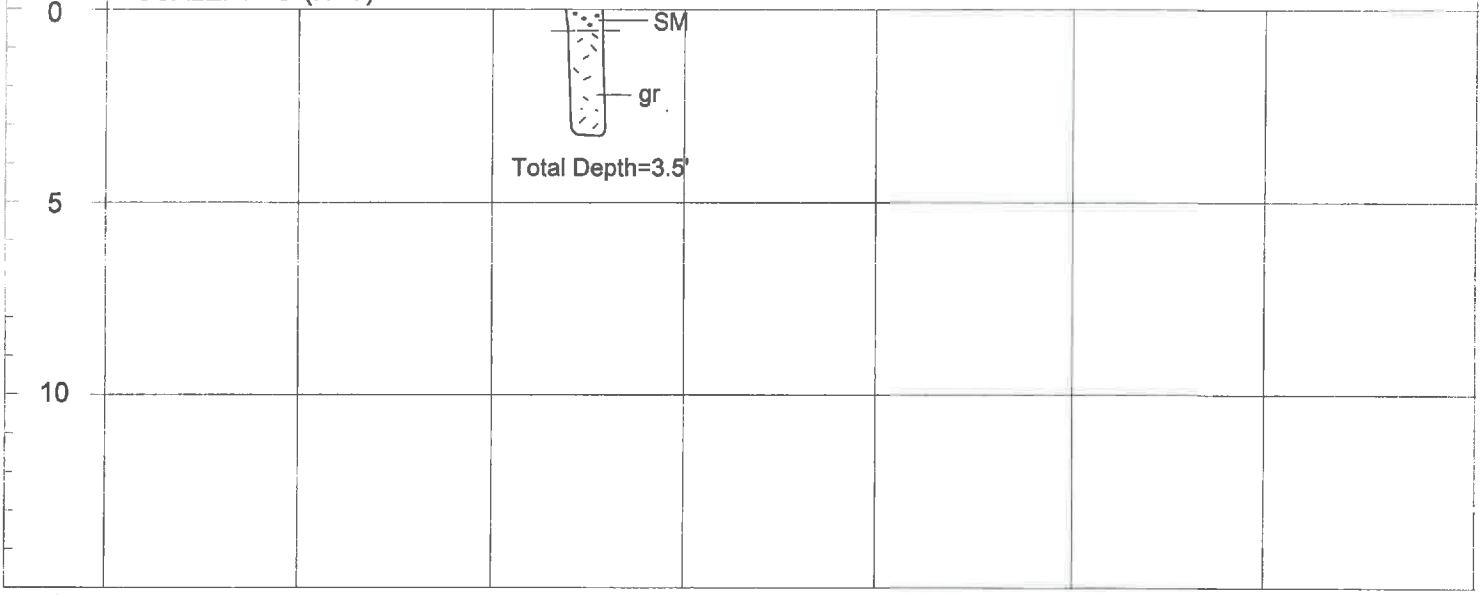
Equipment: 12" AUGER BUCKET Driving Weight and Drop: 866 lb Kelly Bar / 30"

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		SILTY SAND(SM): medium to coarse-grained, some gravels up to 3" in maximum dimension, light brown.						
		GRANTIC BEDROCK (gr): medium weathered at upper 1 ft, moderately to very hard, gray.						
		End of boring at 3.5 feet due to refusal from bedrock. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings on 7-10-13.						

SKETCH

SCALE: 1"=5' (H=V)



Converse Consultants

Project Name: ARROYO SECO CANYON PROJECT, PASADENA, CALIFORNIA

Project No.: 13-31-199-01

Drawing No.: A-5

Log of Boring No. BH-4

Dates Drilled: 7/10/2013 Logged by: MDR Checked By: SCL

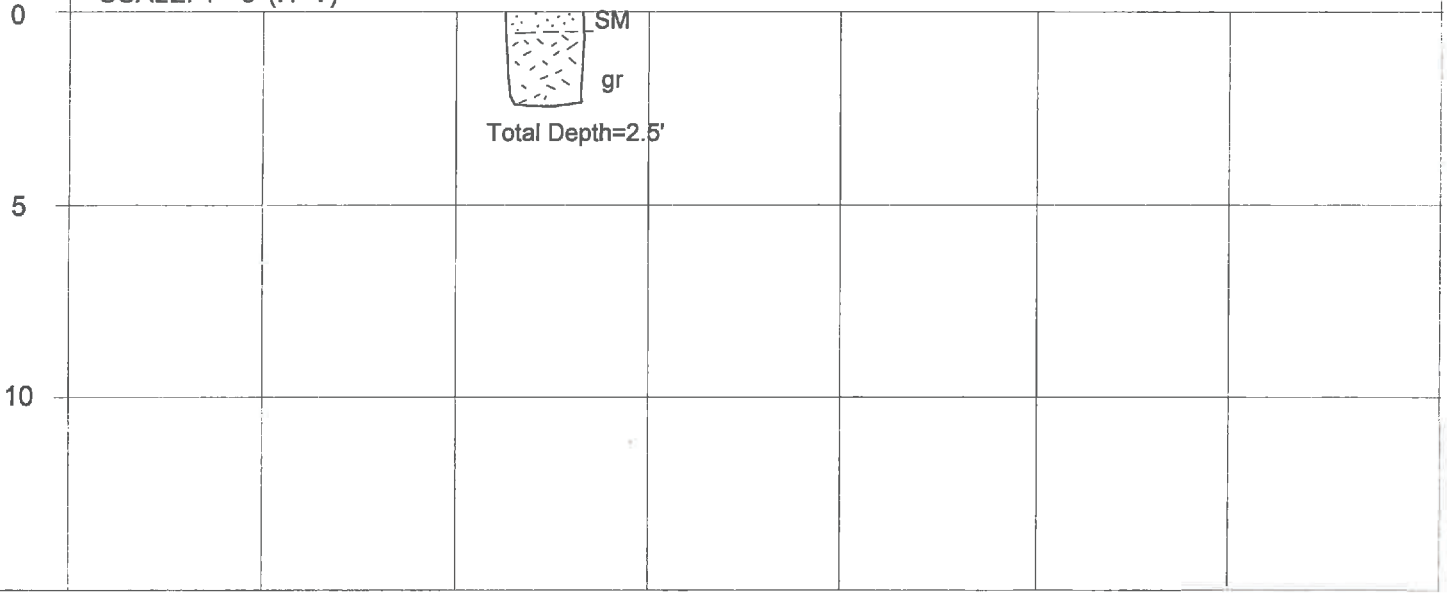
Equipment: 24" AUGER BUCKET Driving Weight and Drop: 866 lb Kelly Bar / 30"

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		SILTY SAND(SM): medium to coarse-grained, some gravels up to 3" in maximum dimension, few cobbles up to 8" in maximum dimension, light brown.						
		GRANTIC BEDROCK (gr): medium weathered at upper 1 ft, moderately hard to very hard, gray.						
		End of boring at 2.5 feet due to refusal from bedrock. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings on 7-10-13.						

SKETCH

SCALE: 1"=5' (H=V)



Converse Consultants

Project Name: ARROYO SECO CANYON PROJECT, PASADENA, CALIFORNIA

Project No.: 13-31-199-01

Drawing No.: A-5a

Log of Boring No. BH-5

Dates Drilled: 7/10/2013 Logged by: MDR Checked By: SCL

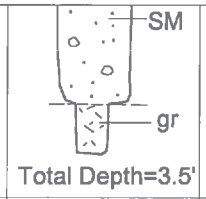
Equipment: 12" & 24" AUGER BUCKET Driving Weight and Drop: 866 lb Kelly Bar / 30"

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FOOT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		GRAVELLY SAND WITH SILT(SP-SM): fine to coarse-grained, some gravels up to 3" in maximum dimension, little cobbles up to 8" in maximum dimension, light brown/gray brown.						ca,er, ma
		GRANTIC BEDROCK (gr): very hard, moderately fractured, slightly weathered, gray.						
		End of boring at 5 feet due to refusal of bedrock Groundwater not encountered during drilling. Borehole utilized for percolation testing Borehole backfilled with soil cuttings after completion of percolation testing on 7-11-13.						

SKETCH

SCALE: 1"=5' (H=V)



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Converse Consultants

Project Name: **ARROYO SECO CANYON PROJECT PASADENA, CALIFORNIA**

Project No.: **13-31-199-01**

Drawing No.: **A-6**

Log of Boring No. BH-6

Dates Drilled: 7/11/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		4.5" ASPHALT OVER 7" BASE						ma
		STREAM DEPOSIT (Qg): **SILTY SAND (SM):** fine-grained, some gravels up to 2" in maximum dimension, brown.			7/11/12	3	117	
5		-some gravels up to 2" in maximum dimension, less silt, yellow brown			13/27/26	1	119	
		-fine-grained, trace gravel up to 3" in maximum dimension, orange brown			16/15/15	9	100	ds
10					18/28/50(5")	1	129	
		-cobble layer, possible boulders						
15		**SAND WITH SILT (SP-SM):** fine-grained, some gravels up to 2" in maximum dimension.			50(6")			dist.
20		-cobble layer, possible boulders			50(3")			dist.
		End of boring at 21 feet due to refusal of cobbles. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings and patchd with asphalt on 7-11-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-7

Log of Boring No. BH-7

Dates Drilled: 7/12/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop:

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		4" ASPHALT WITH NO BASE						
		FILL (Af): **GRAVELLY SAND WITH SILT(SP-SM):** fine to coarse-grained, some gravels up to 3" in maximum dimension, gray brown.						
5		End of boring at 5 feet due to encounter of water main pipe. The road erosion and excavation created by the broken pipe and repair were backfilled with cement slurry.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-8

Log of Boring No. BH-8

Dates Drilled: 7/12/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		FILL (Af): **SILTY SAND (SM):** fine-grained, some gravels up to 3" in maximum dimension, light brown.						
		STREAM DEPOSIT (Qg): **GRAVELLY SAND (SP):** fine to coarse-grained, gravels up to 3" in maximum dimension, light brown.	■		16/35/50(4")	2	139	
5		-cobble layer, possible boulders	■		25/50(5")	1	145	
10		**SAND WITH SILT (SP-SM):** fine to coarse-grained, gravels up to 2" in maximum dimension.	■		26/34/50(3")	15	107	ds
15		-cobble layer, possible boulders	■		50(5")	2	117	
		End of boring at 19 feet due to refusal of cobbles. Groundwater not encountered during drilling. Borehole backfilled with soil cuttings on 7-12-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-9

Log of Boring No. BH-9

Dates Drilled: 7/11/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		5" ASPHALT OVER 8" BASE						
		STREAM DEPOSIT (Qg): **SAND WITH SILT (SP-SM):** fine to coarse-grained, some gravels up to 3" in maximum dimension, gray brown.						
5		**GRAVELLY SAND (SP):** fine-grained, light yellow brown.			27/43/50(4")	2	124	
		End of boring at 6.5 feet. Groundwater not encountered during drilling Borehole utilized for percolation testing. Borehole backfilled with soil cuttings and patched with asphalt after completion of percolation test on 7-11-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-10

Log of Boring No. BH-10

Dates Drilled: 7/11/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
		4" ASPHALT WITH NO BASE						ma
		STREAM DEPOSIT (Qg): **GRAVELLY SAND WITH SILT(SP-SM):** fine to coarse-grained, some gravels up to 3" in maximum dimension, gray brown.			9/23/21	2	137	
5		-little gravels up to 3" in maximum dimension, few silt			12/15/17	4	100	
		End of boring at 6.5 feet. Groundwater not encountered during drilling. Borehole utilized for percolation testing. Borehole backfilled with soil cuttings and patched with asphalt after completion of percolation test on 7-11-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
A-11

Log of Boring No. BH-11

Dates Drilled: 7/11/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		4.5" ASPHALT WITH NO BASE						ma
		STREAM DEPOSIT (Qg): **SILTY SAND (SM):** fine-grained, some gravels up to 2.5" in maximum dimension, olive brown.						
5		**SAND WITH SILT (SP-SM):** fine to medium-grained, brown.			23/47/50(5")	2	142	
		End of boring at 6.5 feet. Groundwater not encountered during drilling. Borehole utilized for percolation testing. Borehole backfilled wth soil cuttings and patched with asphalt after completion of percolation test on 7-11-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-12

Log of Boring No. BH-12

Dates Drilled: 7/12/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		STREAM DEPOSIT (Qg): **SAND WITH SILT (SP-SM):** fine to coarse-grained, gravels up to 3" in maximum dimension, light brown.						ma
5					46/50(3")	1	138	
		End of boring at 5.75 feet. Groundwater not encountered during drilling. Borehole utilized for percolation testing. Borehole backfilled wth soil cuttings after completion of percolation test on 7-12-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-13

Log of Boring No. BH-13

Dates Drilled: 7/12/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		STREAM DEPOSIT (Qg): **GRAVELLY SAND WITH SILT(SP-SM):** fine to coarse-grained, gravels up to 3" in maximum dimension, cobbles up to 12" in maximum dimension.						ma
		End of boring at 3 feet due to refusal of cobbles. Groundwater not encountered during drillig. Borehole utilized for percolation testing. Borehole backfilled wth soil cuttings after completion of percolation test on 7-12-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-14

Log of Boring No. BH-14

Dates Drilled: 7/12/2013 Logged by: JR Checked By: SCL

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): N/A Depth to Water (ft): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS/FT	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		STREAM DEPOSIT (Qg): **SILTY SAND (SM):** coarse-grained, gravels and cobbles up to 10" in maximum dimension, light gray brown.						ma
5		**GRAVELLY SAND WITH SILT(SP-SM):** fine to coarse-grained, light brown.			22/30/50(6")			
		End of boring at 6.5 feet. Groundwater not encountered during drilling. Borehole utilized for percolation testing. Borehole backfilled wth soil cuttings after completion of percolation test on 7-12-13.						

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. A-15

APPENDIX B

LABORATORY TESTING PROGRAM

APPENDIX B

LABORATORY TESTING PROGRAM

Tests were conducted in our laboratory on representative soil samples for the purpose of classification and evaluation of their relevant physical characteristics and engineering properties. The amount and selection of tests were based on the geotechnical requirements of the project. Test results are presented herein and on the Logs of Borings in Appendix A, *Field Exploration*. The following is a summary of the laboratory tests conducted for this project.

Moisture Content and Dry Density

Results of moisture content and dry density tests, performed on relatively undisturbed ring samples were used to aid in the classification of the soils and to provide quantitative measure of the *in situ* dry density. Data obtained from this test provides qualitative information on strength and compressibility characteristics of site soils. For test results, see the Logs of Borings in Appendix A, *Field Exploration*.

Grain-Size Analysis

To assist in classification of soils, mechanical grain-size analyses were performed on nine (9) selected samples. Testing was performed in general accordance with the ASTM Standard C136 test method. Grain-size curve is shown in Drawing No. B-1a and B-1b, *Grain Size Distribution Results*.

Maximum Density Test

One (1) representative bulk sample was tested in the laboratory to determine the maximum dry density and optimum moisture content. The tests were conducted in accordance with the ASTM Standard D1557 laboratory procedure. The test results are presented in Drawing No. B-2, *Moisture-Density Relationship Results*.

Direct Shear

Direct shear tests were performed on four (4) relatively undisturbed in-situ samples. For each test, three brass sampler rings were placed, one at a time, directly into the test apparatus and subjected to a range of normal loads appropriate for the anticipated conditions. The sample was then sheared at a constant strain rate of 0.01 inch/minute. Shear deformation was recorded until a maximum of about 0.25-inch shear displacement was achieved. Ultimate strength was selected from the shear-stress deformation data and plotted to determine the shear strength parameters. For test data,

including sample density and moisture c ontent, see Drawing No. B-3a through B-3d, *Direct Shear Test Results.*

Table No. B-1, Direct Shear Test Results

Boring No.	Depth (feet)	Soil Classification	Ultimate Strength Parameters	
			Friction Angle (degrees)	Cohesion (psf)
BH-1	3	Gravelly Sand with Silt (SP-SM)	33	200
BH-3	3	Weathered Grantic Bedrock (gr)	34	400
BH-6	7	Silty Sand (SM)	33	250
BH-8	10	Sand with Silt (SP-SM)	33	200

Consolidation

Consolidation tests were perfo rmed on one (1) relatively undisturbed in-situ sample. Data obtained from this test procedure was used to evaluate the settlement characteristics of the foundation soils under load. Preparation for this test involved trimming the sample and placing the one-i nch high brass ring into the test apparatus, which contained porous stones, both top and bottom, to accommodate drainage during testing. Normal axial loads were applied to one end of t he sample through the porous stones, and the resul ting deflections were recorded at various time periods. T he load was increa sed after the sample reached a reasona ble state equilibrium. Normal l oads were applied at a constant load-increment ratio, successive loads being ge nerally twice the precedi ng load. The sample was tested at field and submerged conditions. The test results, including sample density and moisture content, are presented in Drawing No. B- 4, *Consolidation Test Results*.

Soil Corrosivity

Three (3) representative soil samples wer e tested to evaluate minimum electrical resistivity, pH, and chemical conten t, including soluble sulfate and chloride concentrations. The purpose of these tests is to determine the corrosion potential of site soils when placed in contact with comm on construction materials. These tests were performed by Environmental Geotechnology Laborat ory, Inc. (EGL), located in Arcadia, California. The test results received from EGL are included in the following table:

Table No. B-2, Corrosivity Test Results

Boring No.	Sample Depth (feet)	pH (Caltrans 643)	Soluble Chlorides (Caltrans 422) ppm	Soluble Sulfate (Caltrans 417) (%)	Saturated Resistivity (Caltrans 643) Ohm-cm
BH-1	0 – 3	7.15	85	0.01	22,000
BH-3	0 – 3	8.15	75	0.002	23,000
BH-5	0 – 2.5	6.01	75	0.001	23,000

R-value

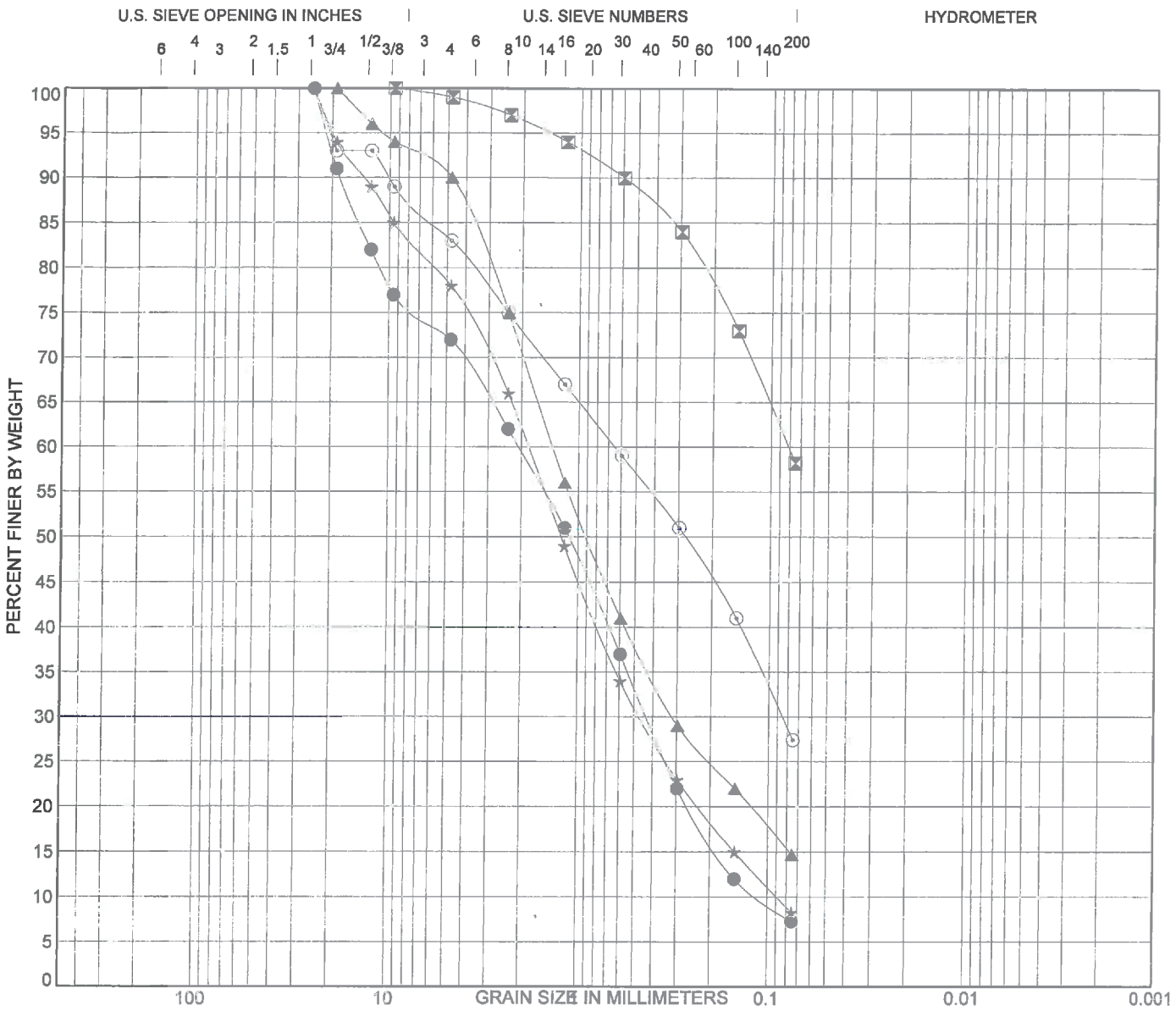
One (1) representative bulk soil sample was tested for resistance value (R-value) in accordance with ASTM D2844 Standard. This test is designed to provide a relative measure of soil strength for use in pavement design. The test results are shown in the following table:

Table No. B-3, R-value Test Result

Boring No.	Depth, (feet)	Soil Classification	Measured R-value
BH-3	0 – 3	Weathered Grantic Bedrock (gr)	74

Sample Storage

Soil samples presently stored in our laboratory will be discarded 30 days after the date of this report, unless this office receives a specific request to retain the samples for a longer period.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
● BH-1	0-3	GRAVELLY SAND WITH SILT (SP-SM)				0.80	18.70
⊠ BH-2	0-5	SANDY SILT WITH SILTY SAND (SM/ML)					
▲ BH-3	0-3	SILTY SAND (SM)					
★ BH-5	0-2.5	GRAVELLY SAND WITH SILT (SP-SM)				1.29	20.70
⊙ BH-6	0-5	SILTY SAND (SM)					

Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● BH-1	0-3	25	2.081	0.43	0.111	28.0	64.7	7.3	
⊠ BH-2	0-5	9.5	0.082			1.0	40.8	58.2	
▲ BH-3	0-3	19	1.365	0.315		10.0	75.3	14.7	
★ BH-5	0-2.5	25	1.848	0.462	0.089	22.0	69.7	8.3	
⊙ BH-6	0-5	25	0.649	0.086		17.0	55.6	27.4	

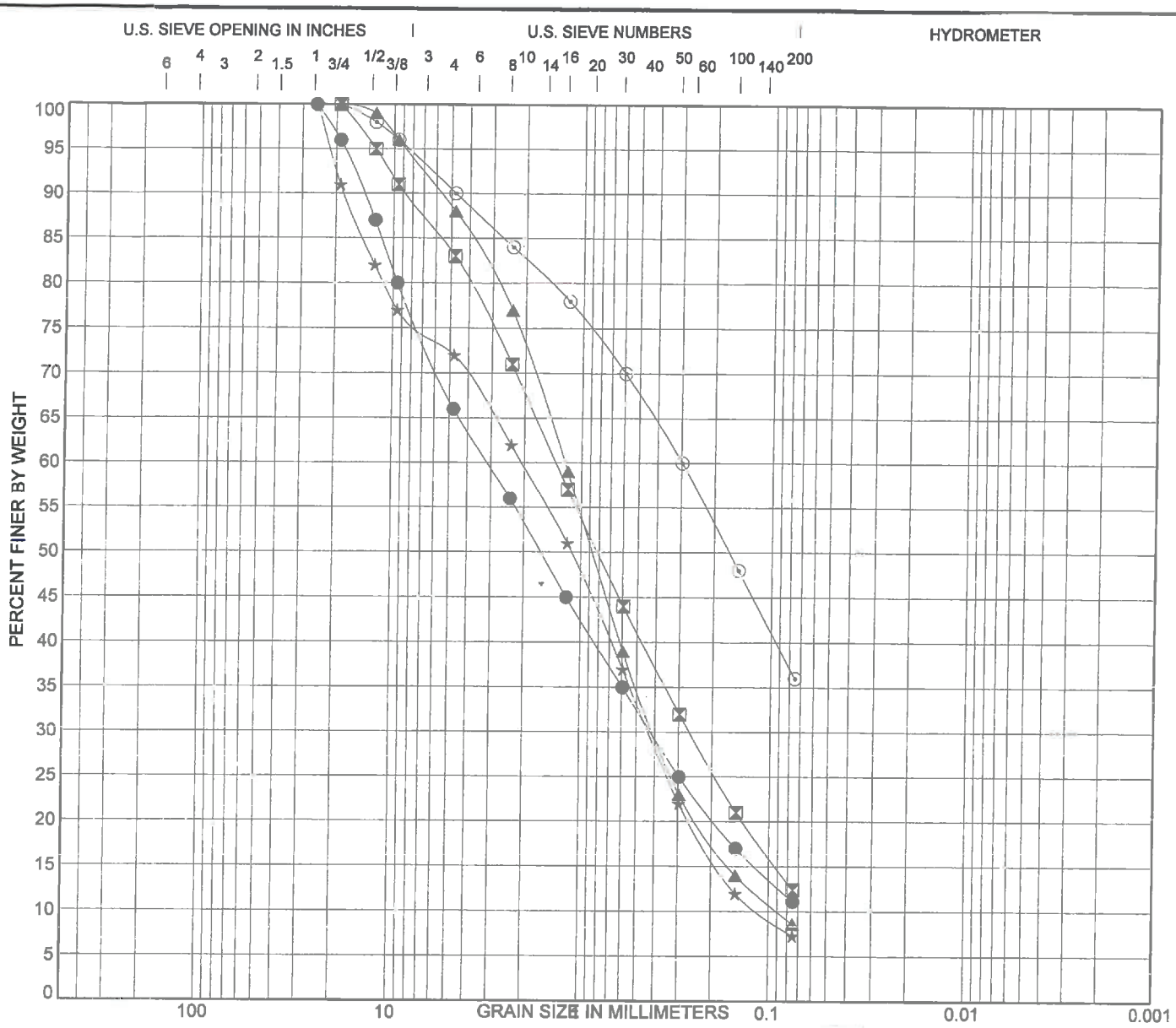
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
B-1a



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	BH-10	0-5	GRAVELLY SAND WITH SILT (SP-SM)				0.85	47.55
⊠	BH-11	0-5	SILTY SAND (SM)				0.81	22.11
▲	BH-12	0-5	SAND WITH SILT (SP-SM)				1.47	13.69
★	BH-13	0-3	GRAVELLY SAND WITH SILT (SP-SM)				0.80	18.70
⊙	BH-14	0-5	SILTY SAND (SM)					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	BH-10	0-5	25.4	3.138	0.42		34.0	54.9	11.1	
⊠	BH-11	0-5	19	1.369	0.262		17.0	70.6	12.4	
▲	BH-12	0-5	19	1.226	0.403	0.09	12.0	79.4	8.6	
★	BH-13	0-3	25	2.081	0.43	0.111	28.0	64.7	7.3	
⊙	BH-14	0-5	19	0.297			10.0	54.0	36.0	

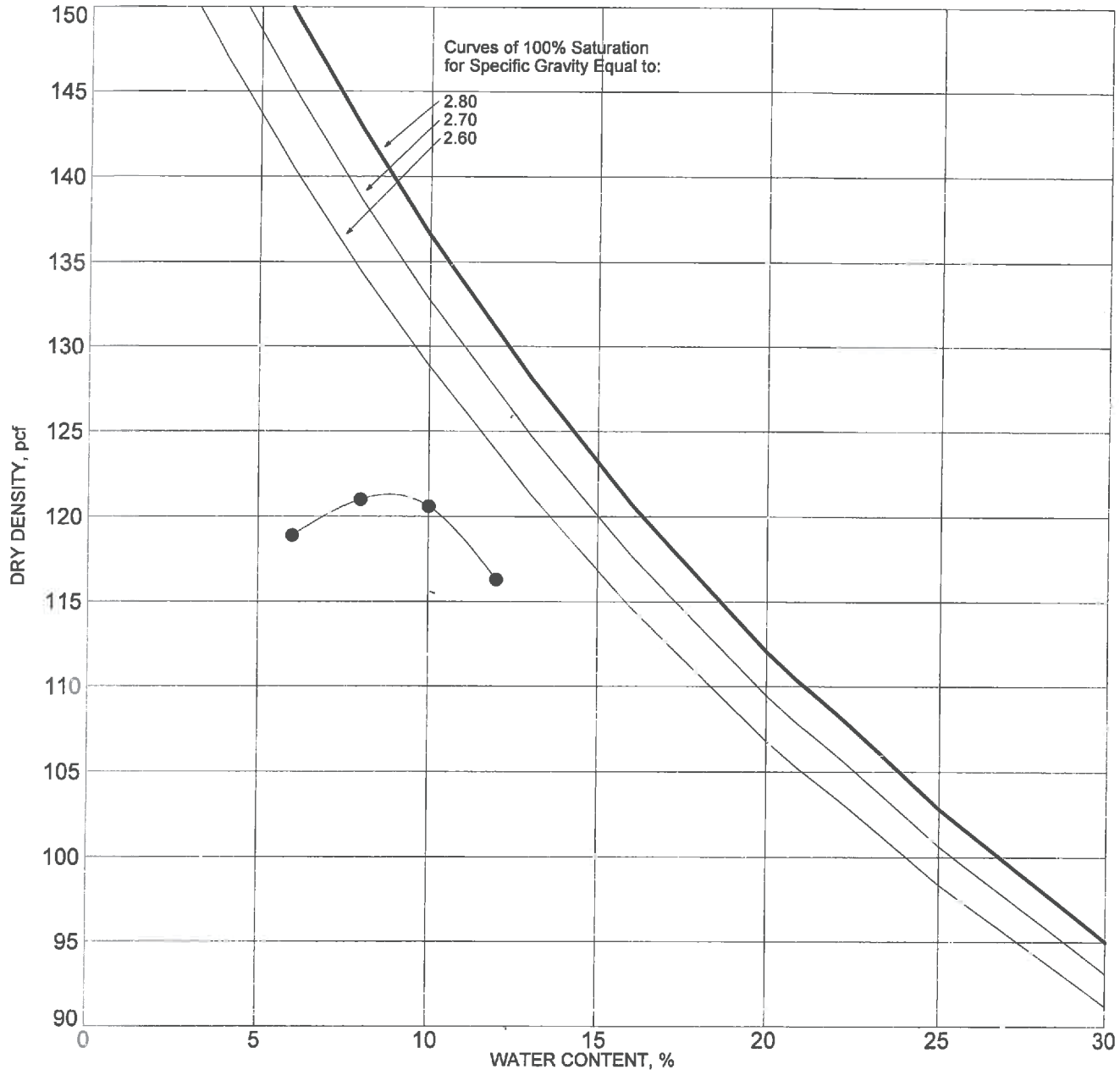
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
B-1b



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	BH-1	0-3	GRAVELLY SAND WITH SILT (SP-SM)	D1557 Method B	9.2	121.5

NOTE:

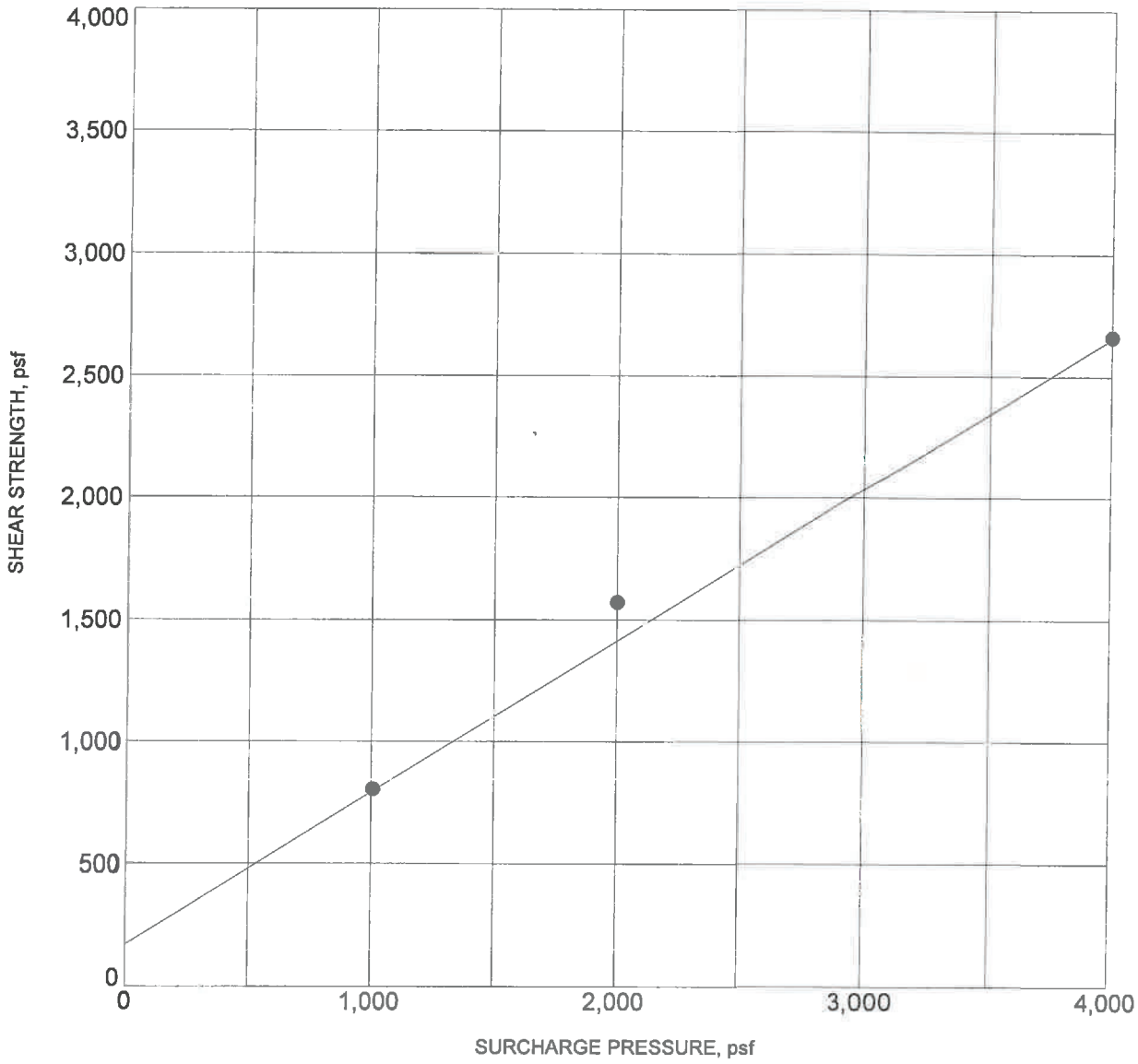
MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
B-2



BORING NO.	:	BH-1	DEPTH (ft)	:	3
DESCRIPTION	:	GRAVELLY SAND WITH SILT (SP-SM)			
COHESION (psf)	:	200	FRICTION ANGLE (degrees)		33
MOISTURE CONTENT (%)	:	4	DRY DENSITY (pcf)	:	115

NOTE: Ultimate Strength.

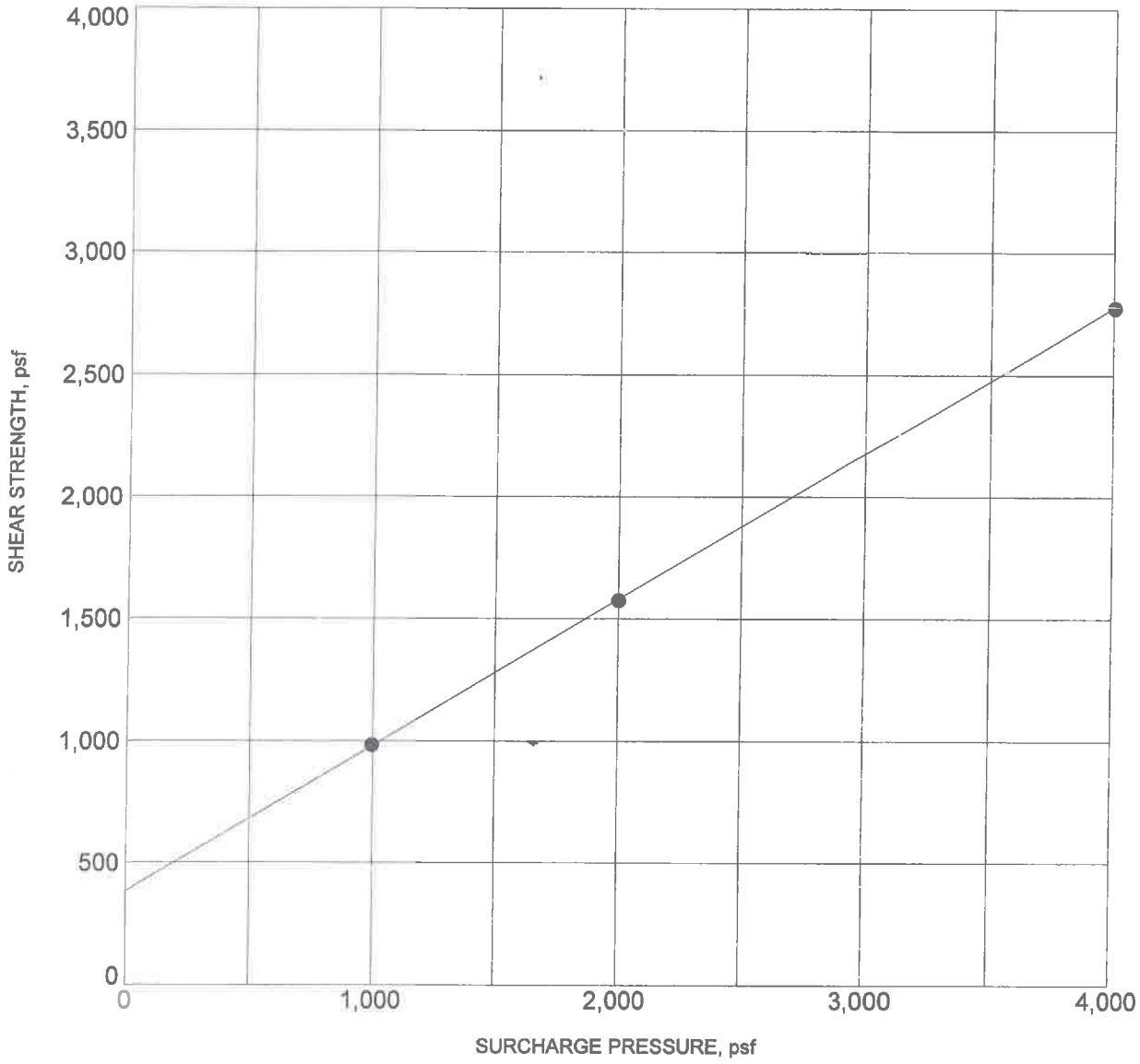
DIRECT SHEAR TEST RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. 13-31-199-01

Drawing No. B-3a



BORING NO.	:	**BH-3**	DEPTH (ft)	:	**3**
DESCRIPTION	:	**WEATHERED BEDROCK (gr)**			
COHESION (psf)	:	**400**	FRICTION ANGLE (degrees)		**34**
MOISTURE CONTENT (%)	:	**15.4**	DRY DENSITY (pcf)	:	**117**

NOTE: Ultimate Strength.

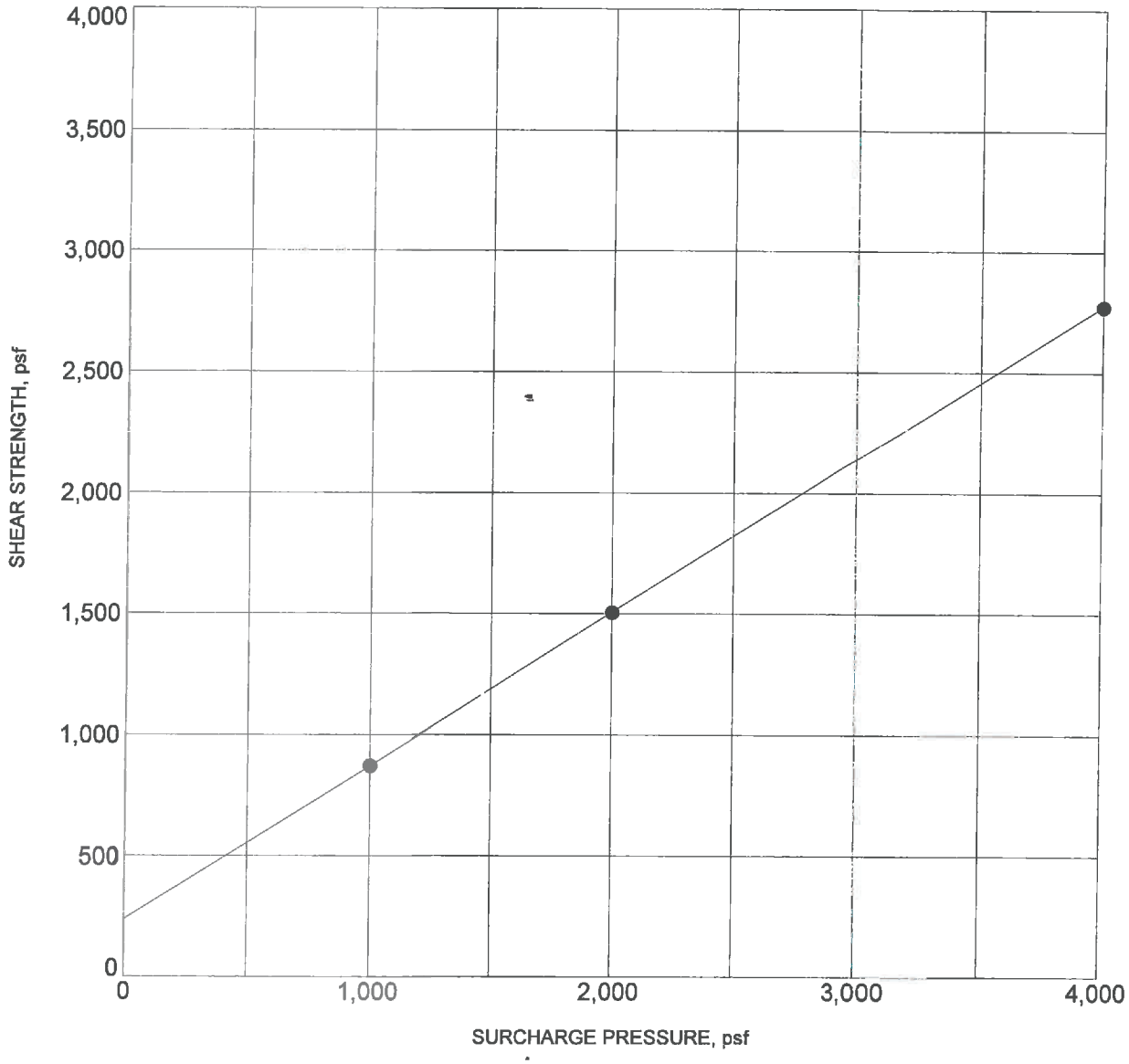
DIRECT SHEAR TEST RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
B-3b



BORING NO.	:	**BH-6**	DEPTH (ft)	:	**7**
DESCRIPTION	:	**SILTY SAND (SM)**			
COHESION (psf)	:	**250**	FRICTION ANGLE (degrees)		**33**
MOISTURE CONTENT (%)	:	**9.4**	DRY DENSITY (pcf)	:	**100.2**

NOTE: Ultimate Strength.

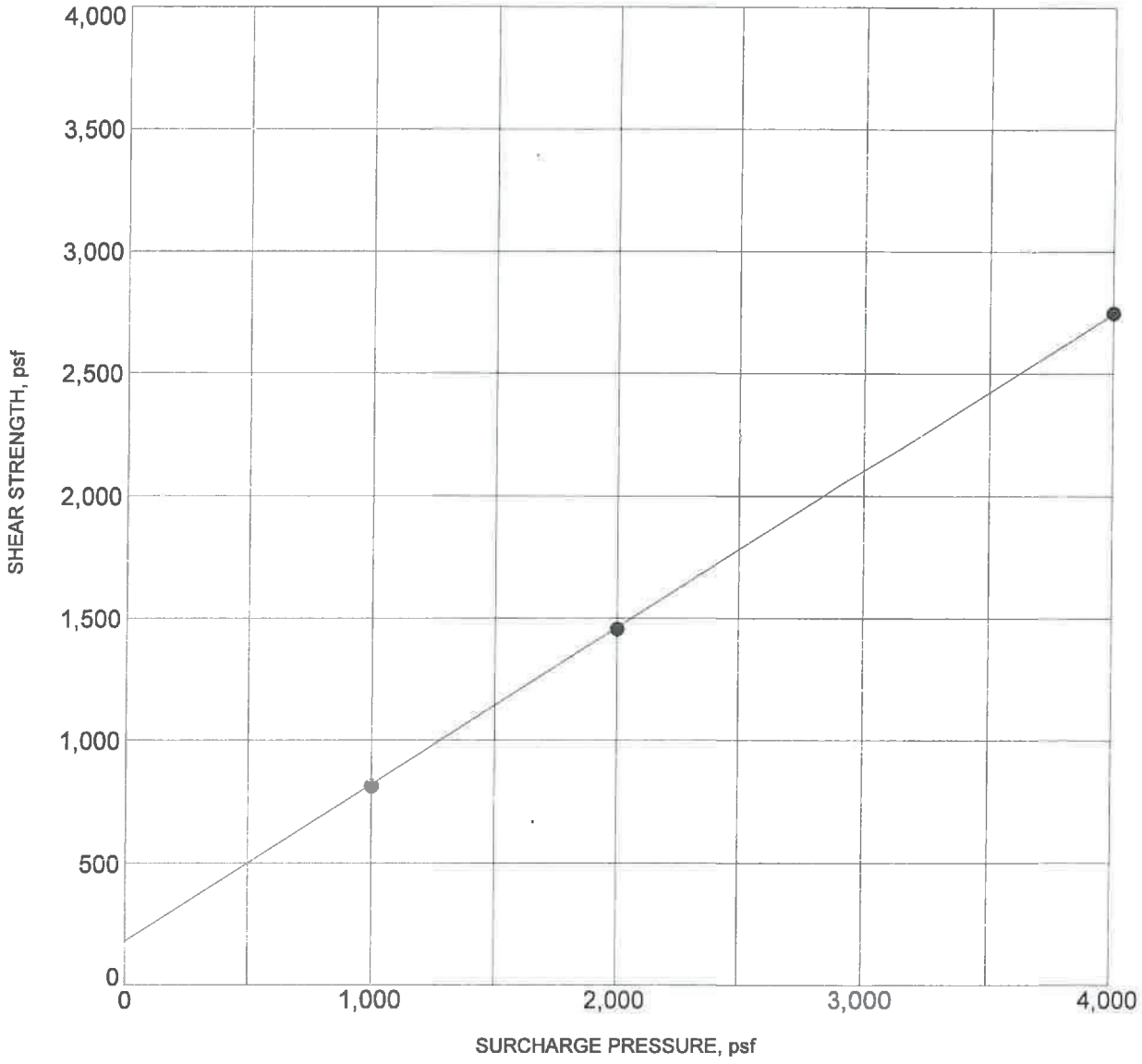
DIRECT SHEAR TEST RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
B-3c



BORING NO.	:	**BH-8**	DEPTH (ft)	:	**10**
DESCRIPTION	:	**SAND WITH SILT (SP-SM)**			
COHESION (psf)	:	**200**	FRICTION ANGLE (degrees)		**33**
MOISTURE CONTENT (%)	:	**15.3**	DRY DENSITY (pcf)	:	**107.4**

NOTE: Ultimate Strength.

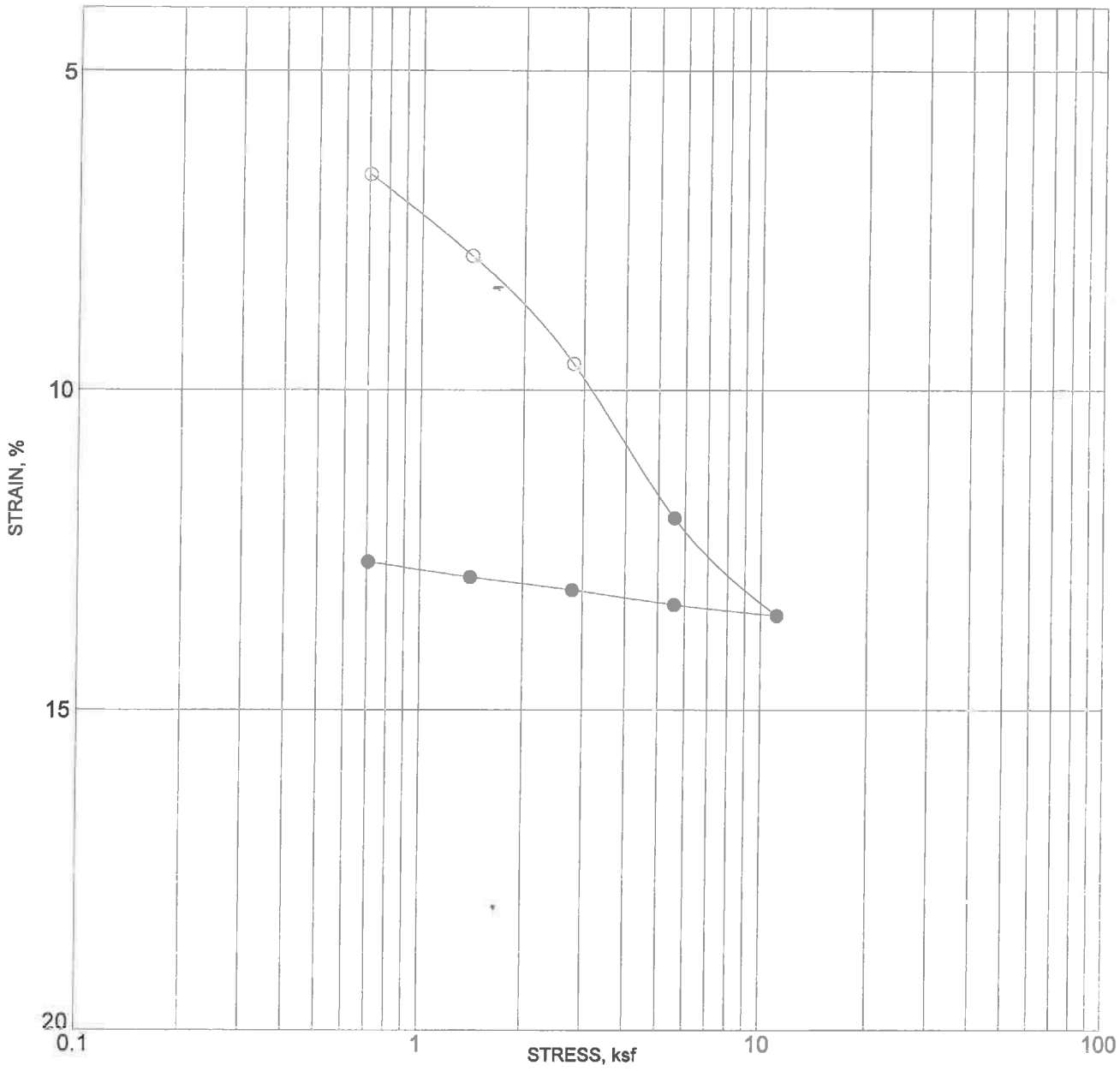
DIRECT SHEAR TEST RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No.
13-31-199-01

Drawing No.
B-3d



BORING NO. :	**BH-1**	DEPTH (ft) :	**5**
DESCRIPTION :	**SILTY SAND (SM)**		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**11.8**	**116.8**		
FINAL	**18.1**	**116.8**		

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

CONSOLIDATION TEST RESULTS

Converse Consultants

Project Name
ARROYO SECO CANYON PROJECT
PASADENA, CALIFORNIA

Project No. **13-31-199-01**

Drawing No. **B-4**

APPENDIX C

PERCOLATION TESTING DATA

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 1 - Leach field area
Test Date: July 9, 2013

Test Boring No. **BH-2**
Depth of Boring (d_b): 5.0 feet
Diameter of Boring (D): 1.00 foot
Test Performer: MDR

Time of Testing			Water Level Measurement at The Bottom 12 inches		Notes
Initial Time T_i	Final Time T_f	Time Interval ΔT (minutes)	Initial depth to water d_1 (inches)	Final depth to water d_2 (inches)	
Presoak 7/8/2013 10:05 AM	7/9/2013 11:00 AM	24 hours	0.00	12.00	Acceptable for leach field
Percolation Test					
11:40:00 AM	11:45:00 AM	5.00	0.00	1.00	
11:45:00 AM	11:52:00 AM	7.00	1.00	2.00	
11:52:00 AM	11:57:00 AM	5.00	2.00	3.00	
11:57:00 AM	12:05:00 PM	8.00	3.00	4.00	
12:05:00 PM	12:15:00 PM	10.00	4.00	5.00	
12:15:00 PM	12:25:00 PM	10.00	5.00	6.00	
12:37:00 PM	12:42:00 PM	5.00	0.00	1.00	
12:42:00 PM	12:49:00 PM	7.00	1.00	2.00	
12:49:00 PM	12:55:00 PM	6.00	2.00	3.00	
12:55:00 PM	1:02:00 PM	7.00	3.00	4.00	
1:02:00 PM	1:09:00 PM	7.00	4.00	5.00	
1:09:00 PM	1:20:00 PM	11.00	5.00	6.00	
1:44:00 PM	1:52:00 PM	8.00	0.00	1.00	
1:52:00 PM	1:59:00 PM	7.00	1.00	2.00	
1:59:00 PM	2:06:00 PM	7.00	2.00	3.00	
2:06:00 PM	2:13:00 PM	7.00	3.00	4.00	
2:13:00 PM	2:21:00 PM	8.00	4.00	5.00	
2:21:00 PM	2:31:00 PM	10.00	5.00	6.00	

Reference: Los Angeles County (2012). A Professional Guide to Requirements and Procedures for Onsite Wasterwater Treatment Systems (OWTS), dated January 1, 2012.

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 2C - Leach field area
Test Date: July 11, 2013

Test Boring No. **BH-5**
Depth of Boring (d_b): 3.5 feet
Diameter of Boring (D): 1.00 foot
Test Performer: MDR

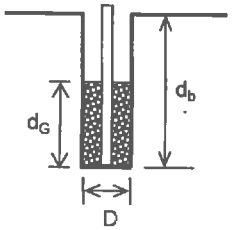
Time of Testing			Water Level Measurement at The Bottom 12 inches		Notes
Initial Time T_i	Final Time T_f	Time Interval ΔT (minutes)	Initial depth to water d_1 (inches)	Final depth to water d_2 (inches)	
Presoak 7/10/2013 10:35 AM	7/11/2013 10:40 AM	24 hours	0.00	6.00	Not acceptable for leach field
Percolation Test					
10:47:00 AM	11:24:00 AM	37.00	0.00	1.00	Percolation rate too slow
11:24:00 AM	12:45:00 PM	81.00	1.00	2.00	Not acceptable for leach field

Reference: Los Angeles County (2012). A Professional Guide to Requirements and Procedures for Onsite Wasterwater Treatment Systems (OWTS), dated January 1, 2012.

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 3 - JPL Parking Lot
Test Date: July 11, 2013

Test Boring No. BH-9
Depth of Boring (d_b): 5.0 feet
Diameter of Boring (D): 0.67 feet
Test Performer: MDR



Time of Testing			Water Level Measurement		Water Level Calculations				Percolation Rate Calculations		
Initial Time	Final Time	Time Interval	Initial depth to water	Final depth to water	Initial Height of water column	Final Height of water column	Drop in Height	Average height of water column	Pre-adjusted Percolation Rate	Reduction Factor	Adjusted Percolation Rate
T_i	T_f	ΔT	d_1	d_2	d_i	d_f	$\Delta d = d_i - d_f$	L_{ave}	$k_i = \Delta d / \Delta T$	R_f	$k = k_i / R_f$
		(hr)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(inch/hr)		(inch/hr)
Presoak											
9:28 AM	11:28 AM	2.00	0.00	5.00							
Percolation Test											
11:35:00 AM	11:45:00 AM	0.17	0.00	1.92	5.00	3.08	1.92	4.04	138.24	13.1	10.59
11:45:00 AM	11:55:00 AM	0.17	1.92	2.92	3.08	2.08	1.00	2.58	72.00	8.7	8.27
11:55:00 AM	12:05:00 PM	0.17	2.92	3.50	2.08	1.50	0.58	1.79	41.76	6.3	6.58
12:09:00 PM	12:19:00 PM	0.17	0.00	1.63	5.00	3.37	1.63	4.19	117.36	13.5	8.70
12:19:00 PM	12:29:00 PM	0.17	1.63	2.58	3.37	2.42	0.95	2.90	68.40	9.6	7.09
12:29:00 PM	12:39:00 PM	0.17	2.58	3.42	2.42	1.58	0.84	2.00	60.48	7.0	8.68
12:41:00 PM	12:51:00 PM	0.17	0.00	1.50	5.00	3.50	1.50	4.25	108.00	13.7	7.89
12:51:00 PM	1:01:00 PM	0.17	1.50	2.46	3.50	2.54	0.96	3.02	69.12	10.0	6.90
1:01:00 PM	1:11:00 PM	0.17	2.46	3.21	2.54	1.79	0.75	2.17	54.00	7.5	7.24
1:14:00 PM	1:24:00 PM	0.17	0.00	1.58	5.00	3.42	1.58	4.21	113.76	13.6	8.38
1:24:00 PM	1:34:00 PM	0.17	1.58	2.58	3.42	2.42	1.00	2.92	72.00	9.7	7.41
1:34:00 PM	1:44:00 PM	0.17	2.58	3.25	2.42	1.75	0.67	2.09	48.24	7.2	6.68

Note: Reduction Factor, $R_f = (2*d_i - \Delta d)/D + 1$

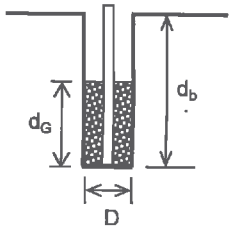
Lowest Perlcolaton Rate = **6.58** **inch/hr**
Average Percolation Rate = **7.87** **inch/hr**

Reference: Los Angeles County (2011). Adminstrative Manual - Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting, 01/03/11.

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 3 - JPL Parking Lot
Test Date: July 11, 2013

Test Boring No. **BH-10**
Depth of Boring (d_b): 5.0 feet
Diameter of Boring (D): 0.67 feet
Test Performer: JR



Time of Testing			Water Level Measurement		Water Level Calculations				Percolation Rate Calculations		
Initial Time	Final Time	Time Interval	Initial depth to water	Final depth to water	Initial Height of water column	Final Height of water column	Drop in Height	Average height of water column	Pre-adjusted Percolation Rate	Reduction Factor	Adjusted Percolation Rate
T_i	T_f	ΔT	d_1	d_2	d_i	d_f	$\Delta d = d_i - d_f$	L_{ave}	$k_i = \Delta d / \Delta T$	R_f	$k = k_i / R_f$
		(hr)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(inch/hr)		(inch/hr)
Presoak											
8:59 AM	11:00 AM	2.00	0.00	5.00							
Percolation Test											
11:11:00 AM	11:21:00 AM	0.17	0.00	2.60	5.00	2.40	2.60	3.70	187.20	12.0	15.54
11:21:00 AM	11:31:00 AM	0.17	2.60	3.69	2.40	1.31	1.09	1.86	78.48	6.5	12.00
11:31:00 AM	11:41:00 AM	0.17	3.69	4.67	1.31	0.33	0.98	0.82	70.56	3.4	20.47
11:42:00 AM	11:52:00 AM	0.17	0.00	2.47	5.00	2.53	2.47	3.77	177.84	12.2	14.53
11:52:00 AM	12:02:00 PM	0.17	2.47	3.59	2.53	1.41	1.12	1.97	80.64	6.9	11.72
12:02:00 PM	12:12:00 PM	0.17	3.59	4.65	1.41	0.35	1.06	0.88	76.32	3.6	21.04
12:13:00 PM	12:23:00 PM	0.17	0.00	2.58	5.00	2.42	2.58	3.71	185.76	12.1	15.38
12:23:00 PM	12:33:00 PM	0.17	2.58	3.65	2.42	1.35	1.07	1.89	77.04	6.6	11.63
12:33:00 PM	12:43:00 PM	0.17	3.65	4.70	1.35	0.30	1.05	0.83	75.60	3.5	21.83
12:44:00 PM	12:54:00 PM	0.17	0.00	2.43	5.00	2.57	2.43	3.79	174.96	12.3	14.23
12:54:00 PM	1:04:00 PM	0.17	2.43	3.55	2.57	1.45	1.12	2.01	80.64	7.0	11.52
1:04:00 PM	1:14:00 PM	0.17	3.55	4.63	1.45	0.37	1.08	0.91	77.76	3.7	20.92

Note: Reduction Factor, $R_f = (2*d_i - \Delta d)/D + 1$

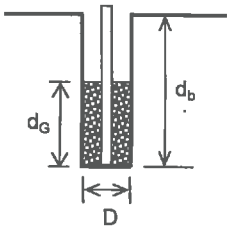
Lowest Perlcolaton Rate = 11.52 inch/hr
Average Percolation Rate = 15.90 inch/hr

Reference: Los Angeles County (2011). Adminstrative Manual - Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting, 01/03/11.

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 3 - JPL Parking Lot
Test Date: July 11, 2013

Test Boring No. **BH-11**
Depth of Boring (d_b): 5.0 feet
Diameter of Boring (D): 0.67 feet
Test Performer: JR



Time of Testing			Water Level Measurement		Water Level Calculations				Percolation Rate Calculations		
Initial Time	Final Time	Time Interval	Initial depth to water	Final depth to water	Initial Height of water column	Final Height of water column	Drop in Height	Average height of water column	Pre-adjusted Percolation Rate	Reduction Factor	Adjusted Percolation Rate
T_i	T_f	ΔT	d_1	d_2	d_i	d_f	$\Delta d = d_i - d_f$	L_{ave}	$k_i = \Delta d / \Delta T$	R_f	$k = k_i / R_f$
		(hr)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(inch/hr)		(inch/hr)
Presoak											
8:00 AM	10:00 AM	2.00	0.00	5.00							
Percolation Test											
10:36:00 AM	10:46:00 AM	0.17	0.00	1.89	5.00	3.11	1.89	4.06	136.08	13.1	10.38
10:46:00 AM	10:56:00 AM	0.17	1.89	2.60	3.11	2.40	0.71	2.76	51.12	9.2	5.54
10:56:00 AM	11:06:00 AM	0.17	2.60	3.10	2.40	1.90	0.50	2.15	36.00	7.4	4.85
11:17:00 AM	11:27:00 AM	0.17	0.00	1.75	5.00	3.25	1.75	4.13	126.00	13.3	9.46
11:27:00 AM	11:37:00 AM	0.17	1.75	2.51	3.25	2.49	0.76	2.87	54.72	9.6	5.72
11:37:00 AM	11:47:00 AM	0.17	2.51	3.00	2.49	2.00	0.49	2.25	35.28	7.7	4.58
11:48:00 AM	11:58:00 AM	0.17	0.00	1.80	5.00	3.20	1.80	4.10	129.60	13.2	9.79
11:58:00 AM	12:08:00 PM	0.17	1.80	2.52	3.20	2.48	0.72	2.84	51.84	9.5	5.47
12:08:00 PM	12:18:00 PM	0.17	2.52	3.00	2.48	2.00	0.48	2.24	34.56	7.7	4.50
12:19:00 PM	12:29:00 PM	0.17	0.00	1.75	5.00	3.25	1.75	4.13	126.00	13.3	9.46
12:29:00 PM	12:39:00 PM	0.17	1.75	2.47	3.25	2.53	0.72	2.89	51.84	9.6	5.38
12:39:00 PM	12:49:00 PM	0.17	2.47	2.97	2.53	2.03	0.50	2.28	36.00	7.8	4.61

Note: Reduction Factor, $R_f = (2*d_i - \Delta d)/D + 1$

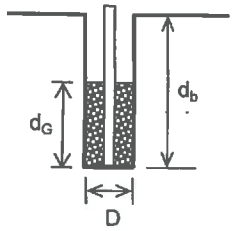
Lowest Perlcolaton Rate = 4.50 inch/hr
Average Percolation Rate = 6.65 inch/hr

Reference: Los Angeles County (2011). Adminstrative Manual - Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting, 01/03/11.

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 3 - Sludge Basin 2
Test Date: July 12, 2013

Test Boring No. BH-12
Depth of Boring (d_b): 5.0 feet
Diameter of Boring (D): 0.67 feet
Test Performer: MDR



Time of Testing			Water Level Measurement		Water Level Calculations				Percolation Rate Calculations		
Initial Time	Final Time	Time Interval	Initial depth to water	Final depth to water	Initial Height of water column	Final Height of water column	Drop in Height	Average height of water column	Pre-adjusted Percolation Rate	Reduction Factor	Adjusted Percolation Rate
T_i	T_f	ΔT	d_1	d_2	d_i	d_f	$\Delta d = d_i - d_f$	L_{ave}	$k_i = \Delta d / \Delta T$	R_f	$k = k_i / R_f$
		(hr)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(inch/hr)		(inch/hr)
Presoak											
10:20 AM	3:20 PM	5.00	0.00	5.00							
Percolation Test											
3:46:00 AM	3:51:00 AM	0.08	0.00	3.25	5.00	1.75	3.25	3.38	468.00	11.1	42.26
3:51:00 AM	3:56:00 AM	0.08	3.25	3.54	1.75	1.46	0.29	1.61	41.76	5.8	7.21
4:02:00 PM	4:07:00 PM	0.08	0.00	3.29	5.00	1.71	3.29	3.36	473.76	11.0	43.01
4:07:00 PM	4:12:00 PM	0.08	3.29	3.48	1.71	1.52	0.19	1.62	27.36	5.8	4.70
4:15:00 PM	4:20:00 PM	0.08	0.00	3.25	5.00	1.75	3.25	3.38	468.00	11.1	42.26
4:20:00 PM	4:25:00 PM	0.08	3.25	3.48	1.75	1.52	0.23	1.64	33.12	5.9	5.63
4:28:00 AM	4:33:00 AM	0.08	0.00	3.25	5.00	1.75	3.25	3.38	468.00	11.1	42.26
4:33:00 AM	4:38:00 AM	0.08	3.25	3.47	1.75	1.53	0.22	1.64	31.68	5.9	5.37

Note: Reduction Factor, $R_f = (2*d_i - \Delta d)/D + 1$

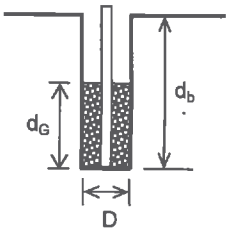
Lowest Perlcolaton Rate = **4.70** **inch/hr**
Average Percolation Rate = **24.09** **inch/hr**

Reference: Los Angeles County (2011). Adminstrative Manual - Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting, 01/03/11.

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 3 - Basin 8
Test Date: July 12, 2013

Test Boring No. BH-13
Depth of Boring (d_b): 2.8 feet
Diameter of Boring (D): 0.67 feet
Test Performer: MDR



Time of Testing			Water Level Measurement		Water Level Calculations				Percolation Rate Calculations		
Initial Time	Final Time	Time Interval	Initial depth to water	Final depth to water	Initial Height of water column	Final Height of water column	Drop in Height	Average height of water column	Pre-adjusted Percolation Rate	Reduction Factor	Adjusted Percolation Rate
T_i	T_f	ΔT	d_1	d_2	d_i	d_f	$\Delta d = d_i - d_f$	L_{ave}	$k_i = \Delta d / \Delta T$	R_f	$k = k_i / R_f$
		(hr)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(inch/hr)		(inch/hr)
Presoak											
7:30 AM	9:00 AM	1.50	0.00	2.80							
Percolation Test											
9:01:00 AM	9:04:00 AM	0.05	0.00	2.29	2.80	0.51	2.29	1.66	549.60	5.9	92.52
9:04:00 AM	9:06:00 AM	0.03	2.29	2.50	0.51	0.30	0.21	0.41	75.60	2.2	34.22
9:06:00 AM	9:08:00 AM	0.03	2.50	2.63	0.30	0.17	0.13	0.24	46.80	1.7	27.51
9:21:00 AM	9:24:00 AM	0.05	0.00	2.25	2.80	0.55	2.25	1.68	540.00	6.0	90.00
9:24:00 AM	9:26:00 AM	0.03	2.25	2.46	0.55	0.34	0.21	0.45	75.60	2.3	32.47
9:33:00 AM	9:36:00 AM	0.05	0.00	2.21	2.80	0.59	2.21	1.70	530.40	6.1	87.53
9:36:00 AM	9:38:00 AM	0.03	2.21	2.46	0.59	0.34	0.25	0.47	90.00	2.4	37.69
9:52:00 AM	9:55:00 AM	0.05	0.00	2.20	2.80	0.60	2.20	1.70	528.00	6.1	86.92
9:55:00 AM	9:57:00 AM	0.03	2.20	2.46	0.60	0.34	0.26	0.47	93.60	2.4	38.95

Note: Reduction Factor, $R_f = (2*d_i - \Delta d)/D + 1$

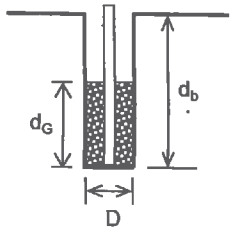
Lowest Percolaton Rate = **27.51** **inch/hr**
Average Percolation Rate = **58.65** **inch/hr**

Reference: Los Angeles County (2011). Adminstrative Manual - Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting, 01/03/11.

Percolation Testing

Job Name: Arroyo Seco Canyon Project
Job No.: 13-31-199-01
Location: Site No. 3 - Basin 13
Test Date: July 12, 2013

Test Boring No. **BH-14**
Depth of Boring (d_b): 5.0 feet
Diameter of Boring (D): 0.67 feet
Test Performer: MDR



Time of Testing			Water Level Measurement		Water Level Calculations				Percolation Rate Calculations		
Initial Time	Final Time	Time Interval	Initial depth to water	Final depth to water	Initial Height of water column	Final Height of water column	Drop in Height	Average height of water column	Pre-adjusted Percolation Rate	Reduction Factor	Adjusted Percolation Rate
T_i	T_f	ΔT	d_1	d_2	d_i	d_f	$\Delta d = d_i - d_f$	L_{ave}	$k_i = \Delta d / \Delta T$	R_f	$k = k_i / R_f$
		(hr)	(feet)	(feet)	(feet)	(feet)	(feet)	(feet)	(inch/hr)		(inch/hr)
Presoak											
8:00 AM	10:30 AM	2.50	0.00	5.00							
Percolation Test											
10:34:00 AM	10:39:00 AM	0.08	0.00	3.08	5.00	1.92	3.08	3.46	443.52	11.3	39.15
10:39:00 AM	10:44:00 AM	0.08	3.08	3.79	1.92	1.21	0.71	1.57	102.24	5.7	18.03
10:55:00 AM	11:00:00 AM	0.08	0.00	3.04	5.00	1.96	3.04	3.48	437.76	11.4	38.44
11:00:00 AM	11:05:00 AM	0.08	3.04	3.79	1.96	1.21	0.75	1.59	108.00	5.7	18.84
11:22:00 AM	11:27:00 AM	0.08	0.00	3.04	5.00	1.96	3.04	3.48	437.76	11.4	38.44
11:27:00 AM	11:32:00 AM	0.08	3.04	3.75	1.96	1.25	0.71	1.61	102.24	5.8	17.65
3:10:00 PM	3:15:00 PM	0.08	0.00	2.96	5.00	2.04	2.96	3.52	426.24	11.5	37.04
3:15:00 PM	3:20:00 PM	0.08	2.96	3.67	2.04	1.33	0.71	1.69	102.24	6.0	16.96

Note: Reduction Factor, $R_f = (2*d_i - \Delta d)/D + 1$

Lowest Perlcolaton Rate = **16.96** **inch/hr**
Average Percolation Rate = **28.07** **inch/hr**

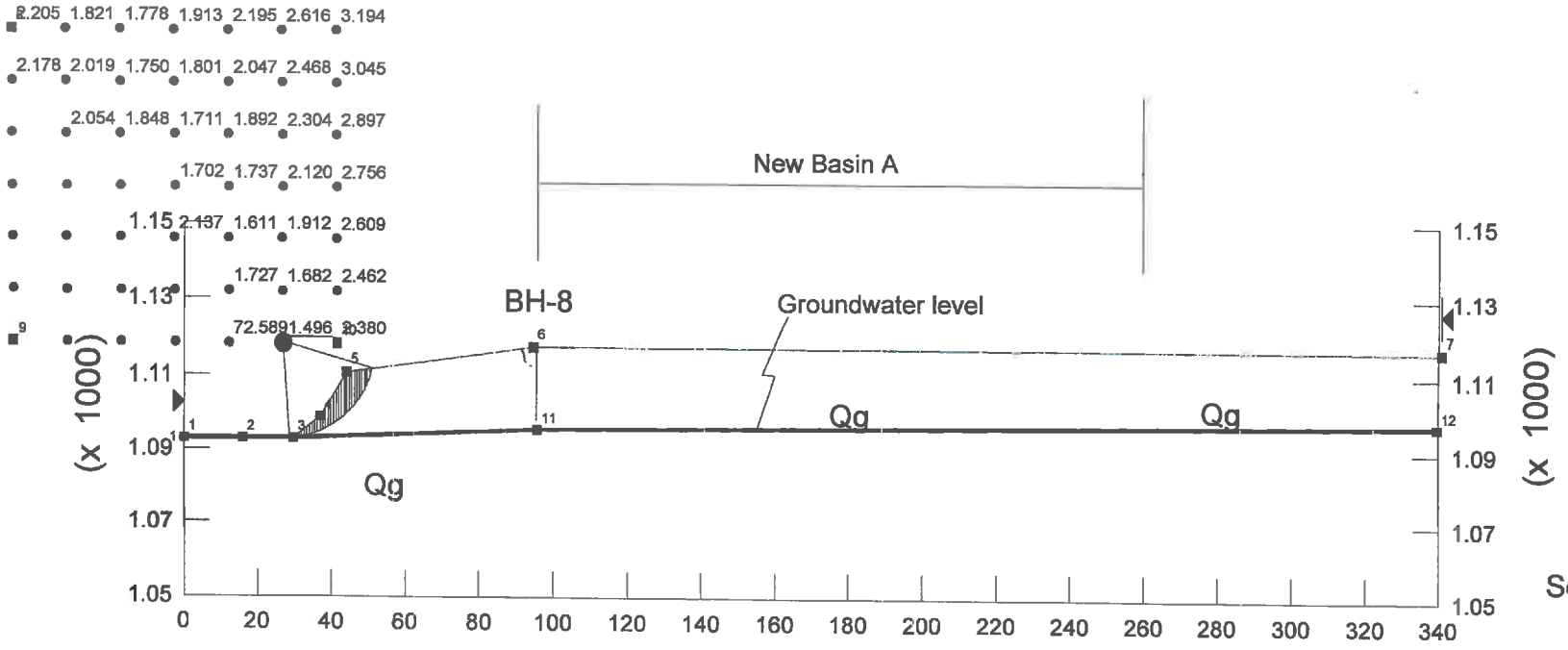
Reference: Los Angeles County (2011). Adminstrative Manual - Low Impact Development Best Management Practice Guideline for Design, Investigation, and Reporting, 01/03/11.

APPENDIX D

SLOPE STABILITY ANALYSES

Description: Gross Slope Stability Analysis - Geologic Cross Section A-A'
Comments: 13-31-199-01 - Arroyo Seco Canyon Project
File Name: 13-31-199-01_a1.slp
Last Saved Date: 8/20/2013
Analysis Method: Spencer
Direction of Slip Movement: Right to Left
Slip Surface Option: Grid and Radius

Case 1: Groundwater level at 20' below grade
Soil Shear Strength
Qg
unit weight = 125 pcf
cohession= 200 psf
friction= 33 degrees

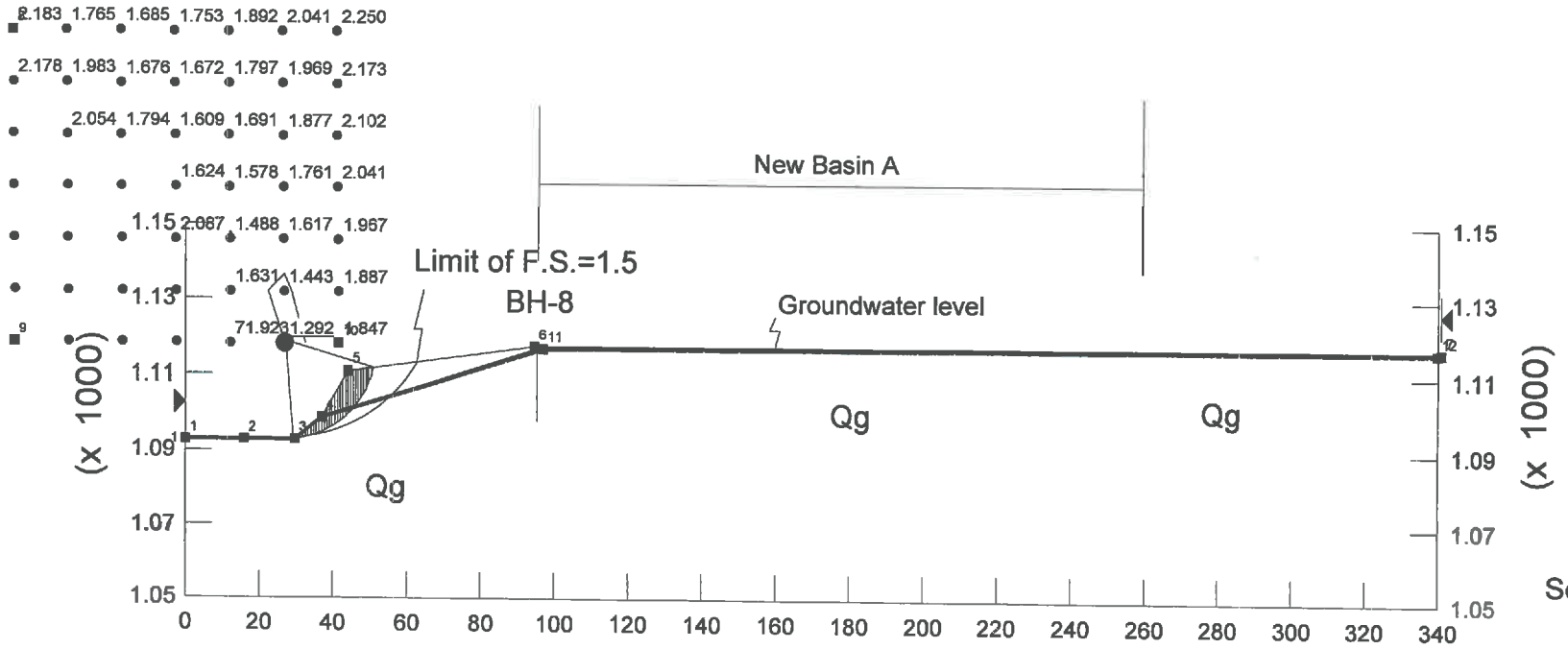


Scale: 1"=50'

Plate S-A1

Description: Gross Slope Stability Analysis - Geologic Cross Section A-A
Comments: 13-31-199-01 - Arroyo Seco Canyon Project
File Name: 13-31-199-01_a2.slp
Last Saved Date: 8/20/2013
Analysis Method: Spencer
Direction of Slip Movement: Right to Left
Slip Surface Option: Grid and Radius

Case 2: Groundwater level at 0' below parking lot grade
Soil Shear Strength
Qg
unit weight = 125 pcf
cohession= 200 psf
friction= 33 degrees



Scale: 1"=50'

Plate S-A2

```
 FILEINFO
 SLOPEW 5.04
 TITLE
 Gross Slope Stability Analysis - Geologic Cross Section A-A'
 13-31-199-01 - Arroyo Seco Canyon Project
 DATESTAMP 8/20/2013
 TIMESTAMP 8:23:45 AM
 ANALYSIS
     2     2     1 +6.2400e+001     1     0     0
 CONVERGE
    30 +1.0000e-002  1000 +0.0000e+000 0 0 0
 SIDE
     1
 LAMBDA
 +0.0000e+000 +9.9900e+002 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
 SOIL           1
     1 +1.2500e+002 +2.0000e+002 +3.3000e+001 +0.0000e+000 +0.0000e+000
+0.0000e+000   1  0
       +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000    0    0
       +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
+0.0000e+000
       +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
+0.0000e+000
 Stream Deposit (Qg)
 SFUNCTION      0
 AFUNCTION      0
 POINT         12
     1 +0.0000e+000 +1.0930e+003
     2 +1.6000e+001 +1.0930e+003
     3 +2.9690e+001 +1.0930e+003
     4 +3.6981e+001 +1.0988e+003
     5 +4.4165e+001 +1.1107e+003
     6 +9.4743e+001 +1.1169e+003
     7 +3.4068e+002 +1.1166e+003
     8 -4.7258e+001 +1.2022e+003
     9 -4.6392e+001 +1.1180e+003
    10 +4.1597e+001 +1.1177e+003
    11 +9.5587e+001 +1.0955e+003
    12 +3.3965e+002 +1.0972e+003
 LINE           1
     1     7
     1
     2
     3
     4
     5
     6
     7
TENSION
    0 +6.2400e+001 +0.0000e+000 +0.0000e+000     0
GRID
    9    10     8     6     6 0 +0.0000e+000 0 +0.0000e+000
RADIUS
    3     3     3     3     0     3     3
AXIS
    0
LIMIT
```

```
 0 +0.0000e+000 +3.4068e+002
 SLIP            0
 BLOCK
     0      0      0      0      0 +1.3500e+002 +1.3500e+002 0  0
     0      0      0      0      0 +4.5000e+001 +4.5000e+001 0  0
 PORU            1
     1 +0.0000e+000      0 +0.0000e+000
 PBBAR           1
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    12
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     8 -4.7258e+001 +1.2022e+003
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     6
     7
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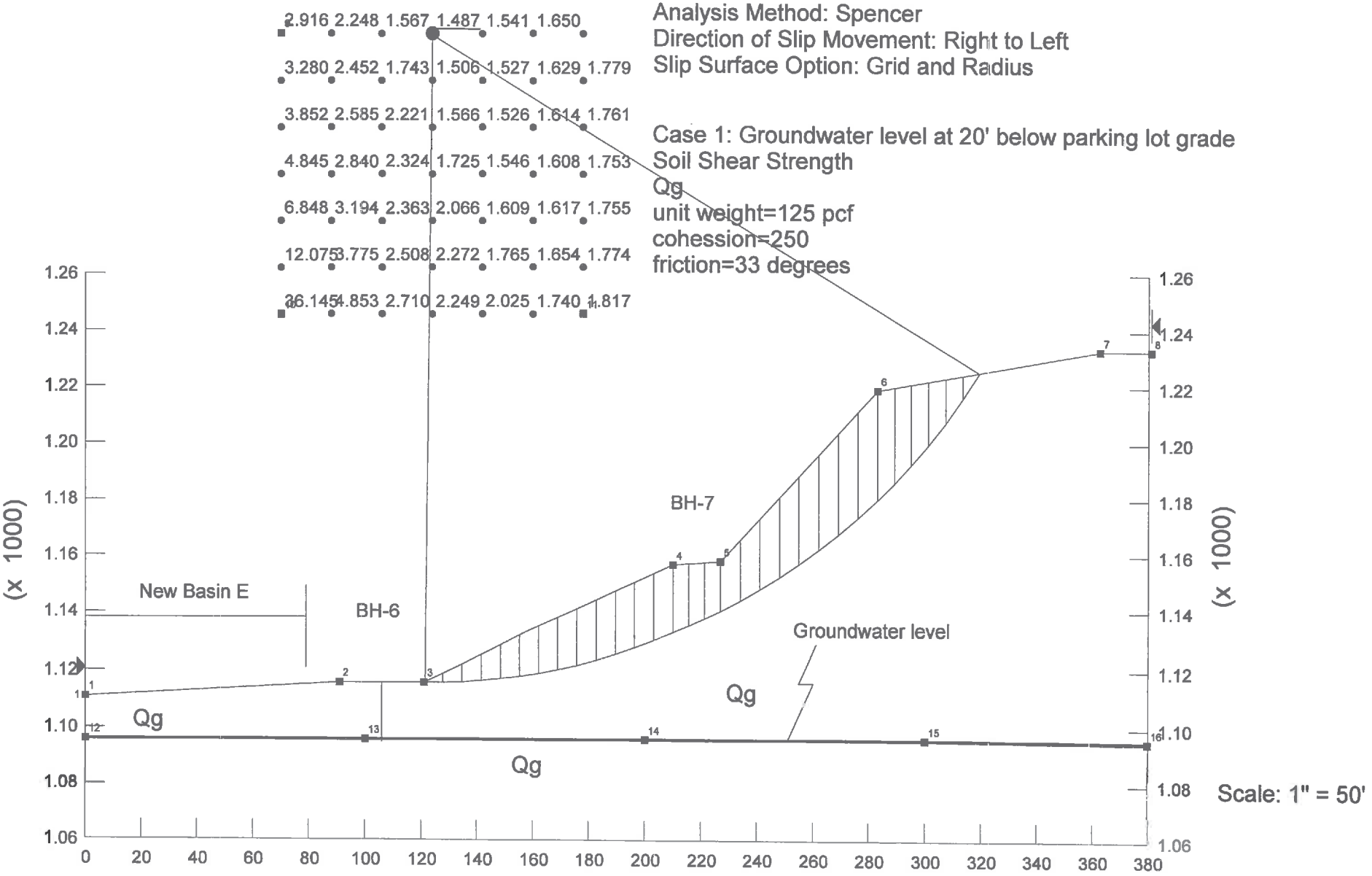
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    1
    2
    3
    4
   11
   12
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Comments: 13-31-199-01 Arroyo Seco Canyon Project
File Name: 13-31-199-01_b1.slp
Last Saved Date: 8/20/2013
Analysis Method: Spencer
Direction of Slip Movement: Right to Left
Slip Surface Option: Grid and Radius

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friction=33 degrees

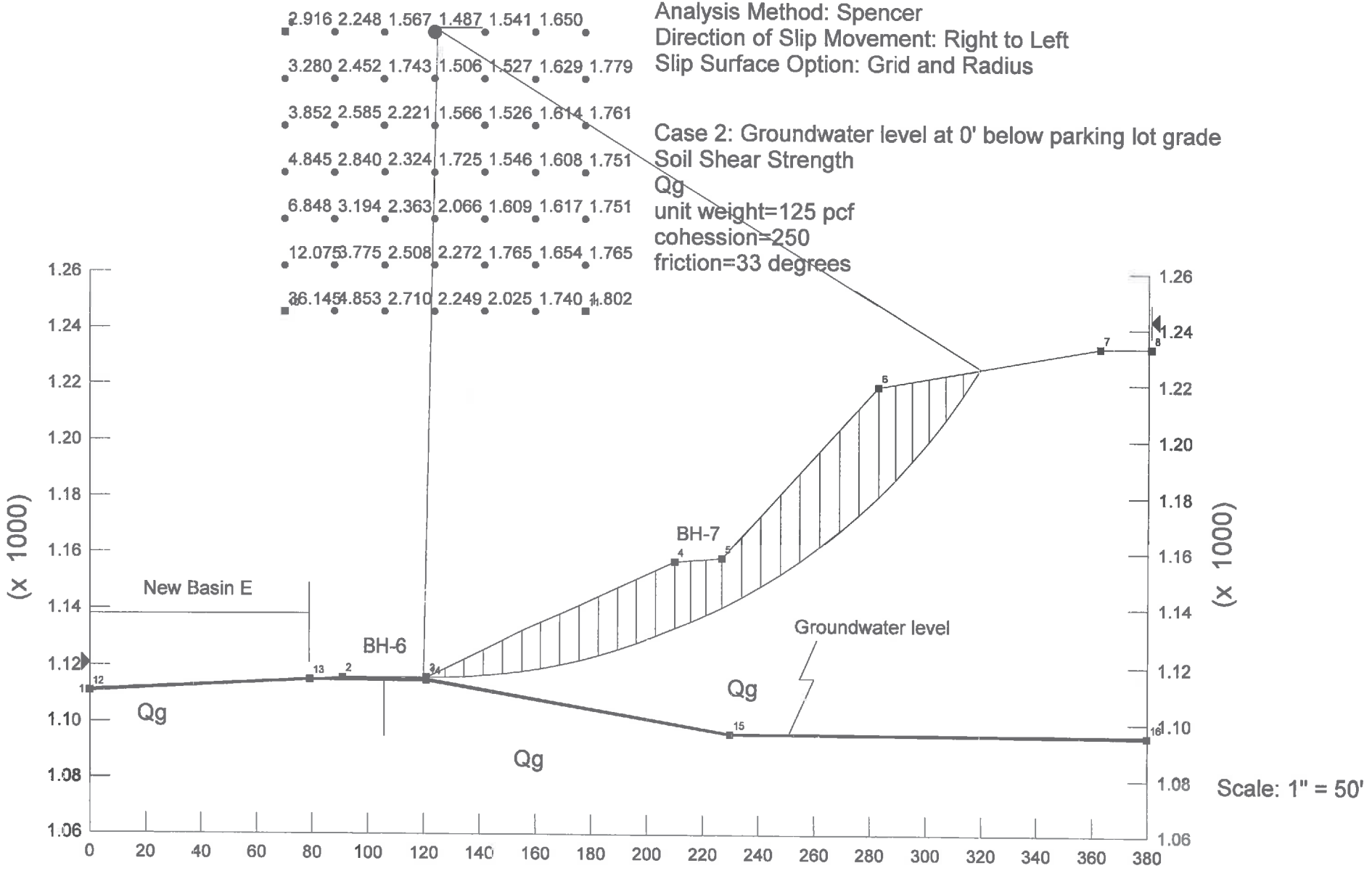


Scale: 1" = 50'

Plate S-B1

Description: Gross Slope Stability Analysis - Geologic Cross Section B-B'
Comments: 13-31-199-01 Arroyo Seco Canyon Project
File Name: 13-31-199-01_b2.slp
Last Saved Date: 8/20/2013
Analysis Method: Spencer
Direction of Slip Movement: Right to Left
Slip Surface Option: Grid and Radius

Case 2: Groundwater level at 0' below parking lot grade
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Qg
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cohession=250
friction=33 degrees



Scale: 1" = 50'

Plate S-B2

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+0.0000e+000
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+0.0000e+000
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 AFUNCTION      0
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   15
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POGR            0
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+0.0000e+000 +0.0000e+000 +0.0000e+000 +0.0000e+000
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 Stream Deposit
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     1
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     3
     4
     5
     6
     7
     8
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Appendix A-3

NOP/Initial Study Comment Letters Received by the City

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
South Coast Region
3883 Ruffin Road
San Diego, CA 92123
(858) 467-4201
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

December 3, 2019

Elisa Ventura
City of Pasadena
150 S. Los Robles Ave., Suite 200
Pasadena, CA 91101
(626) 744-4465

Subject: Comments on the Notice of Preparation of a Draft Environmental Impact Report for the Arroyo Seco Canyon Project Areas 2 and 3, Los Angeles County

Dear Ms. Elisa Ventura:

The California Department of Fish and Wildlife (CDFW) has reviewed the above-referenced Notice of Preparation (NOP) for the Arroyo Seco Project Areas 2 and 3 (Project) Draft Environmental Impact Report (DEIR).

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW's Role

CDFW is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the State [Fish & Game Code, §§ 711.7, subdivision (a) & 1802; Public Resources Code, § 21070; California Environmental Quality Act (CEQA) Guidelines, § 15386, subdivision (a)]. CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (Id., § 1802). Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect state fish and wildlife resources.

CDFW is also submitting comments as a Responsible Agency under CEQA (Public Resources Code, § 21069; CEQA Guidelines, § 15381). CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code, including lake and streambed alteration regulatory authority (Fish & Game Code, § 1600 et seq.). Likewise, to the extent implementation of the Project as proposed may result in "take" (see Fish & Game Code, § 2050) of any species protected under the California Endangered Species Act (CESA; Fish & Game Code, § 2050 et seq.) or the Native Plant Protection Act (NPPA; Fish & Game Code, §1900 et seq.), CDFW recommends the project proponent obtain appropriate authorization under the Fish and Game Code.

Project Location: The Project site is located within the Arroyo Seco Canyon adjacent to North Arroyo Boulevard (i.e., Gabriellino Trail/Access Road), located in Township 1 North, Range 12

West. The proposed Project consists of two primary areas, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements.

Project Description/Objectives: The Project involves a requested modification to Conditional Use Permit #6222 in order to construct and operate proposed water infrastructure improvements in Areas 2 and 3. Improvements in Area 2 include the removal of the existing diversion/weir structure and the intake structure. This would be replaced with a new diversion/weir structure that could be operated to divert up to 25 cubic feet per second (cfs) of creek flows through the new intake structure and into the existing conveyance system (a combination of tunnels and pipelines). Improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased flows for infiltration into the Raymond Basin. Various facilities would be demolished, including inlet/outlet structures, pipes and valves, fencing, and other small appurtenant structures, to allow for the reconstructed basins.

The Project objective is to increase the beneficial use of the City's surface water rights and to improve biological functions within the Arroyo Seco.

COMMENTS AND RECOMMENDATIONS

CDFW offers the following comments and recommendations to assist the City of Pasadena Department of Water and Power (DWP) in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife (biological) resources.

Specific Comments

1) Regional Setting. CEQA Guidelines section 15125(c) require the Lead Agency to include information on the regional setting that is critical to an assessment of environmental impacts, with special emphasis placed on resources that are rare or unique to the region. The DEIR should include measures to fully avoid and otherwise protect Sensitive Natural Communities from Project-related impacts. The Initial Study addresses three Threatened or Endangered plant species as well as impacts to riparian habitat that includes "sensitive vegetation communities". CDFW considers these communities as threatened habitats having both regional and local significance. Plant communities, alliances, and associations with a state-wide ranking of S1, S2, S3, and S4 should be considered sensitive and declining at the local and regional level. These ranks can be obtained by visiting https://www.wildlife.ca.gov/Data/VegCAMP/Natural-Communities#sensitive%20natural%20communities.

2) LSA: The Project would directly impact the Arroyo Seco. As a Responsible Agency under CEQA, CDFW has authority over activities in streams and/or lakes that will divert or obstruct the natural flow; or change the bed, channel, or bank (including vegetation associated with the stream or lake) of a river or stream; or use material from a streambed. For any such activities, the project applicant (or "entity") must provide written notification to CDFW pursuant to section 1600 et seq. of the Fish and Game Code. Based on this notification and other information, CDFW determines whether an LSA Agreement (Agreement) with the applicant is required prior to conducting the proposed activities. CDFW's issuance of an Agreement for a project that is subject to CEQA will require related environmental compliance actions by CDFW as a Responsible Agency. As a Responsible Agency, CDFW

may consider the CEQA document prepared by the local jurisdiction (Lead Agency) for the Project. To minimize additional requirements by CDFW pursuant to section 1600 *et seq.* and/or under CEQA, the DEIR should fully identify the potential impacts to the stream or riparian resources and provide adequate avoidance, mitigation, monitoring and reporting commitments for issuance of the LSA (available at www.wildlife.ca.gov/habcon/1600).

a) The Project area supports aquatic, riparian, and wetland habitats; therefore, a preliminary jurisdictional delineation of the streams and their associated riparian habitats should be included in the DEIR. The delineation should be conducted pursuant to the U. S. Fish and Wildlife Service (USFWS) wetland definition adopted by the CDFW (Cowardin et al. 1970). Some wetland and riparian habitats subject to CDFW's authority may extend beyond the jurisdictional limits of the U.S. Army Corps of Engineers' section 404 permit and Regional Water Quality Control Board section 401 Certification.

b) In areas of the Project site which may support ephemeral streams, herbaceous vegetation, woody vegetation, and woodlands also serve to protect the integrity of ephemeral channels and help maintain natural sedimentation processes; therefore, CDFW recommends effective setbacks be established to maintain appropriately-sized vegetated buffer areas adjoining ephemeral drainages.

c) Project-related changes in upstream and downstream drainage patterns, runoff, and sedimentation should be included and evaluated in the DEIR.

d) As part of the LSA Notification process, CDFW requests the 100, 50, 25, 10, 5, and 2-year frequency storm event for existing and proposed conditions. CDFW recommends the DEIR evaluate the results and address avoidance, minimization, and/or mitigation measures that may be necessary to reduce potential significant impacts.

3) Fish Habitat. Project implementation may result in substantial adverse effect to biological function for fish species during flow periods. Fish and Game Code section 5901 makes it unlawful to construct or maintain in any streams any device that prevents, impedes, or tends to prevent or impede the passing of fish up and downstream. CDFW recommends the DEIR include a thorough and complete survey by a qualified biologist during the spawning season (spring/summer) to determine that Project activities do not prevent or impede fish passage during low flow conditions.

Fish and Game Code section 5937 requires the owner of any dam to allow sufficient water at all times to pass through a fishway or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam. CDFW also recommends the DEIR provide a thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, especially fish species, with specific measures to offset such impacts, the following should be addressed in the DEIR.

a) A discussion of potential adverse impacts from human activity, exotic species, and drainage should also be included. The latter subject should address: project-related changes on drainage and sedimentation patterns on and downstream of the project site; the volume, velocity, and frequency of existing and post-project

surface flows; polluted runoff; soil erosion and/or sedimentation in streams and water bodies; and post-project fate of runoff from the project site. Impact analysis should also address any interruption of sediment transport caused by the dam structure. Impeding sediment transport within the stream can have impacts to fish habitat both upstream and downstream of the dam structure.

b) The discussions should also address the proximity of the extraction activities to the water table, whether dewatering would be necessary, and the potential resulting impacts on the habitat, if any, supported by the groundwater. Mitigation measures proposed to alleviate such impacts should be included.

c) Impacts on, and maintenance of, fishway/movement areas, should be fully evaluated in the DEIR.

General Comments

1) Project Description and Alternatives. To enable CDFW to adequately review and comment on the proposed Project from the standpoint of the protection of plants, fish, and wildlife, we recommend the following information be included in the DEIR:

   a) A complete discussion of the purpose and need for, and description of, the proposed Project, including all staging areas and access routes to the construction and staging areas; and,

   b) A range of feasible alternatives to Project component location and design features to ensure that alternatives to the proposed Project are fully considered and evaluated. The alternatives should avoid or otherwise minimize direct and indirect impacts to sensitive biological resources and wildlife movement areas.

2) Wetlands Resources. CDFW, as described in Fish and Game Code section 703(a), is guided by the Fish and Game Commission's policies. The Wetlands Resources policy (http://www.fgc.ca.gov/policy/) of the Fish and Game Commission "...seek[s] to provide for the protection, preservation, restoration, enhancement and expansion of wetland habitat in California. Further, it is the policy of the Fish and Game Commission to strongly discourage development in or conversion of wetlands. It opposes, consistent with its legal authority, any development or conversion that would result in a reduction of wetland acreage or wetland habitat values. To that end, the Commission opposes wetland development proposals unless, at a minimum, project mitigation assures there will be 'no net loss' of either wetland habitat values or acreage. The Commission strongly prefers mitigation which would achieve expansion of wetland acreage and enhancement of wetland habitat values."

   a) The Wetlands Resources policy provides a framework for maintaining wetland resources and establishes mitigation guidance. CDFW encourages avoidance of wetland resources as a primary mitigation measure and discourages the development or type conversion of wetlands to uplands. CDFW encourages activities that would avoid the reduction of wetland acreage, function, or habitat values. Once avoidance and minimization measures have been exhausted, the Project must include mitigation measures to assure a "no net loss" of either wetland habitat values, or acreage, for unavoidable impacts to wetland resources. Conversions include, but are not limited to, conversion to subsurface drains, placement of fill or

building of structures within the wetland, and channelization or removal of materials from the streambed. All wetlands and watercourses, whether ephemeral, intermittent, or perennial, should be retained and provided with substantial setbacks, which preserve the riparian and aquatic values and functions for the benefit to on-site and off-site wildlife populations. CDFW recommends mitigation measures to compensate for unavoidable impacts be included in the DEIR and these measures should compensate for the loss of function and value.

b) The Fish and Game Commission's Water policy guides CDFW on the quantity and quality of the waters of this state that should be apportioned and maintained respectively so as to produce and sustain maximum numbers of fish and wildlife; to provide maximum protection and enhancement of fish and wildlife and their habitat; encourage and support programs to maintain or restore a high quality of the waters of this state; prevent the degradation thereof caused by pollution and contamination; and, endeavor to keep as much water as possible open and accessible to the public for the use and enjoyment of fish and wildlife. CDFW recommends avoidance of water practices and structures that use excessive amounts of water, and minimization of impacts that negatively affect water quality, to the extent feasible (Fish & Game Code, § 5650).

3) CESA. CDFW considers adverse impacts to a species protected by CESA to be significant without mitigation under CEQA. As to CESA, take of any endangered, threatened, candidate species, or State-listed rare plant species that results from the Project is prohibited, except as authorized by state law (Fish and Game Code, §§ 2080, 2085; Cal. Code Regs., tit. 14, §786.9). Consequently, if the Project, Project construction, or any Project-related activity during the life of the Project will result in take of a species designated as endangered or threatened, or a candidate for listing under CESA, CDFW recommends that the Project proponent seek appropriate take authorization under CESA prior to implementing the Project. Appropriate authorization from CDFW may include an Incidental Take Permit (ITP) or a consistency determination in certain circumstances, among other options [Fish & Game Code, §§ 2080.1, 2081, subds. (b) and (c)]. Early consultation is encouraged, as significant modification to a Project and mitigation measures may be required in order to obtain a CESA Permit. Revisions to the Fish and Game Code, effective January 1998, may require that CDFW issue a separate CEQA document for the issuance of an ITP unless the Project CEQA document addresses all Project impacts to CESA-listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of an ITP. For these reasons, biological mitigation monitoring and reporting proposals should be of sufficient detail and resolution to satisfy the requirements for a CESA ITP.

4) Biological Baseline Assessment. To provide a complete assessment of the flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened, sensitive, regionally and locally unique species, and sensitive habitats, the DEIR should include the following information:

a) Information on the regional setting that is critical to an assessment of environmental impacts, with special emphasis on resources that are rare or unique to the region [CEQA Guidelines, § 15125(c)];

b) A thorough, recent, floristic-based assessment of special status plants and natural communities, following CDFW's *Protocols for Surveying and Evaluating Impacts to*

Special Status Native Plant Populations and Natural Communities (see https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline);

c) Floristic, alliance- and/or association-based mapping and vegetation impact assessments conducted at the Project site and within the neighboring vicinity. *The Manual of California Vegetation*, second edition, should also be used to inform this mapping and assessment (Sawyer, 2008). Adjoining habitat areas should be included in this assessment where site activities could lead to direct or indirect impacts offsite. Habitat mapping at the alliance level will help establish baseline vegetation conditions;

d) A complete, recent, assessment of the biological resources associated with each habitat type on site and within adjacent areas that could also be affected by the project. CDFW's California Natural Diversity Data Base (CNDDB) in Sacramento should be contacted to obtain current information on any previously reported sensitive species and habitat. CDFW recommends that CNDDB Field Survey Forms be completed and submitted to CNDDB to document survey results. Online forms can be obtained and submitted at http://www.dfg.ca.gov/biogeodata/cnddb/submitting_data_to_cnddb.asp;

e) A complete, recent, assessment of rare, threatened, and endangered, and other sensitive species on site and within the area of potential effect, including California SSC and California Fully Protected Species (Fish & Game Code, §§ 3511, 4700, 5050 and 5515). Species to be addressed should include all those which meet the CEQA definition of endangered, rare or threatened species (CEQA Guidelines, § 15380). Seasonal variations in use of the project area should also be addressed. Focused species-specific surveys, conducted at the appropriate time of year and time of day when the sensitive species are active or otherwise identifiable, are required. Acceptable species-specific survey procedures should be developed in consultation with CDFW and the USFWS; and,

f) A recent, wildlife and rare plant survey. CDFW generally considers biological field assessments for wildlife to be valid for a one-year period, and assessments for rare plants may be considered valid for a period of up to three years. Some aspects of the proposed project may warrant periodic updated surveys for certain sensitive taxa, particularly if build out could occur over a protracted time frame, or in phases.

5) Biological Direct, Indirect, and Cumulative Impacts. To provide a thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts, the following should be addressed in the DEIR:

a) A discussion of potential adverse impacts from lighting, noise, human activity, exotic species, and drainage. The latter subject should address Project-related changes on drainage patterns and downstream of the project site; the volume, velocity, and frequency of existing and post-Project surface flows; polluted runoff; soil erosion and/or sedimentation in streams and water bodies; and, post-Project fate of runoff from the project site. The discussion should also address the proximity of the extraction activities to the water table, whether dewatering would be necessary and

the potential resulting impacts on the habitat (if any) supported by the groundwater. Mitigation measures proposed to alleviate such Project impacts should be included;

b) A discussion regarding indirect Project impacts on biological resources, including resources in nearby public lands, open space, adjacent natural habitats, riparian ecosystems, and any designated and/or proposed or existing reserve lands (e.g., preserve lands associated with a Natural Community Conservation Plan (NCCP, Fish & Game Code, § 2800 et. seq.). Impacts on, and maintenance of, wildlife corridor/movement areas, including access to undisturbed habitats in adjacent areas, should be fully evaluated in the DEIR;

c) An analysis of impacts from land use designations and zoning located nearby or adjacent to natural areas that may inadvertently contribute to wildlife-human interactions. A discussion of possible conflicts and mitigation measures to reduce these conflicts should be included in the DEIR; and,

d) A cumulative effects analysis, as described under CEQA Guidelines section 15130. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant communities and wildlife habitats.

6) Compensatory Mitigation. The DEIR should include mitigation measures for adverse Project-related impacts to sensitive plants, animals, and habitats. Mitigation measures should emphasize avoidance and reduction of Project impacts. For unavoidable impacts, on-site habitat restoration or enhancement should be discussed in detail. If on-site mitigation is not feasible or would not be biologically viable and therefore not adequately mitigate the loss of biological functions and values, off-site mitigation through habitat creation and/or acquisition and preservation in perpetuity should be addressed. Areas proposed as mitigation lands should be protected in perpetuity with a conservation easement, financial assurance and dedicated to a qualified entity for long-term management and monitoring. Under Government Code section 65967, the lead agency must exercise due diligence in reviewing the qualifications of a governmental entity, special district, or nonprofit organization to effectively manage and steward land, water, or natural resources on mitigation lands it approves.

7) Long-term Management of Mitigation Lands. For proposed preservation and/or restoration, the DEIR should include measures to protect the targeted habitat values from direct and indirect negative impacts in perpetuity. The objective should be to offset the Project-induced qualitative and quantitative losses of wildlife habitat values. Issues that should be addressed include (but are not limited to) restrictions on access, proposed land dedications, monitoring and management programs, control of illegal dumping, water pollution, and increased human intrusion. An appropriate non-wasting endowment should be set aside to provide for long-term management of mitigation lands.

8) Nesting Birds. CDFW recommends that measures be taken to avoid Project impacts to nesting birds. Migratory nongame native bird species are protected by international treaty under the Federal Migratory Bird Treaty Act (MBTA) of 1918 (Title 50, § 10.13, Code of Federal Regulations). Sections 3503, 3503.5, and 3513 of the California Fish and Game Code prohibit take of all birds and their active nests including raptors and other migratory nongame birds (as listed under the Federal MBTA). Proposed Project activities including

(but not limited to) staging and disturbances to native and nonnative vegetation, structures, and substrates should occur outside of the avian breeding season which generally runs from February 1 through September 1 (as early as January 1 for some raptors) to avoid take of birds or their eggs. If avoidance of the avian breeding season is not feasible, CDFW recommends surveys by a qualified biologist with experience in conducting breeding bird surveys to detect protected native birds occurring in suitable nesting habitat that is to be disturbed and (as access to adjacent areas allows) any other such habitat within 300-feet of the disturbance area (within 500-feet for raptors). Project personnel, including all contractors working on site, should be instructed on the sensitivity of the area. Reductions in the nest buffer distance may be appropriate depending on the avian species involved, ambient levels of human activity, screening vegetation, or possibly other factors.

9) Translocation/Salvage of Plants and Animal Species. Translocation and transplantation is the process of moving an individual from the Project site and permanently moving it to a new location. CDFW generally does not support the use of, translocation or transplantation as the primary mitigation strategy for unavoidable impacts to rare, threatened, or endangered plant or animal species. Studies have shown that these efforts are experimental and the outcome unreliable. CDFW has found that permanent preservation and management of habitat capable of supporting these species is often a more effective long-term strategy for conserving sensitive plants and animals and their habitats.

10) Moving out of Harm's Way. The proposed Project is anticipated to result in clearing of natural habitats that support many species of indigenous wildlife. To avoid direct mortality, we recommend that a qualified biological monitor approved by CDFW be on-site prior to and during ground and habitat disturbing activities to move out of harm's way special status species or other wildlife of low mobility that would be injured or killed by grubbing or Project-related construction activities. It should be noted that the temporary relocation of on-site wildlife does not constitute effective mitigation for the purposes of offsetting project impacts associated with habitat loss. If the project requires species to be removed, disturbed, or otherwise handled, we recommend that the DEIR clearly identify that the designated entity shall obtain all appropriate state and federal permits.

11) Tree Replacement: To compensate for any loss of trees, CDFW recommends replacing all non-native trees removed as a result of the proposed work activities at a 1:1 ratio with native trees. CDFW recommends replacing native trees at a 3:1 ratio with a combination of native trees and/or appropriate understory and lower canopy plantings. CDFW recommends that any loss of oaks shall be replanted at a minimum 10:1 ratio. Replacement oaks shall come from nursery stock grown from locally sourced acorns, or from acorns gathered locally, preferably from the same watershed in which they were planted.

12) Revegetation/Restoration Plan: Plans for restoration and re-vegetation should be prepared by persons with expertise in southern California ecosystems and native plant restoration techniques. Plans should identify the assumptions used to develop the proposed restoration strategy. Each plan should include, at a minimum: (a) the location of restoration sites and assessment of appropriate reference sites; (b) the plant species to be used, sources of local propagules, container sizes, and seeding rates; (c) a schematic depicting the mitigation area; (d) a local seed and cuttings and planting schedule; (e) a description of the irrigation methodology; (f) measures to control exotic vegetation on site; (g) specific success criteria; (h) a detailed monitoring program; (i) contingency measures should the success criteria not

be met; and (j) identification of the party responsible for meeting the success criteria and providing for conservation of the mitigation site in perpetuity. Monitoring of restoration areas should extend across a sufficient time frame to ensure that the new habitat is established, self-sustaining, and capable of surviving drought.

a) CDFW recommends that local on-site propagules from the Project area and nearby vicinity be collected and used for restoration purposes. On-site seed collection should be initiated in the near future to accumulate sufficient propagule material for subsequent use in future years. On-site vegetation mapping at the alliance and/or association level should be used to develop appropriate restoration goals and local plant palettes. Reference areas should be identified to help guide restoration efforts. Specific restoration plans should be developed for various Project components as appropriate.

b) Restoration objectives should include providing special habitat elements where feasible to benefit key wildlife species. These physical and biological features can include (for example) retention of woody material, logs, snags, rocks and brush piles.

13) Fuel Modification. The DEIR should include information as to how the Project or adjacent land may be affected by fuel modification requirements. A discussion of any fuel modification requirements for this Project should be included in the DEIR to allow CDFW to assess potential impacts to biological resources. CDFW recommends all fuel modification requirements be met on the Project, and not in mitigation lands or habitat adjacent to the Project. Habitat being subjected to fuel modification (e.g., thinning, trimming, removal of mulch layer) should be considered an impact to these vegetation communities and mitigated accordingly. CDFW also recommends any irrigation proposed in fuel modification zones drain back into the development and not onto natural habitat land as perennial sources of water allow for the introduction of invasive Argentine ants.

14) Rodenticide Use. Impacts to biological resources can occur from wildlife directly consuming poison. Impacts can also occur through secondary poisoning where an animal consumes another organism that has consumed poison. CDFW confirmed anticoagulant rodenticide in 14 of 14 mountain lions necropsied in 2013 (McMillin, 2013). Lima et al. (2010), tested 96 birds (11 raptor species) in California and found 86 out of 96 raptors tested positive for second generation anticoagulant rodenticides. CDFW recommends the DEIR contain language disallowing the use of rodenticides that could result in direct or secondary poisoning to native mammals, birds, and raptors.

15) Landscaping. CDFW recommends using native, locally appropriate plant species for landscaping on the Project site. CDFW recommends invasive/exotic plants, including pepper trees (*Schinus* genus) and fountain grasses (*Pennisetum* genus), be restricted from use in landscape plans for this Project. A list of invasive/exotic plants that should be avoided as well as suggestions for better landscape plants can be found at https://www.cal-ipc.org/solutions/prevention/landscaping/.

CONCLUSION

CDFW appreciates the opportunity to comment on the NOP to assist the City of Pasadena DWP in identifying and mitigating Project impacts on biological resources. If you have any questions or comments regarding this letter, please contact Felicia Silva, Environmental Scientist, at (562) 430-0098 or by email at Felicia.Silva@wildlife.ca.gov.

Sincerely,

Erinn Wilson
Environmental Program Manager I

cc: CDFW
Erinn Wilson – Los Alamitos
Victoria Tang – Los Alamitos
Andrew Valand – Los Alamitos
Felicia Silva – Los Alamitos
Kelly Schmoker – Glendora

Scott Morgan (State Clearinghouse)

References

California Department of Fish and Wildlife [CDFW]. March 20, 2018. Protocols for Surveying and Evaluation Impacts to Special Status Native Plant Populations and Sensitive Natural Communities. (see https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline)

Cowardin, Lewis M., et al. 1970. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service.

Lima, L. and T. Salmon. 2010. Lima, L. and T. Salmon. 2010. Assessing some potential environmental impacts from agricultural anticoagulant uses. Proceedings of Vertebrate Pest Conference.

McMillin, Stella, California Department of Fish and Game. Wildlife Investigations Laboratory.

Sawyer, J. O., Keeler-Wolf, T., and Evens J.M. 2008. A manual of California Vegetation, 2nd ed. ISBN 978-0-943460-49-9.

DEPARTMENT OF TRANSPORTATION
DISTRICT 7 – Office of Regional Planning
100 S. MAIN STREET, MS 16
LOS ANGELES, CA 90012
PHONE (213) 897-0475
FAX (213) 897-1337
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

December 6, 2019

Ms. Elisa Ventura, PE
City of Pasadena
150 S. Los Robles Avenue, Suite 200
Pasadena, CA 91101

RE: Arroyo Seco Canyon Project Area 2 and 3 – Notice of Preparation (NOP)
SCH # 2014101022
GTS # 07-LA-2019-02909
Vic. LA-210/PM: R21.325

Dear Ms. Elisa Ventura:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced NOP. The proposed project involves water infrastructure improvements in the Arroyo Seco Canyon to allow for the diversion and spreading of up to 25 cubic feet per second (cfs) of surface water. Improvements in Area 2 involve the demolition and replacement of an existing diversion facility and intake structure in the same general location. Improvements in Area 3 involve the reconfiguration and expansion of existing spreading basins. The project objective is to increase the beneficial use of the City's surface water rights and to improve biological functions within the Arroyo Seco. The City of Pasadena is considered the Lead Agency under the California Environmental Quality Act (CEQA).

The proposed project is located approximately 1.25 miles away from Interstate 210 (I-210) and 3.5 miles away from State Route 134 (SR-134).

After reviewing the NOP, Caltrans agrees that project-related construction truck activities, in combination with the ongoing sediment removal activities associated with the Devil's Gate Reservoir project, have the potential to result in cumulative short-term impacts and that this topic should be further evaluated in the forthcoming Draft Environmental Impact Report (DEIR). The transportation impact analysis that will be part of the upcoming DEIR may need to include the following locations, due to their proximity to the project site and the size of the project. Also, some of the below locations were identified in the NOP as facilities that construction trucks will use for this project:

- SR-134 & Figueroa Street/School Canyon Road off-ramp and on-ramp
- I-210 & Windsor Avenue off-ramp and on-ramp
- I-210 & Foothill Boulevard off-ramp and on-ramp
- I-210 & Berkshire Place off-ramp and on-ramp

Also, queueing analyses should be provided for the above off-ramps, since excessive queuing at off-ramps increases the potential for traffic conflicts.

Since the City of Pasadena adopted a Vehicles Miles Traveled (VMT) metric for transportation analysis in 2014, Caltrans looks forward to reviewing the potential VMT analyses for the above locations, and to provide further comments, if warranted.

If it is found that any of the above locations will be significantly impacted by the project, Caltrans looks forward to reviewing the proposed mitigation measures for those locations.

The following information is included for your consideration.

Caltrans applauds the City of Pasadena for its early adoption of the VMT metric, which assists the State in meeting greenhouse gas emissions reductions targets and reducing VMT. Please continue to make every attempt to reduce VMT, and in particular the potential VMT generated from construction trips for this project. For TDM options that can reduce VMT, please refer to:

- The 2010 *Quantifying Greenhouse Gas Mitigation Measures* report by the California Air Pollution Control Officers Association (CAPCOA), available at http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf, or
- *Integrating Demand Management into the Transportation Planning Process: A Desk Reference* (Chapter 8) by the Federal Highway Administration (FHWA), available at https://ops.fhwa.dot.gov/publications/fhwahop12035/index.htm

As a reminder, any transportation of heavy construction equipment and/or materials which requires use of oversized-transport vehicles on State highways will need a Caltrans transportation permit. We recommend large size truck trips be limited to off-peak commute periods. Since construction traffic is expected to cause delays on State facilities such as I-210, please submit a construction traffic management plan detailing these delays for Caltrans' review.

If you have any questions about these comments, please contact Emily Gibson, the project coordinator, at Emily.Gibson@dot.ca.gov, and refer to GTS# 07-LA-2019-02909.

Sincerely,

MIYA EDMONSON
IGR/CEQA Branch Chief
cc: Scott Morgan, State Clearinghouse

STATE OF CALIFORNIA
Governor's Office of Planning and Research
State Clearinghouse and Planning Unit

Gavin Newsom
Governor

Kate Gordon
Director

Notice of Preparation

November 1, 2019

To: Reviewing Agencies

Re: Arroyo Seco Canyon Project
SCH# 2014101022

Attached for your review and comment is the Notice of Preparation (NOP) for the Arroyo Seco Canyon Project draft Environmental Impact Report (EIR).

Responsible agencies must transmit their comments on the scope and content of the NOP, focusing on specific information related to their own statutory responsibility, within 30 days of receipt of the NOP from the Lead Agency. This is a courtesy notice provided by the State Clearinghouse with a reminder for you to comment in a timely manner. We encourage other agencies to also respond to this notice and express their concerns early in the environmental review process.

Please direct your comments to:

Elisa Ventura
Pasadena, City of
150 S. Los Robles Ave., Suite 200
Pasadena, CA 91101

with a copy to the State Clearinghouse in the Office of Planning and Research at state.clearinghouse@opr.ca.gov . Please refer to the SCH number noted above in all correspondence concerning this project on our website: https://ceqanet.opr.ca.gov/2014101022/4.

If you have any questions about the environmental document review process, please call the State Clearinghouse at (916) 445-0613.

Sincerely,

Scott Morgan
Director, State Clearinghouse

Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

2014101022

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Arroyo Seco Canyon Project Areas 2 and 3

Lead Agency: City of Pasadena
Contact Person: Elisa Ventura, PE
Mailing Address: 150 S. Los Robles Ave., Suite 200
Phone: 626-744-4465
City: Pasadena Zip: 91101
County: Los Angeles

Project Location: County: Los Angeles City/Nearest Community: Pasadena
Cross Streets: Explorer Road Zip Code: 91103
Longitude/Latitude (degrees, minutes and seconds): 34 ° 12 ′ 8.00 ″ N / 118 ° 9 ′ 57.44 ″ W Total Acres: 37.4
Assessor's Parcel No.: Part of 5830-001-906, 5823-015-902 Section: 05 Twp.: 1N Range: 12W Base:
Within 2 Miles: State Hwy #: SR-2 and I-210 Waterways: Arroyo Seco
Airports: N/A Railways: N/A Schools: La Canada HS/Odyssey

Document Type:

CEQA: ☒ NOP ☐ Draft EIR
☐ Early Cons ☐ Supplement/Subsequent EIR
☐ Neg Dec (Prior SCH No.)
☐ Mit Neg Dec Other:

NEPA: ☐ NOI Other: ☐ Joint Document
☐ EA ☐ Final Document
☐ Draft EIS ☐ Other:
☐ FONSI

Governor's Office of Planning & Research
NOV 01 2019
STATE CLEARINGHOUSE

Local Action Type:

☐ General Plan Update ☐ Specific Plan ☐ Rezone ☐ Annexation
☐ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☒ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, etc.) ☐ Other:

Development Type:

☐ Residential: Units Acres
☐ Office: Sq.ft. Acres Employees
☐ Commercial: Sq.ft. Acres Employees
☐ Industrial: Sq.ft. Acres Employees
☐ Educational:
☐ Recreational:
☐ Water Facilities: Type MGD

☐ Transportation: Type
☐ Mining: Mineral
☐ Power: Type MW
☐ Waste Treatment: Type MGD
☐ Hazardous Waste: Type
☒ Other: Water Infrastructure; Spreading Basin Expansion

Project Issues Discussed in Document:

☐ Aesthetic/Visual
☐ Agricultural Land
☒ Air Quality
☒ Archeological/Historical
☒ Biological Resources
☐ Coastal Zone
☒ Drainage/Absorption
☐ Economic/Jobs
☐ Fiscal
☒ Flood Plain/Flooding
☐ Forest Land/Fire Hazard
☐ Geologic/Seismic
☐ Minerals
☒ Noise
☐ Population/Housing Balance
☐ Public Services/Facilities
☒ Recreation/Parks
☐ Schools/Universities
☐ Septic Systems
☐ Sewer Capacity
☒ Soil Erosion/Compaction/Grading
☐ Solid Waste
☐ Toxic/Hazardous
☐ Traffic/Circulation
☒ Vegetation
☐ Water Quality
☒ Water Supply/Groundwater
☒ Wetland/Riparian
☐ Growth Inducement
☐ Land Use
☐ Cumulative Effects
☐ Other:

Present Land Use/Zoning/General Plan Designation:

Water Infrastructure Uses/Open Space Zoning/ Open Space GP Designation

Project Description: *(please use a separate page if necessary)*

The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco for direct use or for spreading into their basins for groundwater pumping credits in the Raymond Basin. The City receives between 60 to 80% pumping credit for the amount of water recharged into the Basin. The Project involves water infrastructure improvements in the Arroyo Seco Canyon to allow for the diversion and spreading of up to 25 cfs of surface water. Improvements in Area 2 involve the demolition and replacement of an existing diversion/weir and intake structure in the same general location. Improvements in Area 3 involve the reconfiguration and expansion of existing spreading basins. The Project objective is to increase the beneficial use of the City's surface water rights and to improve biological functions within the Arroyo Seco.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

NOP Distribution List

County: Los Angeles **SCH#** 2014101022

Resources Agency

- [■] **Resources Agency**
  Nadell Gayou
  - [■] **Dept. of Boating & Waterways**
    Denise Peterson
  - [ ] **California Coastal Commission**
    Allyson Hitt
  - [ ] **Colorado River Board**
    Elsa Contreras
  - [ ] **Dept. of Conservation**
    Crina Chan
  - [■] **Cal Fire**
    Dan Foster
  - [ ] **Central Valley Flood Protection Board**
    James Herota
  - [■] **Office of Historic Preservation**
    Ron Parsons
- [■] **Dept of Parks & Recreation**
  Environmental Stewardship Section
  - [ ] **S.F. Bay Conservation & Dev't. Comm.**
    Steve Goldbeck
  - [■] **Dept. of Water Resources**
    Resources Agency
    Nadell Gayou

Fish and Wildlife

- [ ] **Depart. of Fish & Wildlife**
  Scott Flint
  Environmental Services Division
- [ ] **Fish & Wildlife Region 1**
  Curt Babcock
- [ ] **Fish & Wildlife Region 1E**
  Laurie Harnsberger
- [ ] **Fish & Wildlife Region 2**
  Jeff Drongesen
- [ ] **Fish & Wildlife Region 3**
  Craig Weightman
- [ ] **Fish & Wildlife Region 4**
  Julie Vance
- [■] **Fish & Wildlife Region 5**
  Leslie Newton-Reed
  Habitat Conservation Program
- [ ] **Fish & Wildlife Region 6**
  Tiffany Ellis
  Habitat Conservation Program
- [ ] **Fish & Wildlife Region 6 I/M**
  Heidi Calvert
  Inyo/Mono, Habitat Conservation Program
- [ ] **Dept. of Fish & Wildlife M**
  William Paznokas
  Marine Region

Other Departments

- [ ] **California Department of Education**
  Lesley Taylor
- [ ] **OES (Office of Emergency Services)**
  Monique Wilber
- [ ] **Food & Agriculture**
  Sandra Schubert
  Dept. of Food and Agriculture
- [ ] **Dept. of General Services**
  Cathy Buck
  Environmental Services Section
- [ ] **Housing & Comm. Dev.**
  CEQA Coordinator
  Housing Policy Division

Independent Commissions,Boards

- [ ] **Delta Protection Commission**
  Erik Vink
- [ ] **Delta Stewardship Council**
  Anthony Navasero
- [ ] **California Energy Commission**
  Eric Knight
- [■] **Native American Heritage Comm.**
  Debbie Treadway
- [ ] **Public Utilities Commission**
  Supervisor
- [ ] **Santa Monica Bay Restoration**
  Guangyu Wang
- [ ] **State Lands Commission**
  Jennifer Deleong
- [ ] **Tahoe Regional Planning Agency (TRPA)**
  Cherry Jacques

Cal State Transportation Agency CalSTA

- [ ] **Caltrans - Division of Aeronautics**
  Philip Crimmins
- [ ] **Caltrans – Planning HQ LD-IGR**
  Christian Bushong
- [■] **California Highway Patrol**
  Suzann Ikeuchi
  Office of Special Projects

Dept. of Transportation

- [ ] **Caltrans, District 1**
  Rex Jackman
- [ ] **Caltrans, District 2**
  Marcelino Gonzalez
- [ ] **Caltrans, District 3**
  Susan Zanchi
- [ ] **Caltrans, District 4**
  Patricia Maurice
- [ ] **Caltrans, District 5**
  Larry Newland
- [ ] **Caltrans, District 6**
  Michael Navarro
- [■] **Caltrans, District 7**
  Dianna Watson
- [ ] **Caltrans, District 8**
  Mark Roberts
- [ ] **Caltrans, District 9**
  Gayle Rosander
- [ ] **Caltrans, District 10**
  Tom Dumas
- [ ] **Caltrans, District 11**
  Jacob Armstrong
- [ ] **Caltrans, District 12**
  Maureen El Harake

Cal EPA

Air Resources Board

- [ ] **Airport & Freight**
  Jack Wursten
  - [ ] **Transportation Projects**
    Nesamani Kalandiyur
  - [ ] **Industrial/Energy Projects**
    Mike Tollstrup
- [ ] **California Department of Resources, Recycling & Recovery**
  Kevin Taylor/Jeff Esquivel
- [■] **State Water Resources Control Board**
  Regional Programs Unit
  Division of Financial Assistance
- [ ] **State Water Resources Control Board**
  Cindy Forbes – Asst Deputy
  Division of Drinking Water
- [ ] **State Water Resources Control Board**
  Div. Drinking Water #_____
- [■] **State Water Resources Control Board**
  Student Intern, 401 Water Quality Certification Unit
  Division of Water Quality
- [ ] **State Water Resouces Control Board**
  Phil Crader
  Division of Water Rights
- [ ] **Dept. of Toxic Substances Control Reg. #**_____
  CEQA Tracking Center
- [ ] **Department of Pesticide Regulation**
  CEQA Coordinator

Regional Water Quality Control Board (RWQCB)

- [ ] **RWQCB 1**
  Cathleen Hudson
  North Coast Region (1)
- [ ] **RWQCB 2**
  Environmental Document Coordinator
  San Francisco Bay Region (2)
- [ ] **RWQCB 3**
  Central Coast Region (3)
- [■] **RWQCB 4**
  Teresa Rodgers
  Los Angeles Region (4)
- [ ] **RWQCB 5S**
  Central Valley Region (5)
  - [ ] **RWQCB 5F**
    Central Valley Region (5)
    Fresno Branch Office
  - [ ] **RWQCB 5R**
    Central Valley Region (5)
    Redding Branch Office
- [ ] **RWQCB 6**
  Lahontan Region (6)
  - [ ] **RWQCB 6V**
    Lahontan Region (6)
    Victorville Branch Office
- [ ] **RWQCB 7**
  Colorado River Basin Region (7)
- [ ] **RWQCB 8**
  Santa Ana Region (8)
- [ ] **RWQCB 9**
  San Diego Region (9)

- [ ] **Other** _____
  _____
  _____
- [ ] _____
  Conservancy

Last Updated 5/22/18

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

SENT VIA USPS AND E-MAIL: December 3, 2019

eventura@cityofpasadena.net
Elisa Ventura, P.E.
City of Pasadena, Water and Power Department
150 South Los Robles Avenue, Suite 200
Pasadena, CA 91101

Notice of Preparation of an Environmental Impact Report for the Proposed Arroyo Seco Canyon Project Areas 2 and 3

South Coast Air Quality Management District (South Coast AQMD) staff appreciates the opportunity to comment on the above-mentioned document. South Coast AQMD staff's comments are recommendations regarding the analysis of potential air quality impacts from the Proposed Project that should be included in the Environmental Impact Report (EIR). Please send South Coast AQMD a copy of the EIR upon its completion. Note that copies of the EIR that are submitted to the State Clearinghouse are not forwarded to South Coast AQMD. Please forward a copy of the EIR directly to South Coast AQMD at the address shown in the letterhead. **In addition, please send with the EIR all appendices or technical documents related to the air quality, health risk, and greenhouse gas analyses and electronic versions of all air quality modeling and health risk assessment files[1]. These include emission calculation spreadsheets and modeling input and output files (not PDF files). Without all files and supporting documentation, South Coast AQMD staff will be unable to complete our review of the air quality analyses in a timely manner. Any delays in providing all supporting documentation will require additional time for review beyond the end of the comment period.**

Air Quality Analysis

South Coast AQMD adopted its California Environmental Quality Act (CEQA) Air Quality Handbook in 1993 to assist other public agencies with the preparation of air quality analyses. South Coast AQMD recommends that the Lead Agency use this Handbook as guidance when preparing its air quality analysis. Copies of the Handbook are available from South Coast AQMD's Subscription Services Department by calling (909) 396-3720. More guidance developed since this Handbook is also available on South Coast AQMD's website at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/ceqa-air-quality-handbook-(1993). South Coast AQMD staff also recommends that the Lead Agency use the CalEEMod land use emissions software. This software has recently been updated to incorporate up-to-date state and locally approved emission factors and methodologies for estimating pollutant emissions from typical land use development. CalEEMod is the only software model maintained by the California Air Pollution Control Officers Association (CAPCOA) and replaces the now outdated URBEMIS. This model is available free of charge at: www.caleemod.com.

South Coast AQMD has also developed both regional and localized significance thresholds. South Coast AQMD staff requests that the Lead Agency quantify criteria pollutant emissions and compare the results to South Coast AQMD's CEQA regional pollutant emissions significance thresholds to determine air

[1] Pursuant to the CEQA Guidelines Section 15174, the information contained in an EIR shall include summarized technical data, maps, plot plans, diagrams, and similar relevant information sufficient to permit full assessment of significant environmental impacts by reviewing agencies and members of the public. Placement of highly technical and specialized analysis and data in the body of an EIR should be avoided through inclusion of supporting information and analyses as appendices to the main body of the EIR. Appendices to the EIR may be prepared in volumes separate from the basic EIR document, but shall be readily available for public examination and shall be submitted to all clearinghouses which assist in public review.

quality impacts. South Coast AQMD's CEQA regional pollutant emissions significance thresholds can be found here at: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf. In addition to analyzing regional air quality impacts, South Coast AQMD staff recommends calculating localized air quality impacts and comparing the results to localized significance thresholds (LSTs). LSTs can be used in addition to the recommended regional significance thresholds as a second indication of air quality impacts when preparing a CEQA document. Therefore, when preparing the air quality analysis for the Proposed Project, it is recommended that the Lead Agency perform a localized analysis by either using the LSTs developed by South Coast AQMD staff or performing dispersion modeling as necessary. Guidance for performing a localized air quality analysis can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds.

The Lead Agency should identify any potential adverse air quality impacts that could occur from all phases of the Proposed Project and all air pollutant sources related to the Proposed Project. Air quality impacts from both construction (including demolition, if any) and operations should be calculated. Construction-related air quality impacts typically include, but are not limited to, emissions from the use of heavy-duty equipment from grading, earth-loading/unloading, paving, architectural coatings, off-road mobile sources (e.g., heavy-duty construction equipment) and on-road mobile sources (e.g., construction worker vehicle trips, material transport trips). Operation-related air quality impacts may include, but are not limited to, emissions from stationary sources (e.g., boilers), area sources (e.g., solvents and coatings), and vehicular trips (e.g., on- and off-road tailpipe emissions and entrained dust). Air quality impacts from indirect sources, such as sources that generate or attract vehicular trips, should be included in the analysis.

In the event that the Proposed Project generates or attracts vehicular trips, especially heavy-duty diesel-fueled vehicles, it is recommended that the Lead Agency perform a mobile source health risk assessment. Guidance for performing a mobile source health risk assessment ("*Health Risk Assessment Guidance for Analyzing Cancer Risk from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis*") can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mobile-source-toxics-analysis. An analysis of all toxic air contaminant impacts due to the use of equipment potentially generating such air pollutants should also be included.

In addition, guidance on siting incompatible land uses can be found in the California Air Resources Board's *Air Quality and Land Use Handbook: A Community Health Perspective*, which can be found at: http://www.arb.ca.gov/ch/handbook.pdf. CARB's Land Use Handbook is a general reference guide for evaluating and reducing air pollution impacts associated with new projects that go through the land use decision-making process. Guidance[2] on strategies to reduce air pollution exposure near high-volume roadways can be found at: https://www.arb.ca.gov/ch/rd_technical_advisory_final.PDF.

Mitigation Measures

In the event that the Proposed Project generates significant adverse air quality impacts, CEQA requires that all feasible mitigation measures that go beyond what is required by law be utilized during project construction and operation to minimize these impacts. Pursuant to CEQA Guidelines Section 15126.4 (a)(1)(D), any impacts resulting from mitigation measures must also be discussed. Several resources are available to assist the Lead Agency with identifying potential mitigation measures for the Proposed Project, including:

[2] In April 2017, CARB published a technical advisory, *Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways: Technical Advisory*, to supplement CARB's Air Quality and Land Use Handbook: A Community Health Perspective. This technical advisory is intended to provide information on strategies to reduce exposures to traffic emissions near high-volume roadways to assist land use planning and decision-making in order to protect public health and promote equity and environmental justice. The technical advisory is available at: https://www.arb.ca.gov/ch/landuse.htm.

- Chapter 11 "Mitigating the Impact of a Project" of South Coast AQMD'S *CEQA Air Quality Handbook* South Coast AQMD's CEQA web pages available here: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mitigation-measures-and-control-efficiencies
- South Coast AQMD's Rule 403 – Fugitive Dust, and the Implementation Handbook for controlling construction-related emissions and Rule 1403 – Asbestos Emissions from Demolition/Renovation Activities
- South Coast AQMD's Mitigation Monitoring and Reporting Plan (MMRP) for the 2016 Air Quality Management Plan (2016 AQMP) available here (starting on page 86): http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2017/2017-mar3-035.pdf
- CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures* available here: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

Alternatives

In the event that the Proposed Project generates significant adverse air quality impacts, CEQA requires the consideration and discussion of alternatives to the project or its location which are capable of avoiding or substantially lessening any of the significant effects of the project. The discussion of a reasonable range of potentially feasible alternatives, including a "no project" alternative, is intended to foster informed decision-making and public participation. Pursuant to CEQA Guidelines Section 15126.6(d), the EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the Proposed Project.

Permits

If implementation of the Proposed Project requires a permit from South Coast AQMD, South Coast AQMD should be identified as a Responsible Agency for the Proposed Project in the EIR. For more information on permits, please visit South Coast AQMD's webpage at: http://www.aqmd.gov/home/permits. Questions on permits can be directed to South Coast AQMD's Engineering and Permitting staff at (909) 396-3385.

Data Sources

South Coast AQMD rules and relevant air quality reports and data are available by calling South Coast AQMD's Public Information Center at (909) 396-2001. Much of the information available through the Public Information Center is also available at South Coast AQMD's webpage at: http://www.aqmd.gov.

South Coast AQMD staff is available to work with the Lead Agency to ensure that project's air quality and health risk impacts are accurately evaluated and mitigated where feasible. If you have any questions regarding this letter, please contact me at lsun@aqmd.gov.

Sincerely,

Lijin Sun

Lijin Sun, J.D.
Program Supervisor, CEQA IGR
Planning, Rule Development & Area Sources

LS
LAC191105-01
Control Number

ARROYO SECO FOUNDATION

December 6, 2019

Elisa Ventura, P.E.
City of Pasadena Department of Water and Power (PWP)
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
E-mail: eventura@cityofpasadena.net

RE: Comments on Arroyo Seco Canyon Project Environmental Impact Report Initial Study and Scoping Document

Dear Ms. Ventura:

Thank you for the opportunity to comment on scoping issues for the EIR for the Arroyo Seco Canyon Project.

The Arroyo Seco Foundation (ASF) has long been interested in this project which is important to enhance local water supplies and to do so in an integrated way that also protects and promotes habitat, wildlife, conservation and long-term sustainability.

ASF regrets that many of the environmental and recreational benefits previously proposed have dropped from the revised version of the project.

We believe the scope of the project is deficient regarding biology, hydrology and other important concerns.

The project needs to:

1) carefully evaluate stream flow requirements to assure the continued viability of stream-related fish, aquatic and wildlife resources;
2) establish an environmental flow or instream flow for the Arroyo Seco stream, which identifies a low-flow threshold to protect and ensure the long-term persistence of fish and aquatic species. The establishment of a seasonally appropriate low-flow threshold helps protect fish and aquatic species during critically low-flow time periods by supporting stream channel forms and riparian communities that directly affect aquatic life. Conditions such as barriers, sedimentation and invasive species both above and below PWP's water diversion structure need to be carefully considered and addressed.

We urge PWP to evaluate a project alternative that would rely primarily on the sandy alluvial conditions in the Hahamongna basin and the natural stream hydrology rather than the expansion of spreading basins, which are not the most efficient and environmentally appropriate method of capturing and conserving streamflow. Natural stream hydrology over the centuries is what has filled up and

replenished the Raymond Basin. Engineered efforts have proven to be less effective and rather destructive of the natural values of the Hahamongna basin.

In addition to being inefficient methods of local water retention, spreading basins occupy and substantially destroy large patches of alluvial scrub habitat that is increasingly rare in Southern California. Important endangered and threatened bird and plant species rely on this habitat, When the JPL parking lot was permitted by Pasadena for the area at the mouth of the canyon thirty years ago, it was promised that it would only be a temporary use. Now that the parking lot has been removed, the environmental richness of that area should be restored. The expansion of the PWP spreading basins would guarantee permanent destruction of the vital habitat that nature would provide at the key interface between the mountain watershed and the urban stretch of the Arroyo Seco.

PWP needs to document the need for expanded spreading basins in the light of the long recent drought and the probability of more erratic rainfall patterns caused by the impacts of climate change. Most climate experts are predicting somewhat similar overall precipitation amounts that would be contained in longer drier periods and more intense but less frequent storms. The percolation basins have rarely been full in recent decades, only about once every ten years, so the most likely prospect is that expanded spreading basins would rarely be used for water retention and could not be justified on a cost or environmental basis.

If PWP determines to go ahead with an expansion of the spreading basins, it needs to explore methods to make them less destructive and more environmentally sustainable. Altering their configuration and size, reducing compaction and sedimentation in the basins, and the use of appropriate native habitat should all be utilized,

The maintenance of a seasonal pool at the bottom of the Hahamongna basin above Devil's Gate Dam could be used in conjunction with a pump-back pipeline that would send excess streamflow back to the top of the natural stream percolation zone. Such a system would also benefit capture and retention of local water if PWP choses to rely on spreading basins and an expansion of spreading basins. It is disappointing that the pump-back program previously included in Hahamongna planning has been left out of the current ASCP program since it is so clearly and directly related to the goals of ASCP and of improved water management.

We hope you will consider these concerns carefully and positively. The Arroyo Seco Foundation looks forward to working collaboratively with Pasadena Water & Power Department to enhance local water supply while protecting the Arroyo Seco's rich natural resources.

Sincerely yours,



Tim Brick
Managing Director
Arroyo Seco Foundation

To: Elisa Ventura, City of Pasadena, Department of Water and Power
eventura@cityofpasadena.net

From: Betsy Bour, Friends of Hahamongna
bourel@sbcglobal.net

RE: Scoping Comments: Environmental Impact Report for the Arroyo Seco Canyon Project

Introduction:

The Friends of Hahamongna (FOH) is an advocacy group of Pasadena, La Canada Flintridge and Altadena residents working together for the protection of Hahamongna Watershed Park, one of Pasadena's last great open spaces. Our members are united in our support of this environmental treasure. We have attended hundreds of meetings over the past 20 years monitoring Pasadena's Hahamongna master planning. We have been working cooperatively with the Spirit of the Sage Council, the Hahamongna Watch Group and other park advocacy groups as the City of Pasadena moves forward to implement the Hahamongna Watershed Park Master Plan, a component of the Arroyo Seco Master Plan. We plan to be active participants with the Arroyo Seco Canyon Project (ASCP) scoping effort as well as project review and implementation. Our request for general considerations for project development as well as required environmental review categories are outlined below:

General Considerations:

- FOH maintains the position that the adequacy of the various project Environmental Impact Reports may be challenged if there isn't accurate evaluation of the cumulative impacts from all the current and near-future projects in the area. The Los Angeles County Department of Public Works their significant sediment removal initiative and Pasadena Department of Public Works has started their Oak Grove Area Improvements (OGAI) Berkshire Creek restoration, both of which will contribute to cumulative impacts in the Arroyo. It is important that implementation of any project fully evaluate and minimize through mitigation all cumulative impacts.

- Hahamongna Watershed Park once provided significant habitat for many species including Egrets, Blue Heron, Mallard Ducks, and numerous reptile species. Since the habitat destruction from the sediment removal project and the temporary reduction of habitat resulting from the Berkshire Creek restoration, the need for habitat has become more significant, if not critical. FOH asks that the preservation of the habitat be given consideration while developing project scope and environmental impact statements.

- The Initial Study for the ASCP appears to be sufficient for the public and the decision makers to understand and to comment effectively toward scope of and consideration points for the environmental impacts of the project within Hahamongna. However, it is important to make sure that impact scope includes the Central and Lower Arroyos which could be impact by changes in quality and volume of available water necessary to support habitat and natural stream restoration areas.

Required Environmental Review Categories:

- Air quality
    - Impacts, including airborne dust from grading, and dirt hauling and gaseous emissions from heavy equipment, delivery and dirt hauling trucks, and employee vehicles.
    - Impacts from pollutant concentrations, primarily carbon monoxide, resulting from traffic increases in the immediate vicinity of a project

    - Impact of the degraded air quality on schools, athletic fields and residences in the immediate area.
- Biological Resources
    - The potential adverse effect from habitat modifications impacting any of the species currently found in the basin. The EIR must address how various species that thrive in the existing habitat would return to and survive in the "restore" habitat after construction.
    - The potential adverse effect on any riparian habitat or other sensitive natural community, including the natural stream areas below the dam in the Central and Lower Arroyo areas that may result from water diversion.
    - The potential adverse effect on migratory wildlife species or with established migratory wildlife corridors, including those in the Central and Lower Arroyo that may result from water diversion.
- Cultural resources
    - Impact to cultural resources in the project vicinity due to the potential disruption to human remains during excavation.
- Hydrology and Water Quality
    - Potential impacts from alteration of existing drainage patterns in the site area, including the alteration of the course of the stream.
    - Potential impacts from construction activity to stream flows and water quality
    - Potential impacts to water quality and/or volume to the natural stream areas in the Central and lower Arroyo
- Noise
    - The potential increase in ambient noise levels in the project vicinity resulting from construction and construction related vehicles.
    - The impacts to park users and wildlife resulting from temporary or permanent increase to ground-borne vibration.
- Recreation
    - The temporary disruption of existing recreation uses during construction.
    - The impacts caused by a any temporary or permanent relocation or removal of the hiking / equestrian trails in the basin and in the canyon. The primary concern for equestrians is to have safe access through the north crossing trail leading to the Gabrielino Trail during non-construction hours. The north crossing runs between ponds 1 and 2, roughly following the SCE Easement through the old JPL parking lot and across Explorer Road.
    - The safety and feasibility of trail use, especially for equestrians, immediately adjacent to construction areas during non-construction hours.
- Transportation/traffic
    - Impacts from the number of truck trips in and out of the basin using the same freeway routes as the sediment removal project.
    - Impacts to normal traffic flows to area schools, JPL and the Rose Bowl during weekday events.
    - Cumulative impact of construction vehicles in conjunction with the sediment removal project.

FOH members have extensive historical knowledge on Hahamongna Watershed Park, the projects planned for the area and the controversies that have arisen over the past 20 years. Please feel free to use us as a knowledge source and please feel free to contact us with any questions regarding our scoping comments.

Sincerely,
Betsy Bour

GABRIELENO BAND OF MISSION INDIANS - KIZH NATION
Historically known as The San Gabriel Band of Mission Indians
recognized by the State of California as the aboriginal tribe of the Los Angeles basin

Project Name: Arroyo Seco Project Areas 2 and 3 located at 3420 to 3500 North Arroyo Boulevard in the City of Pasadena

Dear Elisa Ventura,

Thank you for your letter dated November 7, 2019 regarding AB52 consultation. The above proposed project location is within our Ancestral Tribal Territory; therefore, our Tribal Government requests to schedule a consultation with you as the lead agency, to discuss the project and the surrounding location in further detail.

Please contact us at your earliest convenience. ***Please Note:AB 52, "consultation" shall have the same meaning as provided in SB 18 (Govt. Code Section 65352.4).***

Thank you for your time,

Andrew Salas, Chairman
Gabrieleno Band of Mission Indians – Kizh Nation
1(844)390-0787

Andrew Salas, Chairman | Nadine Salas, Vice-Chairman | Dr. Christina Swindall Martinez, secretary
Albert Perez, treasurer I | Martha Gonzalez Lemos, treasurer II | Richard Gradias, Chairman of the council of Elders

Bill Christian
1450 Arroyo View Drive
Pasadena, CA 91103

December 6, 2019

Elisa Ventura, P.E.
City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200 Pasadena, California 91101
E-mail: eventura@cityofpasadena.net

Sent via email

Re: Scoping comments on the initial Study (IS) for the Environmental Impact Report of the Arroyo Seco Canyon Project (ASCP) Areas 2 and 3

Dear Ms. Ventura:

I am a Linda Vista, Pasadena resident who frequently walks in and enjoys the area subject to the City's Arroyo Seco Canyon Project proposal. I am also a (retired) California lawyer who long practiced and taught environmental law. I work for the Nature Conservancy, although these comments are my own, and not those of my employer.

My comments focus on three related subjects. First, the need to fully address viable alternatives to the proposed course of action. Second, the requirement that the EIR include a thorough cumulative effects analysis. Third, the requirement that the EIR use the best available information.

Alternatives

The stated purpose of this phase of the ASCP is to divert more water (up to 25 cubic feet per second) from the Arroyo Seco stream for diversion to existing and new spreading basins. The basis for the city's proposed action is the apparent contention that increased diversions and a significant expansion of spreading areas will increase percolation into the subsurface aquifer(s) allowing Pasadena to claim additional water.

However, the city states that the proposed restructured/rebuilt diversion will be used to take all of the water in the Arroyo Seco stream, apart from flow during major storm events. The Arroyo Seco stream rarely reaches 25 CFS, even during rains. While the city's pursuit of more local water supplies is creditable, the removal of all of the water from the Arroyo Seco stream would be ecologically highly destructive.

An alternative exists. Leaving water in the natural stream bed, which is ordinarily significantly more permeable than the spreading basin sediments, would both increase percolation and support water dependent ecosystems.

Other alternatives to satisfy the city's primary goal—to use surface water to increase legally extractable groundwater—also exist. If the pool behind Devil's Gate dam were allowed to fill—as it has been in the past—that water, once the sediment settles, could be pumped back up to either the natural stream or to existing spreading basins, or both. The water that could be stored in a pool behind the dam is a valuable resource, the use of which the city should examine fully in the EIR for this project.

Too, the need to greatly expand spreading basin area must be examined against the need to enhance natural areas in the Arroyo Seco. The County's removal of significant habitat behind Devil's Gate Dam without providing for adequate in-basin mitigation points out the need to replace ecologically important habitat in the arroyo. An alternative that is less environmentally destructive would return all or most of the area proposed for new spreading basins to habitat.

Cumulative Impacts

The LA County Flood Control District's Devil's Gate Dam multi-year sediment removal project when combined with the city's proposed plan wipes out much of the habitat value of the upper Arroyo Seco. The city's diversion of all of the water from the stream would exacerbate the impacts of the county's project. The city's claim that the diversion would enhance potential fish habitat is not a credible or worthy response to the overall impacts of the complete desiccation of the arroyo stream. The EIR should analyze in detail how these two projects would operate together to limit habitat, and look for less destructive alternatives that would avert their ecological consequences. CEQA requires that significant impacts be mitigated, and, contrary to the initial study, the impacts on species and both surface and groundwater of this proposed project are significant. Mitigation in the form of decreased stream take in the dry season and increases in habitat area would seem necessary and appropriate.

Use of the Best Available Information

The city's contention about percolation rates in spreading basins is unproven: in fact, the best science-based studies[1] seem to disprove the City's assumptions about spreading basin recharge rates. Because of sediment plugging and mechanical compaction, the existing spreading basin rates seem to be only a tiny fraction of the assumed rates. There is no information presented that proposes to evaluate these studies, nor that new spreading basins would no fall prey to the same phenomena.

The EIR needs to examine the city's proposed plan in detail in light of what is known—the existing studies-- about recharge rates and examine alternatives against the likelihood that

[1] 1995, Converse Consultants West and 2000, Williams

other options, such as allowing stream flow to conduct a large share of the recharge, may well be superior for the city's as well as the environment's purpose. It would seem incumbent on the city to understand scientifically, and to inform the public, on the best options to recover groundwater and protect the natural values of the Arroyo Seco.

Respectfully submitted,

Bill Christian

Public Comment on Initial Study for Arroyo Seco Canyon Project

Prepared by:
Hugh Bowles
626 482 9116
hsbowles@yahoo.com
12/4/2019

These comments relate to the Initial Study (IS) for the Arroyo Seco Canyon Project (ASCP) Environmental Impact Report (EIR).

Pasadena Water and Power (PWP) are preparing an EIR as a result of a legal challenge to the the original Mitigated Negative Declaration (MND) in 2015. Public comment in 2015 urged the need to complete an EIR for the proposed project. The court decision in 2017 confirmed that need. The lawsuit brought by the Spirit of the Sage Council provides this opportunity to re-iterate much of the comment made in 2015 but ignored by the project.

Under an EIR a Lead Agent is required to consider alternatives that may achieve the same project objectives with less impact on the environment. Under the original MND there was no requirement to consider alternatives.

The following comments focus on the need to consider the restoration of natural streamflows to the Arroyo Seco; this is an alternative to the project's planned increase of stream diversion into expanded spreading basins. Restoring natural flows to the Arroyo Seco can still meet PWP's surface water rights under the law; this approach will have a positive impact on the environment.

In particular, the comments relate to Initial Study (IS) question number 3.10 (b):

> "Would the project substantially decrease ground water supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?"

The IS selection is "Less than significant impact" with the claim of an additional 1100 acre feet of aquifer re-charge annually. To achieve this the project will increase diversion of the natural stream into expanded spreading ponds in Hahamongna.

The current capacity is to divert flows up to 18 cubic feet per second (cfs); under the project proposal this will increase to 25 cfs. The IS states "all flows" up to 25 cfs will be diverted. Mean flows in the Arroyo are less than 5 cfs even during the rain season. Under the proposal the Arroyo Seco stream channel will be dry outside of storm events. This will have a potentially significant impact on the riparian habitats within Hahamongna.

Increased diversion allows PWP to maximize its "surface water rights". Under these "rights" PWP claims credit to pump water from the aquifer. The Raymond Basin Management Board (RBMB) adjudicates pumping rights to local water agencies based on the Raymond Basin Judgment (The Judgment). The Judgment was established in 1944.

The proposed increase in diversion assumes water piped into the spreading basins actually percolates into the aquifer. Science paid for by Pasadena Water and Power (PWP) suggests this does not happen.

In 1995 PWP funded a study by Converse Consultants West: “Hydrogeologic Investigation Devil’s Gate Water Collection Tunnel”.

As part of the study, Converse mapped the hydraulic conductivity (percolation rate) of the different alluviums in the Hahamongna basin. The study identifies 4 types of alluvium with different levels of porosity. The spreading basins sit on the most porous group consisting of “unconsolidated coarse sand, gravel and boulders” — classed in the study as “Unit 1”. Converse measured percolation rates in the Unit 1 alluviums to be up to 3,467 gallons per day per square foot (gpd sqft). (Converse Study Table 4.1)

Yet, test pits dug in the spreading basins themselves found hydraulic conductivity to be “orders of magnitude lower” than adjacent Unit 1 areas. The spreading basins percolate less than 40 gallons per day per square foot.

Converse concluded that the low percolation rate in the spreading basins was due to:

> “…siltation… combined with artificial compaction of surficial soils due to equipment, etc.”. (Page 11 & 12 Converse Study).

Due to the extremely low percolation rate, Converse excluded the spreading basins from their study. Converse found the next lowest percolation rates in other areas of the basin to be over 800 gpd sqft.

In 2000 the City of Pasadena hired Takata and Associates to help prepare the Hahamongna Watershed Park (HWP) Plan. Takata engaged Phillip Williams and Associates (PWA) a firm of hydrology consultants to make recommendations for the the HWP Plan. PWA produced a study titled: “Flood Hazard, Sediment Management, and Water Feature Analyses”. The goal was to come up with a plan for the Park that would:

> “...promote a self-sustaining natural riparian habitat while addressing issues related to flood hazards, erosion control, sedimentation, stream stabilization, and water resource management within the park”. (Williams Study page 1).

The Williams Study references the earlier findings by Converse: the spreading basins are “by orders of magnitude” less porous than the surrounding alluviums. PWA also noticed that the spreading basins, when full, leak water back into the stream channel where it is absorbed.

PWA concluded the spreading basins: “may not be the most efficient or cost-effective way to recharge groundwater in the Hahamongna Watershed Park area”. The Williams Study proposes :

> “...increased groundwater recharge might be achieved if natural flows are restored to the Arroyo Seco channel and if ponding were allowed to occur regularly adjacent to the dam... Furthermore, natural flows in the Arroyo Seco channel could percolate most, if not all, of the low-flows currently diverted to the spreading grounds.” (Williams Study page 5).

In effect, flows of 25 cfs left in the natural stream could be absorbed within the Arroyo Seco channel before water hits the dam. 25 cfs is the maximum flow PWP can claim pumping credit

for; these flows are for “beneficial use”. Remaining flows above 25 cfs that percolate into the underground are considered to be for “the general good” for which PWP can claim no pumping credit.

The Converse and Williams findings suggest more water diverted into expanded spreading basins will not replenish the local water supply. Our Mediterranean climate provides few natural surface lakes; water held on the surface quickly evaporates and stagnates. The natural alluvial structures are designed to conduct water into underground aquifers as quickly as possible.

Under the 2015 Mitigated Negative Declaration, public comment challenged the PWP claim that the project would improve aquifer re-charge. PWP were asked to support their position. The written response was:

> “In regard to the spreading basins we have to use them regardless of their efficiency.”

There was no attempt to disprove the findings from either the Converse or Williams studies.

This response led to the challenge of the MND to the Board of Zoning Appeals and the City Council in 2015.

At the Board of Zoning Appeals Special Meeting on March 4, 2015, Chair Greg Jones asked: “The spreading basins are not efficient and are agreed upon that they are not efficient... Does the Judgment require spreading basins?”

Mr. Gary Takara from PWP replied:

> “The Judgment is the law... The question of efficiency is not necessarily which mechanism allows water to re-charge at the quickest rate.”

The Board of Zoning Appeals concluded the request in front of them related to a Conditional Use Permit (CUP) not to PWP’s method of water conservation and its impact on the environment or our water supply. The Board approved the (CUP).

With the questions on aquifer impacts evaded, the appeal went to a full hearing at Pasadena City Council on June 1, 2015. Similar presentations were made. Mayor Tornek asked: “Are spreading basins, in fact, effective re-charge technology?” Mr. Takara from PWP responded:

> “Spreading basins used for re-charge is a common practice in Southern California.”

Throughout the MND public comment and appeal process PWP failed to support the claim the project would improve aquifer re-charge. These same unproven claims have re-appeared in the new IS for the ASCP.

During the 2015 appeal hearings, support for the ASCP came from associates of the Arroyo Seco Foundation (ASF). Mr. Tim Brick, ASF Managing Director, declared that the ASCP was a “cutting edge” project with “best practices” and that it would be heard about “across the region”. Mr. Tom Seiffert informed City Council that the project was “too important” not to implement. These statements, made during “public comment” failed to acknowledge that ASF received a $250,000 no bid contract to “partner” with PWP on the project. The contract included a “gag order” that prevented associates of ASF from speaking about the project without PWP permission; this was not independent subjective comment.

The comments made by Mr. Brick and other ASF associates are in contrast with an e-mail from Mr. Brick to Mr. Tony Zampiello, Executive Officer, of RBMB dated June 20, 2013 titled “Arroyo Seco Canyon Project and Groundwater Percolation”. Mr Brick wrote:

> “This maybe a good opportunity to obtain funding to explore the issue raised by the Phillip Williams study and several community members about the best way to percolate water into the Raymond Basin and how to measure and monitor it. As an Integrated Regional Water Management project, the goal of the Arroyo Seco Canyon Project should be to maximize both water percolation and habitat values, so if we can determine the best way to percolate water and measure it, this would be a valuable tool for other groundwater and conservation programs throughout Southern California.”

The “cutting edge” project Mr. Brick mentioned in public comment on the ASCP is really that described in his e-mail: maximizing groundwater re-charge and habitat values. This is not what PWP propose. PWP have been clear they are not trying to create efficient re-charge of the aquifer.

Of note, too: Mr. Brick submitted the grant application on PWP’s behalf to obtain funding under the IRWM program Prop 84 funds. PWP have the money thanks to Mr. Brick. As Mr. Brick lays out in his e-mail to Tony Zampiello, as this is an IRWM project it should focus on maximizing re-charge and improving habitats. This is not public money obtained for PWP to do as they please; PWP has a responsibility to implement a project that is in line with IRWM goals.

In a slip, perhaps, Mr. Brick, stepping outside the constraint of the gag order, did admit to Council, that the presentation on restoring natural flows to the Arroyo represents “a better way”.

This comment along with Mr. Brick’s e-mail also reflects off the record comments about changing the approach to water conservation in Hahamongna; it shows that restoring natural flows to the Arroyo can gain mainstream support if open discussion were allowed.

On May 12, 2015 LA County Board of Supervisors adopted the resolution for Proposition 84 implementation. The stated purpose of the grants issued under this proposition include:

> “...the implementation of projects that protect communities from drought, conserve and improve water quality, restore habitat, and reduce dependency on imported water.”

Expanding diversion of a stream into spreading basins “regardless of their efficiency” undermines these objectives and is a misuse of public funds. As proposed, the ASCP could have a significant impact on our local aquifer as well as destroy key riparian habitats.

Under an EIR a Lead Agent must consider alternatives to the project that could achieve the same objectives with less impact on the environment. Using the natural stream channel to improve aquifer re-charge is a key alternative and must be considered under the law and IRWM goals.

PWP argue that the Raymond Basin Judgment affords no alternative. If the City is to maximize its “surface water rights” the stream must be diverted into the spreading basins.

PWP claim the diversion is mandated by the The Judgment quoting Section II (1) in their defense, which states:

> “The water shall be spread for percolation into the underground in the existing water conservation facilities of the Los Angeles County Flood Control District (now run by

> PWP), or in such additional spreading grounds as the parties may acquire or construct, or in any natural stream channels leading to such existing or future spreading grounds..." (Parentheses added).

PWP interprets this as a mandate to divert the Arroyo Seco a mile upstream into the existing spreading ponds with no alternative allowed under "the law". Mr Takara (Board of Zoning Appeals 3/4/2015):

> "If water is spread anywhere else the City of Pasadena will not gain any additional pumping credit."

However, Section II (1) is not prescriptive. The Judgment allows PWP to "spread" water **"in any natural stream channels leading to existing or future spreading grounds"**.

For example, under this section PWP could have claimed pumping credit for water in the 2012/13 season that spilled from the stream channel into the spreading pond just above Johnson field. There is an overflow pipe/culvert from the stream zone into that pond. Debris flows from the Station Fire raised the grade in the riparian corridor up to the level of this pipe. During higher flows water siphoned from the stream into the pond. Once full, surplus flows went into the basin below and Johnson Field. This was water in the "natural stream channel leading to a spreading ground".

Also, during this period, both the spreading basin above Johnson Field and Johnson Field itself became seasonal "wetlands". Formalized, this would be a natural implementation of LA County Flood Control District's (LACFD) objective to turn Johnson Field into a "wetland"; this plan is wholly unrealistic without the restoration of natural flows into the Arroyo.

The movement of debris downstream has since covered the pipe, but for two seasons the process provided a window into the flexibility inherent within the legal language: showing how natural processes could enhance water conservation in the Hahamongna basin.

Under current conditions, flows around 10 cfs, if not diverted, are absorbed in the stream channel by the time the stream reaches Johnson Field. Mean flows in the Arroyo measure less than 5 cfs even during months of rainfall — less during the dry season. If left in the "natural stream", for 90% of the year, flows could be absorbed entirely by the stream before reaching Johnson Field and well before reaching the dam.

Diversion of low flows occurs at a critical time for the environment – riparian habitats depend on these flows to provide crucial shaded nursery sites for wildlife – particularly quail and wildfowl – rich in insect life and protected from avian predators.

Around 30 white alder trees re-established themselves below the JPL bridge after the high flows in the 2009/10 season after the Station Fire. These trees perished in the drought years around 2013/14 — not because of the drought, but because flows that would have been in the stream were diverted so no water passed below the JPL bridge. These flows were piped into the existing settlement basin where they stagnated, evaporated, and leaked back into the stream 50 yards downstream.

During low summer flows of around 3 cfs PWP extract clean water from the stream and leave it to stagnate in a settlement basin. The flow is insufficient to pass into a spreading basin.

There needs to be clear scientific reason why low flows cannot be left in the natural stream, and why PWP cannot claim pumping credit for these flows from RBMB. These are flows of

less than 3-5 cfs that occur from the end of April through to the first rains in October/ November. If left in the stream these flows would be absorbed half a mile before the dam.

PWP make no claim that water in the settlement basin percolates into the aquifer. The new settlement basins proposed by the project will be lined with concrete.

Under The Judgment, water flowing in the stream can contribute to the City's local water allocation if it flows to "new or existing spreading grounds". The current spreading basins are just one form of "spreading ground"; they are not the only way to "spread" water. PWP are not precluded from adopting other forms of water conservation that maximize the percolation capacity of the natural stream channel.

As long ago as 1967 USDA outlined preferred mechanisms for "water spreading" of which "a series of small impound basins" was just one. USDA considered other ways of slowing water as it passes through the "intake area". (USDA Soil Conservation Service Engineering Division Technical Release #36 Geology June 1967, Victor Ponce).

In public comment on the 2015 MND California Fish and Wildlife suggested moving the diversion further downstream to allow more percolation in the stream. This might not be practical for the permanent structure; but under the USDA definition of "spreading ground" a low berm in the stream zone would "spread" and slow water to allow percolation. A seasonal berm at the lower end of Johnson Field, or anywhere before the dam, could be classed as a new "spreading ground". PWP could claim credit for all natural flows up to that berm; in reality, during low flow periods the stream would never reach that far.

Insistence that critical summer flows are diverted and the steam left dry is willful destruction of the natural environment. The "no alternative" argument is inadequate.

Diversion into spreading basins should be for excess flows up to the 25 cfs limit that cannot be absorbed by the stream. Most of the year the stream should flow as close to the dam as possible and the spreading basins remain dry, not vice versa.

PWPs adherence to "the law" has flaws. With the spreading basins absorbing just 40 gpd sqft, much of the water stagnates and evaporates (see appendix photos). Water quality quickly deteriorates in the spreading basins. The question is whether the diversion is for "percolation into the underground" as the law requires or just a measure that PWP can use to claim pumping credit. The Judgment has no requirement to measure how much of the diverted water reaches "the underground" where it becomes available for "re-capture". PWP assumes the diverted water percolates, but the Converse study findings show this is not the case.

Using the natural stream within the context of "the law" could yield a substantial improvement in aquifer re-charge; this would leverage the stream's ability to absorb up to 3,467 gpd sqft versus less than 40 gpd sqft in the spreading basins.

The Philip Williams Study in 2000 states "RBMB is currently in the process of re-evaluating their accounting procedure for percolation in the basin" and desires "to make this accounting procedure more scientifically rigorous."

RBMB were asked in public comment at their meeting on April 20, 2016 (at 2 p.m. in Azuza) what progress had been made on this objective. RBMB did not respond at that time. Follow up e-mails to Mr. Tony Zampiello put the questions in writing; Ms. Kelly Gardner responded that Mr. Zampiello could not respond to the questions in the meeting as he "did not have an opportunity to familiarize himself with the inquiry."

A final response to the questions came from Ms. Gardner who wrote “the reports (Williams and Converse studies) were prepared several years before the current team was involved in Basin Management.” There was never a direct response to the questions asked or any interest expressed in exploring the subject further.

Section XII of the RBMB Charter states the RBMB Powers and Responsibilities:

> “... shall be exercised with a view toward protecting the long term quantity and quality of the groundwater supply; utilizing the groundwater storage capacity of the basin for the maximum advantage of the parties... to reduce costs, improve reliability of supply, and to protect against drought”.

Continuing to support the diversion of natural streamflows into spreading ponds “regardless of their efficiency” that are by “orders of magnitude” less porous than the surrounding alluviums breaks the RBMB charter: it does not “protect the quantity and quality of the groundwater supply” nor “protect against drought”.

The planned expansion of the spreading ponds does not “reduce costs”... over $3MM of taxpayer funds are required plus annual maintenance.

In addition, PWP insistence that there is no option but to use the existing spreading basins is outside the requirements of the law it cites: PWP provide no evidence that the diverted water “percolates into the underground” as required.

The Converse Study details how the aquifer reacts in rainfall years when the dam is in use compared to when it is not. In years when the dam was not functioning, wells responded in line with rainfall. However, when the dam is used to hold water for short periods well logs improve. The Converse Study states:

> “This suggests that groundwater levels in the Arroyo and below the Altadena Fan decline at a much lower rate and remain at a relatively high elevation for the entire year when a lake is present.” (Converse study submission letter addressed to Ms. Rebecca Fisher of PWP dated August 29, 1995).

The Williams Study concludes that in a normal rainfall year, if water is left in the natural stream and held for short periods behind the dam, aquifer re-charge could improve by 160%.

Although prepared in 2000 the Williams Study, with its recommendation to restore natural flows to the arroyo and improve water conservation, was ignored in the 2003 HWP Plan. When questioned the City responded “it does not meet our needs.”

The Williams Study is often seen as utopian and impractical. Yet, the study provides for the clean out of accumulated debris. The study defines clean out areas of some size behind the dam and in the middle of the basin. The key is by allowing the natural stream to percolate water there is less need for the spreading basins; the study recommends the basins can be allowed to revert back to natural habitat. At a minimum, expansion of the spreading basins into the area once occupied by the JPL parking lot is unnecessary — nature can continue its work of re-claiming this area with the appropriate plant palette it chooses: buckwheat, sumac, sage... no need for human intervention.

While the Williams Study recommends retiring the spreading basins completely, this may not be practical. The porosity of the stream appears to have declined since the influx of debris from the rain season after the Station Fire. A phased approach based on measuring the percolation capacity of the stream makes sense; as one person working on the ASCP in 2013

stated: “It’s not like we cannot measure it...” — the amount of water the stream can absorb. If, for example, the stream can absorb 10 cfs before getting close to the dam, remaining flows up to 25 cfs could still be diverted with no need to expand the spreading basins — only 15 cfs would be diverted.

Much public concern about the LACFD Clean-out is that mitigation is being done off site; this is an admission the basin will be irreparably damaged. Adopting a science based approach to water conservation restores the damaged riparian corridor and frees up other areas for on site restoration. This is preferable to the off site restoration underway for the LACFD Devil’s Gate Clean-out project.

The 1967 USDA report states spreading ponds should be vegetated to avoid the problem Converse found in their study — silt and compaction reducing percolation rates. Attention to this also opens up the prospect of the remaining spreading ponds being useful for wildlife.

PWP remain wholly resistant to any consideration of percolating water in the stream and use of the dam. Mr. Takara (Board of Zoning Appeals Meeting March 4, 2015):

> “Co-mingling natural re-charge with the City’s water initiates a conflict between what water is actually percolating and what water is being released by the County.”

LACFD are not a party to The Judgment. If LACFD release flows from the dam Mr. Takara asks:

> “... so what water was released? The City’s water, the natural re-charge water, the water from a storm drain?”

This has been a common PWP refrain against restoring natural flows to the Arroyo.

The Converse and Williams studies provide a window to answers. LACFD allow water to pond behind the dam at flows around 50 cfs. The Williams study estimates the natural stream could absorb 25 cfs before water hits the dam.

If LACFD close the dam gates at 50 cfs, PWP’s maximum allocation of 25 cfs has already been absorbed by the stream. Water ponding behind the dam is water spread “for the general good” and has no impact on PWP pumping credit — the stream absorbs PWP’s maximum allocation.

To Mr. Takara’s question “What water was released if LACFD open the dam gates?” the answer is: “Not the City’s water” — the stream has already percolated PWP’s allocation “into the underground”.

In its adherence to “the law” PWP omit mention of Section II (3) of The Judgment:

> “... water diverted for spreading in such facilities cannot be percolated into the Basin and escapes therefrom, such quantity of water shall be subtracted from the amount diverted for spreading to determine the amount available for re-capture.”

The Williams Study noted that, when full, the spreading basins leak flows back into the stream where they are absorbed. In addition, low summer flows leak out of the settlement basin. If PWP were to adhere to “the law” this leakage should be measured and deducted from their pumping credit. Section II (1) is clear that the diversion is for percolation of water “into the underground”; the substantial evaporation that occurs from holding water in surface ponds in our hot climate should also be deducted.

The picture of the finished Devil's Gate Clean-out project in LACFD documentation shows a blue ribbon of streamflow winding through an alpine like meadow down to the dam. The image is designed to woo the public but under current conditions is fiction. At the level of flow depicted, the stream is diverted by PWP and never gets close to the dam. However, conserving water using natural processes in the basin could make this enticing image achievable.

A similar "artist impression" for the ASCP IS document shows clear water flowing over the new diversion dam a mile upstream. Again, this is a false image. The new dam is to divert water. Only high storm flows will spill over the new diversion dam.

LACFD's objectives with the Devil's Gate Clean-out are to restore capacity behind the dam. There should also be a commitment to restore hydraulic conductivity to the stream zone.

<u>In summation:</u>

Benefits from restoring natural flows to the Arroyo Seco include:

1. **Cost savings** — using the current spreading basins as overflow eliminates the need to expand the existing basins; this, in turn, reduces the cost of construction and annual maintenance.

2. **Increased pumping credit with no extra cost**: measuring the percolation capacity of the stream and claiming credit for water "spread in the natural stream" allows for credit during all flows. Currently, PWP cannot claim credit during high flow events as no diversion occurs. PWP has to wait for flows to slow so water is less turbid — this means that during and after prolonged periods of high flows PWP claim no pumping credit. If PWP claims credit for all flows up to the percolation capacity of the stream these credits can be issued even during high flow storm events. This will enhance PWP's pumping credit claims above the existing project goals.

3. **Water "underground" not evaporating in surface ponds**: using the natural stream to spread water ensures water percolates "into the underground" as the law requires and is not left stagnating and evaporating in ponds.

4. **Restored riparian habitats:** natural flows restored to the Arroyo Seco will lead to enhanced riparian habitats. This will compensate for the loss of riparian habitat close to the dam from the LACFD Devil's Gate clean-out. Potential environmental impacts of diverting all flows into spreading basins goes away. The type of riparian habitat that would emerge — shady areas with white alder and willow, will provide for safe wildlife nursery sites that currently do not exist.

5. **On-site mitigation for LACFD Devil's Gate clean-out** — with restored natural flows LACFD can focus on "on site" restoration of habitats. If the spreading basins are used for overflow purposes — flows that cannot be absorbed by the stream up to 25 cfs — this leaves room for the LACFD Devil's Gate restoration to occur on site; in particular, in the area left by the removal of the old JPL parking lot.

6. **Fish Passage:** much of the public comment around the MND in 2015 lauded the idea of creating "fish passage" — this is unrealistic with all flows being diverted into a pipe. The new IS is wise to point out there are no fish currently within the project area. However, restoration of natural flows could make that a possibility. There is no reason a restored natural stream channel could not support a resident fish population above the dam.

Approach options for a phased restoration of natural flows to the Arroyo Seco:

1. Measure percolation capacity of the stream from the USGS gauging station down to the dam. RBMB then allows PWP to claim credit for the full percolation of water in the "natural stream channel" before it hits the dam. Flows not absorbed by the stream up to PWP's surface water right (25 cfs) are diverted into the existing spreading basins. E.g. if the stream can absorb 15 cfs before water hits the dam, PWP diverts the remaining 10 cfs into the existing spreading basins.

2. If there is an issue with "natural stream channels" not leading to "existing or new spreading grounds", calculate the percolation rate for the natural stream up to the last of the spreading ponds, Johnson Field. All flows in the natural stream channel up to Johnson Field provide for PWP pumping credit. Most of the year flows, if left in the stream, will not reach Johnson Field.

3. Use the Prop 84 funds to construct new "spreading grounds" that allow for maximization of the high percolation provided by the stream. This includes engaging LACFD to ensure they maximize the percolation capacity of the stream under their clean-out project.

4. If "the law" proves inflexible, challenge the ongoing use of a 75 year old document that dictates an out-dated mechanism of water conservation — science and public attitudes have moved on. The environment and our fragile water supply require better. It is unreasonable to believe that the stakeholders in our local aquifer are not interested in replenishing the same as efficiently as possible.

Currently there are two lead agents implementing projects in the Arroyo — LACFD and PWP — each fails to look at the Hahamongna watershed as an integrated whole. The cumulative impacts of the ASCP and the Devil's Gate Clean-out on the Hahamongna basin must be considered.

At all stages of the project there needs to be full consultation with US Fish & Wildlife Services as well as California Department of Fish and Wildlife.

There is an imperative, with the increasing fragility of our climate, to work with, not against, the natural processes in the basin.

If the ASCP and Devil's Gate Clean-out projects continue under their current plans, the concept of Hahamongna - flowing water, fruitful valley — will die.

Please add these comments to the Administrative Record for the project.

APPENDIX
Photographs taken in the spring of 2019



Diverted water flows into Spreading Basin 1 (left).

Water outside of the main flow starts to stagnate and grow algae (below). Water quality quickly deteriorates when held in surface ponds.



Flows stop at Spreading Basin #5 (below). At this point, because the spreading basins do not absorb water efficiently there is significant stagnation and deterioration in water quality.

Note: PWP claims credit for this stagnant water — this is our “local water supply”.





Photographs taken on April 3 2019 after storm flows receded and water was being diverted.





Above: Similar flows left in the stream 50 yards below the JPL bridge.

Flows are completely absorbed adjacent to Spreading Basin #3 (left). Water quality for flows in the stream remains high.

PWP considers this “lost” water. Under the project these flows in the natural stream will be diverted into the spreading basins.

Photo taken in June 2018.

PWP diverts nearly all summer flows. Flows sit and stagnate in the sediment basin. Flows also leak back into the stream.

If these flows were left in the stream they would be absorbed well before reaching the dam.

Leaving flows in the stream would allow the recovery of riparian habitat, provide nursery sites for wildlife, and help mitigate the loss of habitat from the LACFD Devil's Gate Clean-out.



From: Laura Garrett
To: Ventura, Elisa
Subject: Arroyo Seco Canyon Project
Date: Friday, December 6, 2019 4:41:51 PM

CAUTION: This email was delivered from the Internet. Do not click links or open attachments unless you know the content is safe.

Re: Arroyo Seco Canyon Project EIR Initial Study and Scoping Document

Dear Ms Ventura,
Thank you for the opportunity to comment on this project.
My name is Laura Solomon and I am a concerned stakeholder. As a bird watcher, water conserver, and believer in the value of wildlife corridors, I am very interested in this project.
I'm concerned that it uses out-of-date strategies and needs to work more closely with natural processes. I urge PWP to work with nature to restore habitat, not destroy it. Use the conditions already present in the Hahamongna basin to replenish the aquifer. The basin is already sandy, and therefore is primed for water sinking through the sandy soil into the ground.
If PWP is determined to use spreading basins, then I urge them to use the spreading basins to create habitat. Plants are much better at collecting and storing water than basins.
Again, I urge PWP to work with natural processes in this project.
Thank you for your time.
Sincerely,
Laura Solomon
626-437-1867
711 S Mentor Ave
Pasadena, CA 91106

Sent from my iPhone

Appendix A-4

Final Initial Study/Mitigated Negative Declaration, January 2015

BonTerra PSOMAS

Final

Initial Study/Mitigated Negative Declaration

Arroyo Seco Canyon Project

Prepared for
City of Pasadena
Department of Water and Power
150 South Los Robles Avenue, #200
Pasadena, CA 91101

Prepared by
BonTerra Psomas
225 South Lake Avenue, Suite 1000
Pasadena, California 91101
T: (626) 351-2000

January 2015

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LOS ANGELES. COUNTY CLERK

Notice of Determination

Appendix D

To:

☑ Office of Planning and Research

For U.S. Mail: P.O. Box 3044, Sacramento, CA 95812-3044

Street Address: 1400 Tenth St., Rm 113, Sacramento, CA 95814

☑ County Clerk

County of: Los Angeles

Address: 12400 Imperial Highway, Norwalk, CA 90650

From:

Public Agency: City of Pasadena

Address: 175 North Garfield Avenue, Pasadena, CA 91101

Contact: Jose Daniel Jimenez

Phone: 626-744-7137

Lead Agency (if different from above): (Same)

Address:

Contact:

Phone:

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): 2014101022

Project Title: Arroyo Seco Canyon Project

Project Applicant: City of Pasadena Department of Water and Power

Project Location (include county): 3420, 3500, 4401, 4500 Arroyo Seco Road, Pasadena, Los Angeles County; Arroyo Seco Canyon near Explorer Road; Hahamonga Watershed

Project Description:

The Project involves three areas of improvements along the upper Arroyo Seco. Area 1 includes demolition of the damaged existing headworks structure and creation of habitat restoration and a rest area/picnic area; Area 2 includes removal of the damaged existing intake structure and construction of a new diversion and wier structure and improvements to the Gabrielino Trail/access road; Area 3 includes creation of a parking lot for recreational users, reconfiguration and expansion of existing spreading basins, restrooms, and a guard house. The new intake would divert additional water during high-flows into the spreading basins for groundwater replenishment.

This is to advise that the City of Pasadena has approved the above

(■ Lead Agency or ☐ Responsible Agency)

described project on January 7, 2015 (date) and has made the following determinations regarding the above described project.

1. The project [☐ will ■ will not] have a significant effect on the environment.
2. ☐ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ■ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [■ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [■ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☐ was ■ was not] adopted for this project.
6. Findings [■ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the negative Declaration, is available to the General Public at:

City of Pasadena, Planning Department, 175 N. Garfield Avenue, Pasadena, CA, 91101

Signature (Public Agency): [signature] Title: City Planner

Date: 1/12/15 Date Received for filing at OPR:

Authority cited: Section 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Revised 2011

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Arroyo Seco Canyon Project

Lead Agency: Pasadena Water and Power | Contact Person: Gary Takara

Mailing Address: 150 South Los Robles Avenue, Suite 200 | Phone: (626) 744-3729

City: Pasadena | Zip: 91101 | County: Los Angeles

Project Location: County: Los Angeles | City/Nearest Community: Pasadena

Cross Streets: Windsor Avenue and Ventura Street | Zip Code: 91011/91001

Longitude/Latitude (degrees, minutes and seconds): 34°12'7.5" N/118°9.56'67" W | Total Acres: 32

Assessor's Parcel No.: 5823-015-902; 5830-001-906, 5863-001-908; 5863-002-902 | Section: 5 | Twp: 1N/2N | Range: 12W | Base: SBM

Within 2 Miles: State Hwy. #: I-210 | Waterways: Arroyo Seco

Airports: | Railways: | Schools: Sycamores, Odyssey Charter

Document Type:

CEQA: ☐ NOP ☐ Early Cons ☐ Neg Dec ☒ Mit Neg Dec ☐ Draft EIR ☐ Supplement/Subsequent EIR (Prior SCH No.) ☐ Other:

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other:

Local Action Type:

☐ General Plan Update ☐ General Plan Amendment ☐ General Plan Element ☐ Community Plan
☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan
☐ Rezone ☐ Prezone ☒ Use Permit ☐ Land Division (subdivision, etc.)
☐ Annexation ☐ Redevelopment ☐ Coastal Permit ☐ Other:

Development Type:

☐ Residential: Units ____ Acres ____
☐ Office: Sq.ft. ____ Acres ____ Employees ____
☐ Commercial: Sq.ft. ____ Acres ____ Employees ____
☐ Industrial: Sq.ft. ____ Acres ____ Employees ____
☐ Educational ____
☒ Recreational ____
☐ Water Facilities: Type ____ MGD ____
☐ Transportation: Type ____
☐ Mining: Mineral ____
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type ____
☒ Other: stream restoration, water diversion and recharge

Project Issues Discussed in Document:

☒ Aesthetics/Visual
☐ Agricultural Land
☒ Air Quality
☒ Archaeological/Historical
☒ Biological Resources
☐ Coastal Zone
☒ Drainage/Absorption
☐ Economic/Jobs
☐ Fiscal
☒ Flood Plain/Flooding
☒ Forest Land/Fire Hazard
☒ Geologic/Seismic
☒ Minerals
☒ Noise
☒ Population/Housing Balance
☒ Public Services/Facilities
☒ Recreation/Parks
☒ Schools/Universities
☐ Septic Systems
☐ Sewer Capacity
☒ Soil Erosion/Compaction/Grading
☒ Solid Waste
☒ Toxic/Hazardous
☒ Traffic/Circulation
☒ Vegetation
☒ Water Quality
☒ Water Supply/Groundwater
☒ Wetland/Riparian
☐ Growth Inducement
☒ Land Use
☒ Cumulative Effects
☐ Other:

Present Land Use/Zoning/General Plan Designation:

Parking lot, trail, drainage channel/Open Space/Open Space

Project Description: *(please use a separate page if necessary)*

The project would involve restoration of a portion of the Arroyo Seco, reconstruction of surface water diversion facilities; expansion of spreading basins; and construction of recreational and educational amenities.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g., Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with an "X".
If you have already sent your document to the agency please denote that with an "S".

X	Air Resources Board		Office of Historic Preservation
	Boating & Waterways, Department of		Office of Public School Construction
	California Emergency Management Agency	X	Parks & Recreation, Department of
	California Highway Patrol		Pesticide Regulation, Department of
X	Caltrans District # 7		Public Utilities Commission
	Caltrans Division of Aeronautics	X	Regional WQCB # 4
	Caltrans Planning	X	Resources Agency
	Central Valley Flood Protection Board		Resources Recycling and Recovery, Department of
	Coachella Valley Mtns. Conservancy		S.F. Bay Conservation & Development Comm.
	Coastal Commission	X	San Gabriel & Lower L.A. Rivers & Mountains Conservancy
	Colorado River Board		San Joaquin River Conservancy
X	Conservation, Department of		Santa Monica Mountains Conservancy
	Corrections, Department of		State Lands Commission
	Delta Protection Commission		SWRCB: Clean Water Grants
	Education, Department of	X	SWRCB: Water Quality
	Energy Commission	X	SWRCB: Water Rights
X	Fish & Game Region #		Tahoe Regional Planning Agency
	Food & Agriculture, Department of	X	Toxic Substances Control, Department of
X	Forestry and Fire Protection	X	Water Resources, Department of
	General Services, Department of		
X	Health Services, Department of		Other:
	Housing & Community Development		Other:
X	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date: _____ Ending Date: _____

Lead Agency (Complete if applicable):

Consulting Firm: BonTerra Psomas
Address: 225 South Lake Avenue, Suite 1000
City/State/Zip: Pasadena, CA 91101
Contact: Kristin Keeling
Phone: (626) 351-2000

Applicant: Pasadena Water and Power
Address: 150 South Los Robles Avenue, Suite 200
City/State/Zip: Pasadena, CA 91101
Phone: (626) 744-3729

Signature of Lead Agency Representative: Gary Jakara **Date:** 10/7/2014

Authority cited: Sections 21083 and 21087, Public Resources Code, Reference: Section 21161, Public Resources Code.

SECTION 1.0 INTRODUCTION

1.1 PURPOSE OF INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

The California Environmental Quality Act (CEQA) (*California Public Resources Code* §21000 et seq.) and the State CEQA Guidelines (*California Code of Regulations,* Title 14, §15000 et seq.) require that local government agencies, prior to taking action on projects requiring discretionary approval, consider the environmental consequences of such projects. In accordance with CEQA, this Initial Study (IS) has been prepared as documentation to support a Mitigated Negative Declaration (MND) for the Arroyo Seco Canyon Project (Project) proposed by the City of Pasadena. This IS/MND includes a description of the proposed Project; the location of the Project site; an evaluation of the potential environmental impacts of Project implementation; and recommended mitigation measures to lessen or avoid impacts on the environment.

Pursuant to Section 15367 of the State CEQA Guidelines, the City of Pasadena is the Lead Agency for the Project. This Project is being implemented under a partnership between the City of Pasadena Department of Water and Power (PWP) and the Arroyo Seco Foundation (ASF).[1] However, the City of Pasadena is serving as the Lead Agency, as it has the principal responsibility for carrying out the Project and has the authority for approving the Project and its accompanying environmental documentation.

In addition to addressing the potential environmental impacts that would result from the proposed Project, this IS/MND serves as the primary environmental document for future activities associated with the Project, including discretionary approvals requested or required for Project implementation. The Project proposes improvements to three areas within the Arroyo Seco Canyon. Project components include improvements to Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, Jet Propulsion Laboratory (JPL) East Parking Lot that would allow for the recharge of greater amounts of surface water into the groundwater basin, and would provide additional recreational and educational amenities.

This IS/MND evaluates the potential environmental impacts associated with implementation of the Project; includes significance determinations from the environmental analyses; identifies project design features (PDF) and regulatory requirements (RR) to be incorporated into the Project; and sets forth mitigation measures (MM) that would lessen or avoid potentially significant Project impacts on the environment. The IS/MND indicates that, while implementation of the Project would have environmental impacts, MMs have been incorporated to reduce potentially adverse impacts to levels considered less than significant (State CEQA Guidelines §15070). The reader is referred to the full text of this IS/MND and the technical appendices for a complete discussion and analysis of the Project's potential environmental effects.

As the Lead Agency, the City has reviewed and revised, as necessary, all submitted drafts and technical studies and has commissioned the preparation of this IS/MND to reflect its independent judgment, including reliance on City staff for the review of all technical subconsultant reports. Data for this IS/MND was obtained from on-site field observations; discussions with affected agencies; review of available technical studies, reports, guidelines, and data; and review of specialized environmental assessments prepared for the Project.

[1] The ASF is a community-based 501(c)(3) nonprofit organization that advocates an integrated, harmonious approach to watershed and flood management, water conservation, habitat enhancement, and the expansion of recreational opportunities in the Arroyo Seco.

1.2 SUMMARY OF ENVIRONMENTAL IMPACTS

The Arroyo Seco Canyon Project proposes improvements in three areas along the Upper Arroyo Seco, north of Devil's Gate Dam.

Area 1: Improvements proposed in Area 1 include habitat restoration along the stream channel, a new nature trail, and a rest area/picnic area, along with demolition of the existing Headworks structure on the Arroyo Seco.

Area 2: The existing diversion and intake structures are located on the Arroyo Seco in Area 2. New diversion and weir structures, a control equipment enclosure, and improvements to the damaged portion of the Gabrielino Trail/access road are proposed in this area.

Area 3: A recreational parking lot, sedimentation basins, expanded spreading basins, a restroom, and a guard station are proposed in Area 3 where the JPL East Parking Lot and four existing spreading basins are located.

Section 1.0 of this IS/MND provides the purpose of the IS/MND and a summary of the Project's environmental impacts; Section 2.0 discusses the existing environmental setting, and Section 3.0 provides a discussion of the improvements proposed as part of the Arroyo Seco Canyon Project. Section 4.0 of this IS/MND evaluates the impacts that would occur with Project implementation.

As analyzed, no impacts on Agriculture and Forest Resources and Population and Housing would accompany the Project. A number of PDFs would serve to minimize or avoid environmental impacts. Compliance with existing regulations would also reduce environmental impacts. With implementation of PDFs and compliance with RRs, the Project would have less than significant impacts on Aesthetics, Air Quality, Geology and Soils, Greenhouse Gas Emissions, Hydrology and Water Quality, Land Use and Planning, Mineral Resources, Noise, Public Services, and Utilities and Service Systems.

To avoid and reduce other potentially significant Project impacts, MMs have been developed for Biological Resources, Cultural Resources, Hazards/Hazardous Materials, Recreation, and Transportation/Traffic. With the implementation of these MMs, impacts would be reduced to less than significant levels.

The City will include these PDFs, RRs and MMs in the Contractor Specifications, as appropriate, and verify their implementation as part of the Mitigation Monitoring and Reporting Program (MMRP) for the Project. These PDFs, RRs and MMs are listed below.

Aesthetics

PDF AES-1 Public improvements in Areas 1 and 2 will be designed to comply with the Arroyo Seco Design Guidelines that address habitat restoration and landscaping using high value native plant species that would contribute to the genetic material of the Arroyo Seco, walls, signs, and site furnishings that are consistent with those found in the Hahamongna Watershed Park (HWP), subject to design review and approval by the City's Planning Division.

RR AES-1 The proposed improvements in Area 3 are required to be designed to comply with applicable criteria in the Arroyo Seco Design Guidelines, subject to design review and approval by the City's Planning Division.

Air Quality

RR AQ-1 During construction, the Contractor is required to comply with the South Coast Air Quality Management District's (SCAQMD's) Rule 403, Fugitive Dust, which requires the implementation of best available control measures (BACM) for any activity or man-made condition capable of generating fugitive dust including, but not limited to, earth-moving activities, construction/demolition activities, disturbed surface area, or heavy- and light-duty vehicular movement. The BACMs include stabilizing soil; watering surface soils and crushed materials; covering hauls or providing freeboard; preventing track-out; and limiting vehicle speeds and wind barriers, among others.

RR AQ-2 In accordance with Section 2449(d)(3) of California Air Resources Board's (CARB's) Regulation for In-Use Off-Road Diesel-Fueled Fleets, construction equipment and vehicles are required to limit idling times to no more than five consecutive minutes.

Biological Resources

PDF BIO-1 Habitat restoration in Area 1 will utilize native plant species, in accordance with the Plant Palettes set forth in Appendix A of the Arroyo Seco Design Guidelines, which allow for substitutions with the concurrence of the Project's biologist/restoration specialist.

RR BIO-1 The City of Pasadena Department of Water and Power is required to obtain all necessary permits for impacts to "waters of the United States" and "waters of the State" from applicable resource agencies, including the United States Army Corps of Engineers (USACE), the Los Angeles Regional Water Quality Control Board (RWQCB), and the California Department of Fish and Wildlife (CDFW).

RR BIO-2 Tree pruning, removal, relocation, and replacement is required to be made in compliance with the City of Pasadena "City Trees and Tree Protection Ordinance" (Section 8.52 of the Pasadena Municipal Code), which requires that mature, public, landmark, landmark-eligible, native and specimen trees be protected and preserved. Work on protected trees must be approved by the City Manager or his/her designated personnel.

MM BIO-1 A Biological Monitor shall be on site during vegetation clearing activities in Project work areas (i.e., areas of disturbance). Prior to the start of activities, the Biological Monitor shall confirm that the limits of Project work areas are clearly marked. In addition, the Biological Monitor shall conduct a pre-clearing sweep of the Project work area and shall flush and/or move common and unlisted special status wildlife to nearby suitable habitat outside the Project work area to the extent practicable. The Biological Monitor shall also be familiar with least Bell's vireo and shall conduct pre-clearing non-protocol surveys for this species while onsite. If a least Bell's vireo or other State of federally listed species is detected, work activity within 200 feet of the occupied habitat detected will be temporarily halted and the City will consult with the USFWS and CDFW. With authorization from these agencies, which may include a 'take' permit, the project will proceed in accordance with conditions developed in the consultation. Conditions will include avoidance and minimization measures to prevent or minimize impacts on the listed species(s) occurring on or adjacent to the site.

MM BIO-2 Project construction shall be conducted in compliance with the conditions set forth in the Migratory Bird Treaty Act (MBTA) and *California Fish and Game Code* with methods approved by the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) to protect active bird/raptor nests. To the maximum extent feasible, vegetation removal shall occur during the non-breeding season for nesting birds (generally late September to early March) and nesting raptors (generally early July to late January) to avoid impacts to nesting birds and raptors. If the Project requires that work be initiated during the breeding season for nesting birds (March 1–September 30) and nesting raptors (February 1–June 30), in order to avoid direct impacts on active nests, a pre-construction survey shall be conducted by a qualified Biologist for nesting birds and/or raptors within 3 days prior to clearing of any vegetation and/or any work near existing structures (i.e., within 300 feet for nesting birds and within 500 feet for nesting raptors). If the Biologist does not find any active nests within or immediately adjacent to the impact areas, the vegetation clearing/construction work shall be allowed to proceed.

If the Biologist finds an active nest within or immediately adjacent to the construction area and determines that the nest may be impacted or breeding activities substantially disrupted, the Biologist shall delineate an appropriate buffer zone around the nest depending on the sensitivity of the species and the nature of the construction activity. Any nest found during survey efforts shall be mapped on the construction plans. The active nest shall be protected until nesting activity has ended. To protect any nest site, the following restrictions to construction activities shall be required until nests are no longer active, as determined by a qualified Biologist: (1) clearing limits shall be established within a buffer around any occupied nest (the buffer shall be 100–300 feet for nesting birds and 300–500 feet for nesting raptors), unless otherwise determined by a qualified Biologist and (2) access and surveying shall be restricted within the buffer of any occupied nest, unless otherwise determined by a qualified Biologist. Encroachment into the buffer area around a known nest shall only be allowed if the Biologist determines that the proposed activity would not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest or the nest has failed.

MM BIO-3 A Biological Monitor shall conduct a pre-construction bat habitat assessment of buildings and~~the~~ trees marked for potential removal. Potential for roosting shall be categorized by 1) potential for solitary roost sites 2) potential for colonial roost sites (10 bats or more). If the potential for colonial roosting is determined, those trees shall not be removed during the bat maternity roost season (March 1 – July 31). Trees potentially supporting colonial roosts outside of maternity roost season, and trees potentially supporting solitary roosts may be removed via a two-step removal process, whereby some level of disturbance (such as trimming of lower branches) (at the direction of the Biological Monitor) is applied to the tree on day one to allow bats to escape during the darker hours, and the roost tree shall be removed two days later~~the following day~~ (i.e., there shall be no less or more than two~~one~~ nights between initial disturbance and the grading or tree removal). When feasible, trees will be dropped slowly and a Biological Monitor will monitor the activity. If buildings are determined to be occupied, one-way exclusionary devices will be placed over bat access points and left in place for two nights prior to building removal.

MM BIO-4 Prior to habitat disturbing activities of any Project component, a detailed restoration program shall be developed and implemented for any special status vegetation

type identified within the Project disturbance limits that is removed. These special status vegetation types shall be restored within the project disturbance limits at a ratio of not less than 1:1, or as agreed to by the City of Pasadena in consultation with the CDFW. If the 1:1 ratio cannot be achieved within the project disturbance limits, then the balance shall be achieved by identifying additional areas for restoration or conservation within the Arroyo Seco or adjacent watersheds. Restoration shall consist of seeding and container plantings of appropriate species. A Restoration Program shall be submitted to the City of Pasadena for review by a qualified Biologist and approval by the resource agencies (USACE, RWQCB, CDFW) prior to issuance of grading permits. The Restoration Program shall include, at a minimum, the following elements:

a. **Responsibilities and qualifications of the personnel to implement and supervise the plan.** The responsibilities of the landowner, specialists, and maintenance personnel that will supervise and implement the plan shall be specified.

b. **Site selection.** The site(s) for mitigation shall be determined in coordination with the City of Pasadena and the resource agencies. Restoration required outside the Project disturbance limits shall be located in dedicated open space areas (i.e. preserved in perpetuity as open space) and shall be contiguous with other natural open space areas.

c. **Site preparation and planting implementation.** The site preparation shall include (1) protection of existing native species; (2) trash and invasive non-natives removal; (3) native species salvage and reuse (i.e., duff); (4) soil treatments (i.e., imprinting, decompacting); (5) erosion-control measures (i.e., rice or willow wattles); and (6) native seed mix application and plantings.

d. **Schedule.** Establishment of restoration/revegetation sites shall be conducted between October 1 and January 30. Seeding and planting of container plants shall take place immediately after preparation of the restoration sites.

e. **Maintenance plan/guidelines.** The maintenance plan shall include (1) invasive non-natives control, (2) herbivory control, (3) trash removal, (4) irrigation system maintenance, (5) maintenance training, and (6) replacement seeding and/or planting.

f. **Monitoring Plan.** The monitoring plan shall include (1) site preparation and implementation activities; (2) performance criteria as approved by the City of Pasadena and resource agencies; (3) long-term monitoring requirements and methods to determine compliance with performance criteria; (4) goals and methods of site maintenance (e.g., weed removal, erosion control); (5) preparation of regular progress reports to document site progress; and (6) preparation of annual reports which shall be submitted to the City of Pasadena and resources agencies for three to five years. The monitoring shall be conducted for three to five years, depending upon the performance standard requirements for the vegetation type at the mitigation site.

g. **Long-term preservation.** Long-term preservation of the restoration site shall be outlined in the conceptual mitigation plan to ensure the mitigation site is not impacted by future development.

h. Performance standards will be identified and will apply for each special status vegetation type. Revegetation shall be considered successful at three years if the percent cover and species diversity of the restored and/or created habitat areas are similar to percent cover and species diversity of adjacent existing habitats, as determined by quantitative testing of existing, restored, and created habitat areas.

In addition, earth-moving equipment shall avoid maneuvering in areas outside the construction limits in order to avoid disturbing adjacent habitats. Prior to grading, the construction limits shall be identified on the grading plan and established at the Project site with appropriate staking and flagging materials. The Contractor shall submit a letter to the City of Pasadena verifying that the construction limits have been staked and flagged at the Project site.

MM BIO-5 Mitigation for the loss of jurisdictional resources shall be negotiated with the resource agencies during the regulatory permitting process (see RR BIO-1) and shall ensure that mitigation to compensate for permanent impacts on jurisdictional resources is equivalent or superior to biological functions and values impacted by the Project. Potential mitigation options may include: (1) removal of exotic species from the Arroyo Seco Canyon or Hahamongna Watershed Park or elsewhere within the Arroyo Seco or adjacent watersheds; (2) payment to a mitigation bank or regional riparian enhancement program (e.g., invasive plant or wildlife species removal); and/or (3) restoration of riparian habitat, including qualifying vegetation and trees, either on site or off site at a ratio of no less than 1:1, determined through consultation with the USACE, the RWQCB, and the CDFW. The restoration plan shall detail the methodology and performance standards, which shall be prepared in accordance with requirements specified in permits/agreements issued by the USACE, the RWQCB, and the CDFW.

MM BIO-6 A team of qualified specialists in hydrology and plant and wildlife biology will monitor the Arroyo Seco stream and associated riparian habitat from the intake structure (i.e. diversion point) downstream to Devil's Gate Dam. The extent of the riparian habitat, including aquatic habitat, will be defined based on field observations during the initial site visit. Monitoring will begin with an initial baseline assessment to be conducted within six months prior to start of increased diversions. Thereafter, monitoring shall continue quarterly for a duration of five years. Data will be gathered at fixed points along the stream, and general descriptive notes and photos will be taken of the entire stretch. Data will include surface flow measurements; subsurface hydrology; surface water extent mapping; vegetation mapping; a vegetation health assessment; active channel location mapping; and a plant and wildlife habitat suitability assessment (including protocol surveys if warranted and necessary to determine presence or absence of species). Data from four quarterly visits will be compiled in an annual report. The initial report will include a summary of available biological and hydrological historic data for the site. Annual reports will also include U.S. Geological Survey (USGS) stream gauge data from the Arroyo Seco (upstream of the Project site) and City of Pasadena data on diversion amounts within the year. These reports will consider all potential contributing factors, including precipitation and hydrologic conditions, flows from other managed tributaries, as well as potential maintenance and sediment removal activities behind the Devil's Gate Dam, and focus the reports on that which is attributable to the project to the maximum extent feasible. Annual reports will conclude with an assessment on the effects of increased diversion and will provide recommendations for corrective actions, if deemed necessary to avoid or reduce

downstream impacts attributable to the Project. Reports will be submitted to the City of Pasadena for review and approval of recommended corrective measures, if any.

Alternatively, if the City chooses not to take corrective measures, the City may mitigate for any loss of vegetation at a minimum 1:1 replacement ratio. The City shall only be required to mitigate for those impacts attributable to the City's increased diversions. Replacement vegetation shall be in kind; shall be equal to or greater than biological value prior to diversion; and shall be located within the Arroyo Seco watershed. Vegetation replacement shall mitigate for plant and wildlife impacts of the impacted community. Re-vegetated riparian communities within Area 1 established as part of the Project may potentially qualify towards credit for reduced flow impacts, if credit is available.

MM BIO-7 Prior to commencement of construction activities, trees not expected to be impacted by construction shall be enclosed by barriers such as chain-link fencing or orange snow fencing. At a minimum, the barriers will be placed at the outer canopy of each tree to be protected in place, and no grade changes will be made within the barriers without prior approval by the City. During Project construction, a biological monitor will be periodically present to record the number of trees actually impacted. If project construction can avoid impacting oak trees, the number of replacement trees will be reduced accordingly.

Cultural Resources

PDF CUL-1 A temporary bridge will be constructed over Bridge No. 3 prior to the start of construction activities in Areas 1 and 2. The temporary bridge will be used for all construction vehicles and equipment and will be removed after construction activities are completed.

RR CUL-1 If human remains are encountered during excavation activities, all work is required to halt in the immediate vicinity of the discovery and the County Coroner must be notified (*California Public Resources Code* §5097.98). The Coroner is required to determine whether the remains are of forensic interest. If the Coroner, with the aid of an Archaeologist, determines that the remains are prehistoric, s/he is required to contact the Native American Heritage Commission (NAHC). The NAHC is responsible for designating the most likely descendant (MLD), who is responsible for the ultimate disposition of the remains, as required by Section 7050.5 of the *California Health and Safety Code.* The MLD is required to make his/her recommendation within 48 hours of being granted access to the site. The MLD's recommendation is required to be followed if feasible, and may include scientific removal and non-destructive analysis of the human remains and any items associated with Native American burials (*California Health and Safety Code* §7050.5). If the landowner rejects the MLD's recommendations, the landowner is required to rebury the remains with appropriate dignity on the property in a location that will not be subject to further subsurface disturbance (*California Public Resources Code* §5097.98).

MM CUL-1 Prior to the start of construction activities in Areas 1 and 2, the cast concrete baluster railing of Bridge No. 2 shall be protected from construction activities that include the movement of heavy and large motor vehicles and machinery over it to gain access to Areas 1 and 2. Each baluster railing, from the bridge deck to the top of the railing, shall be clad with solid plywood panels, with a minimum thickness

of ¾ inches (or equally effective measures shall be installed) to protect against unintentional impacts from passing over the bridge. The plywood barriers shall be secured without damaging the balusters or railing.

The design and construction (and eventual removal) of the protective barriers at Bridge No. 2 shall be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The plans for the temporary barriers shall be reviewed by an architectural historian, historic architect, and structural or civil engineer who has experience with the physical components of historic bridges. A qualified architectural historian (who meets the Secretary of Interior's Professional Qualification Standards) shall be retained to monitor the proposed installation and removal of the protective barriers on Bridge No. 2, prior to construction. An installation/construction/repair methodology to protect the historic resources shall be developed prior to construction activities to ensure that the protective measures adequately safeguard Bridge No. 2.

A pre-construction and a post-construction survey shall be prepared to ensure that adverse effects or significant impacts have not occurred to the bridge. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning – Historic Preservation.

MM CUL-2 Prior to commencement of construction activities within Areas 1 and 2, the design and construction (and eventual removal) of the temporary bridge over Bridge No. 3 shall be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The plans for temporary bridge shall be reviewed by an architectural historian, historic architect, and structural or civil engineer who has experience with the physical components of historic bridges and stone walls. A qualified architectural historian (who meets the Secretary of Interior's Professional Qualification Standards) shall be retained to monitor the proposed installation/construction and removal plan documents for the temporary bridge on Bridge No. 3, prior to the start of construction activities.

A pre-construction and a post-construction survey shall be prepared to ensure that adverse effects or significant impacts have not occurred to the bridge. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning and Community Development, Design and Historic Preservation.

MM CUL-3 Prior to commencement of earthmoving activities, the City shall retain a qualified Archaeologist to observe grading activities. The Archaeologist shall be present at the pre-grade conference; shall establish procedures for archaeological resource surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts, as appropriate. Should archaeological resources be found during ground-disturbing activities for the Project, the Archaeologist shall first determine whether it is a "unique archaeological resource" pursuant to the California Environmental Quality Act (CEQA, i.e., Section 21083.2[g] of the *California Public Resources Code*) or a "historical resource" pursuant to Section 15064.5(a) of the State CEQA Guidelines. If the archaeological resource is determined to be a "unique archaeological resource" or a "historical resource", the Archaeologist shall formulate a mitigation plan in consultation with the City of Pasadena that satisfies the requirements of the above-referenced sections. The Archaeologist shall prepare a report of the results of any study prepared as part of

a testing or mitigation plan, following guidelines of the California Office of Historic Preservation, and s/he shall record the site and submit the recordation form to the City of Pasadena and the California Historic Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton. Work may proceed in other areas of the site, subject to the direction of the Archaeologist.

MM CUL-4 Prior to commencement of earthmoving activities, a qualified Paleontologist shall be retained to observe grading activities in native soils that are 5 feet below the ground surface or deeper, in paleontologically sensitive sediments, and to conduct salvage excavation of paleontological resources, as necessary. The Paleontologist shall be present at the pre-grading conference; shall establish procedures for paleontological resources surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of any fossils discovered, as appropriate. If paleontological resources are discovered, the Paleontologist shall report such findings to the City of Pasadena. If paleontological resources are found to be significant, the Paleontologist shall determine appropriate actions, in cooperation with the City, for exploration and/or salvage. These actions, as well as final mitigation and disposition of the resources, shall be subject to the approval of the City. All recovered fossils shall be deposited in an accredited institution or museum, such as the Natural History Museum of Los Angeles County.

Geology and Soils

RR GEO-1 Grading, excavation, and construction is required to comply with the City's Building Code (Title 14 of the Pasadena Municipal Code, which incorporates the 2010 California Building Code), as they relate to site preparation and construction; alteration; moving; demolition; repair; use and occupancy of buildings; and structures and building service equipment within the City. The California Building Code requires the preparation of engineering geologic reports, supplemental ground-response reports, and/or geotechnical reports for all new construction; new structures on existing sites; and alterations to existing buildings. It also includes seismic design criteria and requirements for use in the structural design of buildings (i.e., based on seismic hazard maps and the seismic design category) and specifies building components that require special seismic certification.

RR GEO-2 Proposed improvements must be designed and constructed in accordance with the recommendations of the Geotechnical Feasibility Report that has been prepared for the Project, as required by the City's Building Code.

Hazards/Hazardous Materials

RR HAZ-1 Construction activities are required to comply with existing federal, State, and local regulations regarding hazardous material use, storage, disposal, and transport to prevent risks to public health and safety. Construction wastes that meet hazardous waste criteria must be stored, manifested, transported, and disposed of in accordance with the *California Code of Regulations* (Title 22) and to the satisfaction of the Los Angeles County Fire Department, which serves as the local Certified Unified Program Agency (CUPA).

RR HAZ-2 The City shall continue to implement its Emergency Operations Plan, which outlines the City's responses to emergencies associated with natural disasters, technological incidents, and national security emergencies.

MM HAZ-1 The City shall require Construction Contractors to implement the following measures:

- Trucks and equipment entering the site shall be inspected to be free from oil, gasoline, or other vehicle fluid leaks.
- Equipment fueling areas shall be located outside jurisdictional waters as identified by the USACE and CDFW.
- Hazardous materials shall not be stored within the 50-year floodplain for the Arroyo Seco. Instead, hazardous materials shall be stored within staging areas located away from the Arroyo Seco and shall be removed prior to the start of the storm season.
- All hazardous material spills and contaminated soils shall be excavated immediately upon discovery to minimize soil and water contamination and the potential of wildlife being poisoned or otherwise harmed.
- The Contractor shall maintain hazardous materials spill control, containment, and cleanup kits of adequate size and materials for potential accidental instream spills and releases.

MM HAZ-2 Should discolored or odorous soils be encountered during grading and excavation activities in Area 3, the Contractor shall have a sample of the soils analyzed for the presence of contamination. If the results of the testing show that chemical levels are present below regulatory levels, grading and excavation activities may proceed accordingly. Otherwise, remediation and/or removal of the contaminated soils shall be completed prior to continued ground disturbance if chemical levels are above regulatory standards. Remediation and/or disposal shall be conducted with the oversight of applicable regulatory agencies such as the Los Angeles County Fire Department, the South Coast Air Quality Management District (SCAQMD), the California Department of Toxic Substances Control (DTSC), and/or the U.S. Environmental Protection Agency in compliance with established maximum contaminant levels (MCLs).

MM HAZ-3 The Contractor shall schedule the temporary bridge construction and the access road reconstruction in Area 2 so as to shorten the necessary closures of the bridges and access road to the extent feasible. The Contractor shall also inform the Pasadena Department of Water and Power (PWP), the Pasadena Fire Department, the Pasadena Police Department, the Los Angeles County Fire Department, and the United States Forest Service (USFS) at least one week in advance of the start of construction of the times when work on Bridge No. 1/temporary bridge; Bridge No. 3/temporary bridge; and the Gabrielino Trail/access road are planned. Any major changes to the schedule shall be forwarded to these agencies at least one week prior to the bridge or trail closures.

MM HAZ-4 The Contractor shall not use, operate, or cause to be operated any internal combustion engine that uses hydrocarbon fuel, unless the engine is equipped with a spark arrestor and is maintained in effective working order, or the engine is constructed, equipped and maintained for the prevention of fire.

Hydrology and Water Quality

PDF HYD-1 Habitat restoration proposed in Area 1 will create a more natural riparian corridor for the Arroyo Seco and will include recontouring the stream channel; stabilizing the bank; revegetating with native plants; creating planting islands; and placing woody debris clusters at scattered locations.

PDF HYD-2 Replacement of the diversion and weir structures in Area 2 and additional spreading basins and expansion of the spreading basins in Area 3 will increase groundwater recharge using the City's surface water rights from the Arroyo Seco.

PDF HYD-3 The proposed restroom in Area 3 will be located outside the 50-year floodplain and would be connected to the public sewer system. In addition, trash cans and pet waste stations will be provided in Areas 1 and 3 to reduce pollutants that may enter the Arroyo Seco.

RR HYD-1 Prior to the start of construction activities, the Contractor is required to file a Permit Registration Document (PRD) with the State Water Resources Control Board (SWRCB) in order to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with the Construction and Land Disturbance Activities (Order No 2009-009-DWQ, NPDES No. CAS000002) or the latest approved general permit. This permit is required for construction activities (including demolition, clearing, grading, and excavation) and other land disturbance activities that result in the disturbance of one acre or more of total land area. The PRD consists of a Notice of Intent (NOI); a Risk Assessment; a Site Map; a Storm Water Pollution Prevention Program (SWPPP); an annual fee; and a signed certification statement. Pursuant to permit requirements, the Contractor must implement Best Management Practices (BMPs) in the SWPPP into the Project to reduce or eliminate construction-related pollutants in the runoff.

RR HYD -2 The Contractor is required to comply with SWRCB Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification", which requires compliance with all conditions of the Water Quality Certification issued by the Regional Water Quality Control Board (RWQCB). Compliance with the Water Quality Certification issued by the RWQCB would ensure that any discharge does not conflict with the applicable provisions of Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), or 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, or any other applicable requirements of State law.

RR HYD-3 Construction activities that will result in discharges of groundwater and dewatering that could result in discharges to surface waters are required to comply with the effluent limitations, discharge prohibitions, receiving water limitations, and other provisions outlined in the Los Angeles RWQCB Order No. R4-2013-0095. This Order requires that an NOI be filed with the Los Angeles RWQCB prior to dewatering activities and discharge into surface waters; water sampling and analysis; implementation of BMPs to prevent water quality degradation; and/or treatment of groundwater prior to discharge. The Los Angeles RWQCB reviews the NOI and the proposed discharge; authorizes the discharge subject to the

requirements in the Order; and prescribes an appropriate monitoring and reporting program.

RR HYD-4 The Contractor is required to comply with the City's Stormwater Management and Discharge Control Ordinance (Chapter 8.7 of the Pasadena Municipal Code), which prohibits illicit discharges and connections to the municipal storm water system; requires that storm water pollutants be reduced through litter control, natural water course protection, and containment of spills; and calls for the implementation of BMPs during construction through storm water pollution prevention plans (SWPPPs) and standard urban storm water mitigation plans (SUSMPs) for new development and major redevelopment.

RR HYD-5 All new construction and improvements in flood-prone areas are required by the City's Floodplain Management Regulations Ordinance (Chapter 14.27 of the Pasadena Municipal Code) to be adequately anchored to prevent flotation, collapse, or lateral movement; to be constructed with materials and equipment resistant to flood damage; to have utility and service facilities designed and located to prevent water from entering; and to provide adequate drainage to reduce exposure to flood hazards.

Land Use and Planning

RR LU-1 The proposed improvements in Area 3 must be designed and constructed in compliance with the *Hahamongna Watershed Park Master Plan* (HWMP) and the proposed restroom building will require Design Review Approval.

RR LU-2 The proposed Project will require a Conditional Use Permit (CUP) for developing/improving recreational facilities in the Open Space zone.

Mineral Resources

PDF MIN-1 Large cobbles and boulders exposed in Area 2 will be collected and stockpiled at a designated area for future use as trail markers, signs, and other decorative purposes.

RR MIN-1 Excavation activities in Area 3 is required to include the collection of arroyo stone for use in structures, signs, walls, and other improvements in accordance with the Arroyo Seco Design Guidelines, subject to the review and approval of the City's Planning Division.

Noise

RR NOI-1 In accordance with Section 9.36.070 of the City of Pasadena Municipal Code, the Contractor is required to limit noise-generating construction activities to between the hours of 7:00 AM and 7:00 PM Monday through Friday and between the hours of 8:00 AM and 5:00 PM Saturday in or within 500 feet of a residential district. No noise-generating construction activities shall be conducted on Sundays and federal holidays.

MM NOI-1 The Contractor shall implement the following noise-reduction measures during all construction activities:

- Equip all construction equipment (fixed or mobile) with properly operating and maintained mufflers, consistent with or exceeding manufacturers' standards.
- Ensure that construction equipment engine enclosures and covers, as provided by manufacturers, shall be in place during operation.
- Place all stationary construction equipment so that the equipment is as far as feasible from noise-sensitive receptors and so that the emitted noise is directed away from the noise-sensitive receptors.
- Locate equipment and materials staging in areas that will create the greatest distance between staging area noise sources and noise-sensitive receptors during Project construction.
- Ensure that construction equipment is shut down when not in use.
- Limit haul truck deliveries to the same hours specified for the operation of construction equipment.

Public Services

RR PS-1 Proposed improvements are required to be designed and constructed in accordance with the Pasadena Fire Prevention Code (Chapter 14.28 of the City's Municipal Code), which adopts the California Fire Code with changes and additions to the adopted code.

Recreation

MM REC-1 Prior to the closure of recreational trails for public use, the Construction Contractor shall post signs at the parking lots and trail entrances providing at least one week of advanced notice of the dates and times of planned trail closures. The trails shall be closed no more than 5 consecutive days in non-emergency circumstances. In addition to the closure notice, the Contractor shall provide directions to the nearest trails in the surrounding areas that would be open for public use at the times when the trails are closed.

Transportation/Traffic

PDF TRA-1 During the construction phase, a temporary access road will be maintained in Area 3 prior to the availability of the permanent access road, to provide continued vehicle access to the Jet Propulsion Laboratory (JPL) campus via the JPL Bridge. During construction activities in Area 3, the temporary access road will be available for use by JPL employees and visitors during the working weekdays, but the access road will be restricted at other times.

RR TRA-1 Construction activities are required to be conducted in accordance with the Standard Specifications for Public Works Construction (Greenbook) and the City's Supplements and Modifications to the Greenbook to maintain access to all parcels in and near the construction sites. This includes notification of residents and businesses affected by the road work; utility agencies with facilities in the area; the Pasadena Fire and Police Departments; and other emergency service providers.

The Greenbook also requires that access be made available at the end of each workday.

RR TRA-2 Temporary traffic control devices and methods used during construction are required to conform to the requirements of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) and the California Supplement to the MUTCD. The Contractor shall provide traffic tapers, traffic control devices, barricading, and signs necessary to ensure driver awareness and safety in construction areas and to assist fire and law enforcement personnel.

MM TRA-1 During construction activities in Areas 1, 2 and 3, all Contractors shall schedule the arrival and departure of the construction equipment, and construction trucks outside the AM peak hours of 7:30 AM to 8:30 AM and the PM peak hours of 4:30 PM to 5:30 PM. In addition, trucks transporting sediment and debris from the site shall travel to and from the site outside the AM and PM peak hours.

MM TRA-2 During construction activities in Areas 1 and 2, use of Bridge No. 1, Bridge No. 3, and the Gabrielino Trail/access road by hikers, bicyclists and equestrians shall be limited or prohibited when work on the temporary bridges and Gabrielino Trail/access road is ongoing. Flagpersons and/or other safety procedures shall be used as necessary to ensure the safety of recreational users.

MM TRA-3 Prior to the start of construction, the Construction Contractor shall provide written notice to the USFS and residences at the Ranger Station of the anticipated construction schedule, stating that access may be temporarily obstructed on an intermittent basis and providing a schedule of anticipated closures. In order to ensure that emergency vehicles would not be obstructed at any time, any temporary obstructions to the Gabrielino Trail/access road that could hinder emergency vehicular access shall be mobile and able to be removed from the roadway immediately upon notice from emergency responders.

Utilities and Service Systems

RR UTIL-1 The Contractor shall comply with the City's Construction and Demolition Waste Management Ordinance (Chapter 8.62 of the Pasadena Municipal Code), which requires preparation and implementation of a Waste Management Plan that shows how at least 50 percent of construction and demolition debris would be diverted away from landfills. The Waste Management Plan shall be subject to City approval prior to the start of construction activities, and the Contractor shall provide monthly reports to demonstrate compliance during the construction phase.

Cumulative Traffic

MM CUM-1 The Contractor for the Arroyo Seco Canyon Project shall coordinate with the Los Angeles County Department of Public Works and their contractor for the sediment removal activities at Devil's Gate Reservoir on the schedule of trucks coming to and from Scholl Canyon Landfill, such that the Project's truck traffic avoids the AM and PM peak hours to reduce conflict with local traffic and so that truck arrival times are staggered between the two projects to avoid queuing on Figueroa Street and on the State Route 134 on- and off-ramps.

SECTION 2.0 ENVIRONMENTAL SETTING

2.1 PROJECT LOCATION

The Project site is located within the Arroyo Seco Watershed, which is a subwatershed of the larger Los Angeles River Watershed. The Arroyo Seco is a perennial creek, which means there is generally flowing water year-round, but the flow is below the surface (underground) in some locations. Creek flows that originate in the San Gabriel Mountains continue to flow south through the cities of Pasadena, South Pasadena and Los Angeles, before joining the Los Angeles River just east of Elysian Park and west of the Interstate (I) 5/I-110 Interchange. Within the City of Pasadena, the Arroyo Seco passes through three distinct recreational areas: (1) Upper Arroyo Seco, containing Hahamongna Watershed Park and Devil's Gate Dam; (2) Central Arroyo Seco, containing the Brookside Golf Course and Rose Bowl; and (3) Lower Arroyo Seco, containing an archery range, casting pond, and Memorial Grove. The Project proposes new facilities and improvements in the Upper Arroyo Seco (in the City of Pasadena on land owned by the City) and sewer line connection to the JPL campus in the City of La Cañada Flintridge through the JPL Bridge. Exhibit 2-1, Regional Location and Local Vicinity Map, shows the location of the Arroyo Seco in the City of Pasadena.

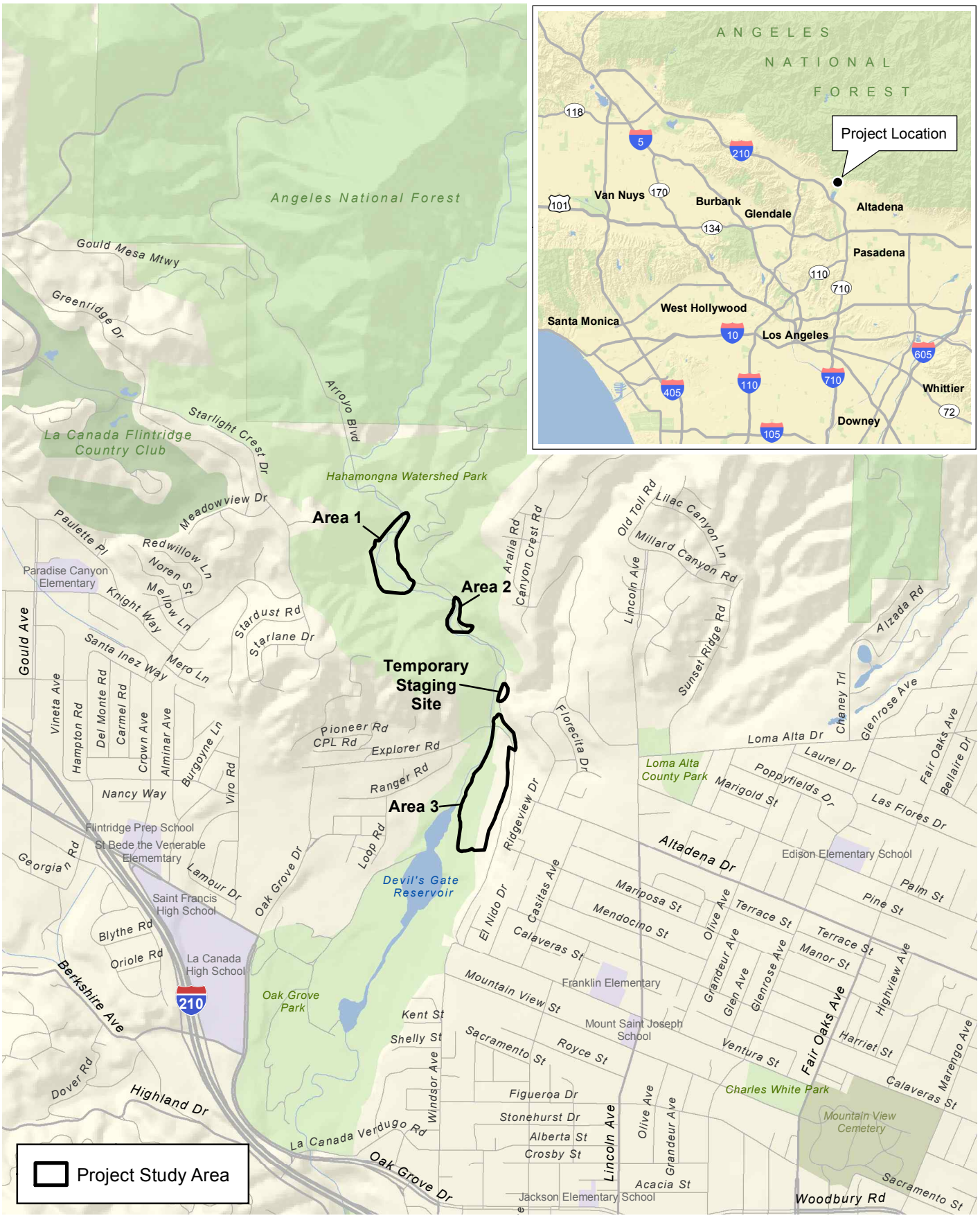
The Project site can be accessed via I-210 by exiting Windsor Avenue and traveling northward for approximately 0.8 mile to its intersection with Ventura Street. From this intersection, the JPL East Parking Lot is located approximately 0.27 mile north along Explorer Road, which can be accessed by walking, bicycling, driving, or by horse.

The Project site consists of three primary areas: Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, JPL East Parking Lot. These 3 areas are connected together by the Gabrielino Trail, which serves as a recreational trail and the access road for City of Pasadena and United States Forest Service (USFS) vehicles heading into the Arroyo Seco Canyon. The locations of the three areas where improvements are proposed are described below and shown on Exhibit 2-2, Project Location Areas 1, 2, and 3.

2.2 EXISTING CONDITIONS

The Arroyo Seco is an important source of water supply for the City of Pasadena. The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco and its tributaries into the City's spreading basins located along the east side of the Devil's Gate Reservoir, upstream of Devil's Gate Dam. An additional 7 cfs of surface water rights from Millard Creek (which is a tributary to the Arroyo Seco) are held by the Lincoln Avenue Water Company (LAWC). PWP and LAWC use the surface water to recharge the underlying Monk Hill Subbasin (a sub-aquifer of the Raymond Basin) for groundwater well extraction.

PWP currently operates several structures in the Arroyo Seco Canyon that capture and convey stream water to a series of groundwater recharge basins that are located adjacent to the National Aeronautics and Space Administration's (NASA's) JPL. These facilities include the Arroyo Seco Headworks structure and adjacent sedimentation basins, the Arroyo Seco Intake Dam, and the associated pipelines that convey water to the existing spreading basins. A large number of these facilities were entirely or severely damaged due to debris flows in 2010 subsequent to the 2009 Station Fire.



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Regional Location and Local Vicinity

Exhibit 2-1

Arroyo Seco Canyon Project

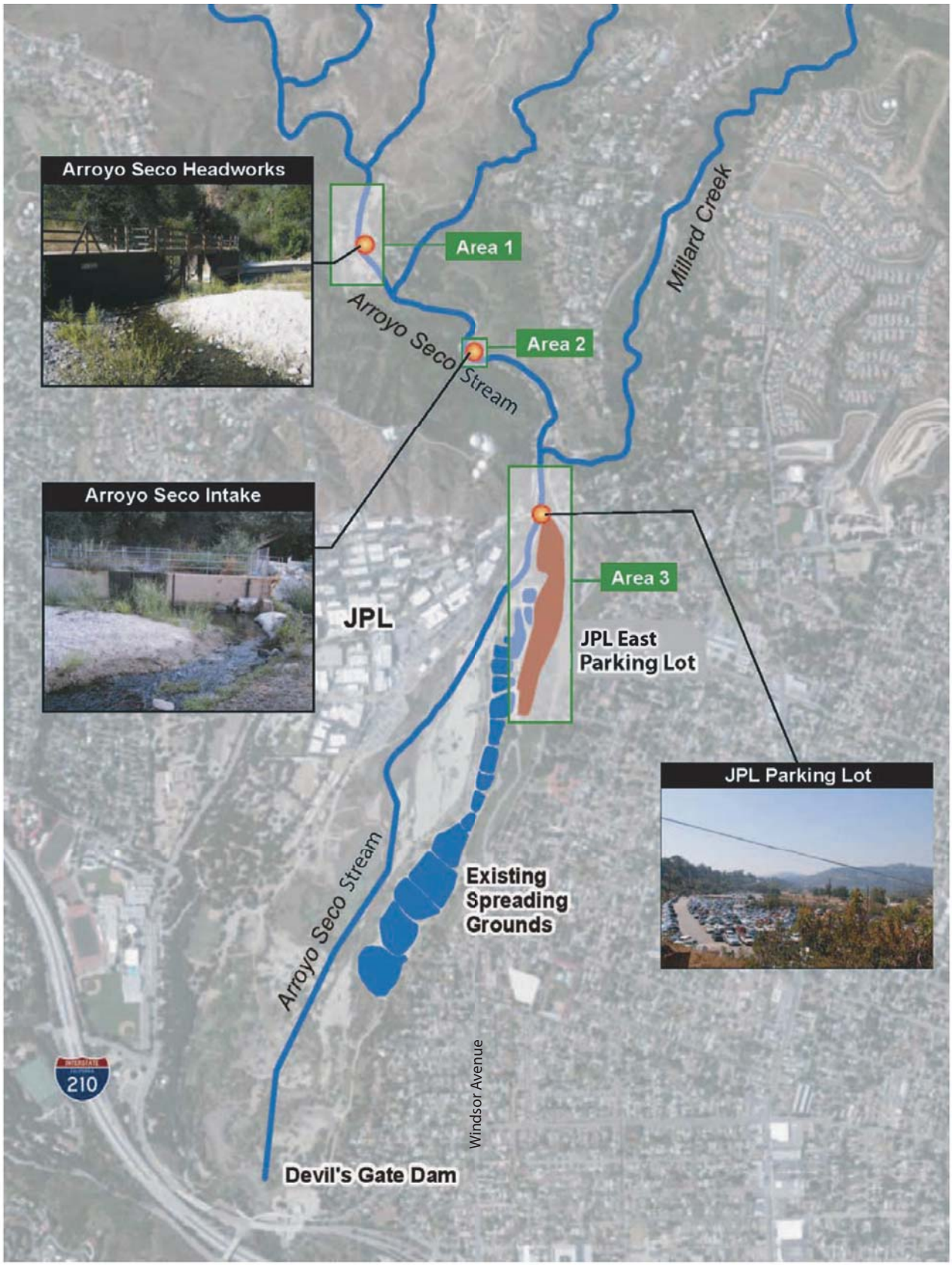
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Source: Carollo 2013

Project Location Areas 1, 2, and 3

Exhibit 2-2

Arroyo Seco Canyon Project

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Map not to scale

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2.2.1 HYDROLOGY AND DRAINAGE

Natural Drainage

The Arroyo Seco Watershed includes approximately 47 square miles of land and is generally divided by the Devil's Gate Dam into the upper and lower watersheds. The drainage area north of the Dam is approximately 32 square miles. Numerous tributary streams within the San Gabriel Mountains contribute flows to the Arroyo Seco, including Colby Canyon, Little Bear Canyon, Bear Canyon, Long Canyon, Dark Canyon, Brown Canyon, Pine Canyon, Falls Canyon, Fern Canyon, El Prieto Canyon, and Millard Canyon.

Water flow within the Arroyo Seco is perennial, but can be highly variable due to seasonal rains, with the majority of rain events occurring between November and April. During drought and/or dry summer months, the stream flows can drop below the surface in areas with deeper alluvial deposits, such as in Hahamongna Watershed Park (HWP). Between 1990 and 2011, flows in the Arroyo Seco varied significantly and ranged from 471 acre-feet in 2002 to 37,888 acre-feet in 2005. Based on the results of a hydrologic study of the entire Arroyo Seco Watershed conducted by the Los Angeles County Flood Control District (LACFCD), the 2-year, 5-year, 10-year, and 50-year peak storm flows at the existing diversion structure in Area 2 were estimated to be 2,200, 4,100, 5,500 and 8,400 cfs, respectively. The 100-year storm event is estimated to generate 10,010 cfs (Carollo 2013).

In addition to highly variable stream flows, the San Gabriel Mountains are very erodible and regularly deposit alluvium, including large boulders, eroded rocks, cobbles, gravels, and coarse to fine sandy soils, into the stream course. Large amounts of sediment are deposited into the Arroyo Seco following large storm events and particularly after wildfires. During large storm events, flows could have four times more sediment load than during average years. Large storm events with sediment-laden flows are historically allowed to bypass the City's flood control facilities and continue downstream into the Devil's Gate Reservoir. However, due to the 2009 Station Fire and destruction of vegetation in upstream watershed areas, a large number of these facilities were entirely or significantly damaged due to the subsequent sediment flows. Additionally, the streambed was altered and filled with debris (e.g., sediment, vegetative/woody materials, and rocks/cobbles) in many places.

Existing Drainage Facilities

The Project site can be divided into three primary areas: Area 1 - Arroyo Seco Headworks; Area 2 - Arroyo Seco Intake; and Area 3 - JPL East Parking Lot.

Area 1 – Arroyo Seco Headworks

Area 1 is the northernmost and farthest upstream area, and is located approximately 0.7 mile north and upstream of the JPL East Parking Lot. This area is primarily located in the low- to mid-level floodplain of the Arroyo Seco and features a bend in the stream course. It includes the existing Headworks structure across the stream; an approximate 1,000-foot portion of the Arroyo Seco streambed and associated sedimentation basins; naturally vegetated areas; and the Gabrielino Trail. A chain-link fence runs along the western edge of the trail from Area 1 to Area 2.

The Arroyo Seco Headworks structure was designed to divert flows into adjacent sedimentation basins to reduce the amount of suspended solids in the stream flow. The natural stream channel around the Headworks and sedimentation basins were substantially altered due to the debris flows following the 2009 Station Fire, thus rendering the facilities inoperable. The USFS Ranger Station, which includes three dwelling units providing housing for USFS Rangers, is located just

east of the Gabrielino Trail. An aerial photograph of Area 1 is depicted in Exhibit 2-3a, Area 1 – Arroyo Seco Headworks.

Area 2 – Arroyo Seco Intake

Area 2 is located approximately 0.3 mile downstream from the Arroyo Seco Headworks and 0.4 mile upstream from the JPL East Parking Lot. The primary structures in Area 2 include the diversion structure and intake structure, an equipment building, the Gabrielino Trail, and a historic bridge (Bridge No. 3) over the Arroyo Seco.

The diversion structure has historically diverted streamflows into the intake structure, which was designed to accommodate up to approximately 25 cfs of water. Upon entering the intake, the water is piped downstream approximately 3,000 feet to the PWP's spreading basins. The diversion structure consists of an approximate nine-foot high reinforced concrete retaining wall on the east bank of the stream. Near the downstream end of the retaining wall is a reinforced concrete weir that extends above the streambed roughly two feet, and generally does not support diversion of water at higher flows.[2] The diversion structure and intake structure were slightly damaged due to the debris flows following the 2009 Station Fire. Since then, the structures were repaired and placed back into service.

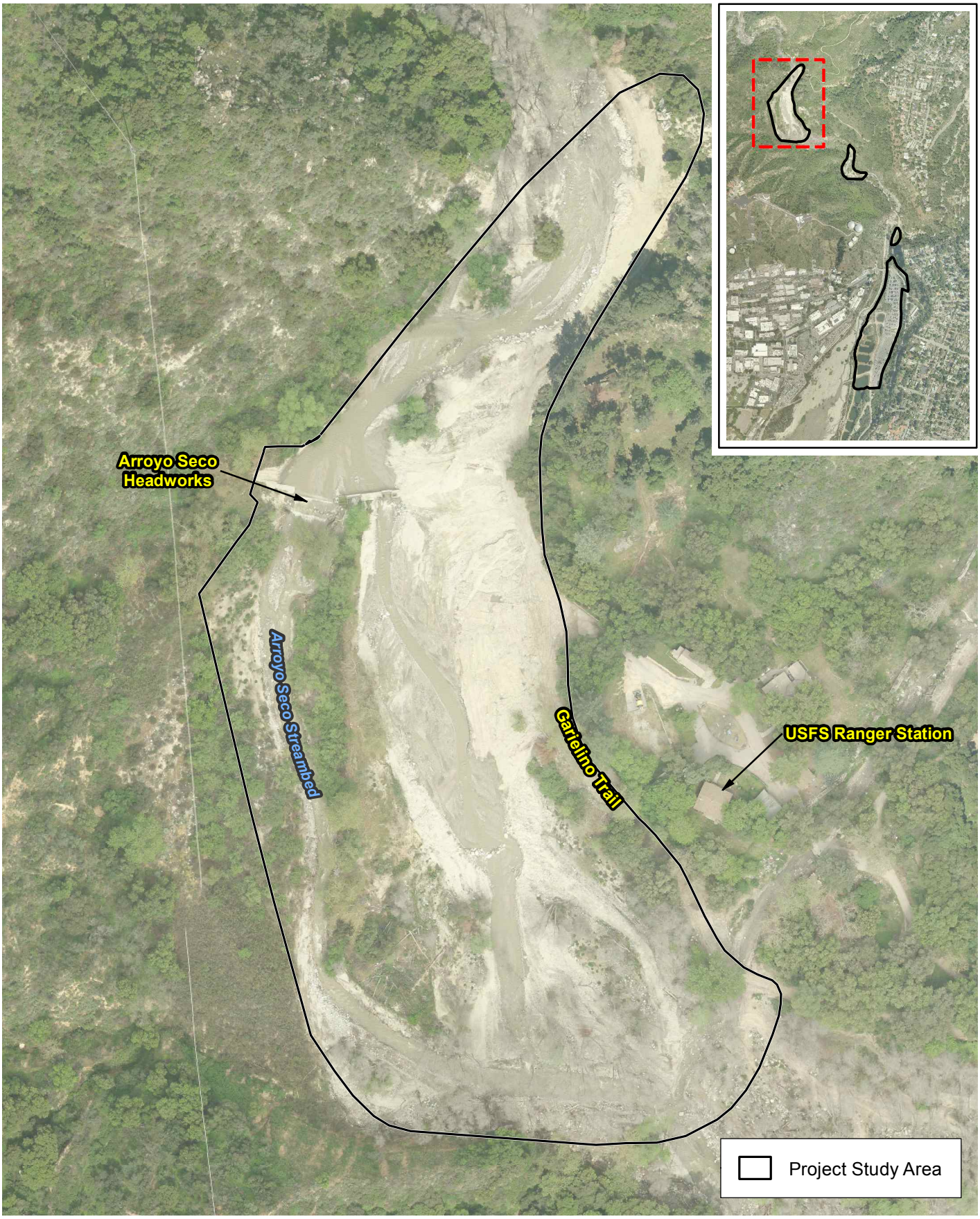
There is a small building pad north of the intake structure that previously supported an equipment building on the east side of the Gabrielino Trail/access road. There is another equipment building south of the intake structure and east of the Gabrielino Trail/access road. Approximately 150 feet of the Gabrielino Trail's protective embankment between the diversion structure and Bridge No. 3 has eroded, causing the edge of the paved road to break and fall apart. Currently, K-rails are used as a temporary means to prevent vehicle or foot traffic from approaching the drop-off adjacent to the trail. An aerial photograph of Area 2 is depicted in Exhibit 2-3b, Area 2 – Arroyo Seco Intake.

Millard Creek joins the Arroyo Seco approximately 0.25 mile south of the Arroyo Seco Intake and 0.15 mile north of the JPL East Parking Lot. There was an intake structure at this location that was completely damaged by floods after the 2009 Station Fire, but no new intake structure is proposed in this area. Bridge No. 1 spans Millard Creek and Bridge No. 2 crosses the Arroyo Seco just north of the Millard Creek confluence. South of this confluence and approximately 600 feet north of the JPL East Parking Lot is an area that may be used as a temporary staging site for construction activities. Construction materials, equipment, and vehicles may be temporarily located in this area during construction activities in Areas 1 and 2. An aerial photograph of this area is depicted in Exhibit 2-3c, Temporary Staging Area. All areas contained within the boundaries of the Study Area, as discussed in Section 4.4, Biological Resources, may also be used for construction staging activities.

Area 3 – JPL East Parking Lot

Area 3 includes the JPL East Parking Lot, adjacent City-owned spreading basins, and the access bridge that connects the Parking Lot to the NASA JPL Campus to the west. The Parking Lot is approximately 9.6 acres and contains 1,132 parking spaces that NASA JPL has leased from the City since 1960; these are restricted for use by NASA JPL employees and visitors. The Parking Lot is accessed from Explorer Road, which begins near the intersection of Windsor Avenue and Ventura Street, and travels through the Parking Lot northward to the access bridge. The Gabrielino Trail runs parallel to and east of the Parking Lot and also serves as a maintenance

[2] As stream flows increase during runoff events or seasonally higher water, the bed load is trapped on the upstream side of the weir, directing sediment into the intake. These sediments clog the intake and require maintenance that stops water diversion and groundwater recharge.



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Area 1 – Arroyo Seco Headworks

Exhibit 2-3a

Arroyo Seco Canyon Project

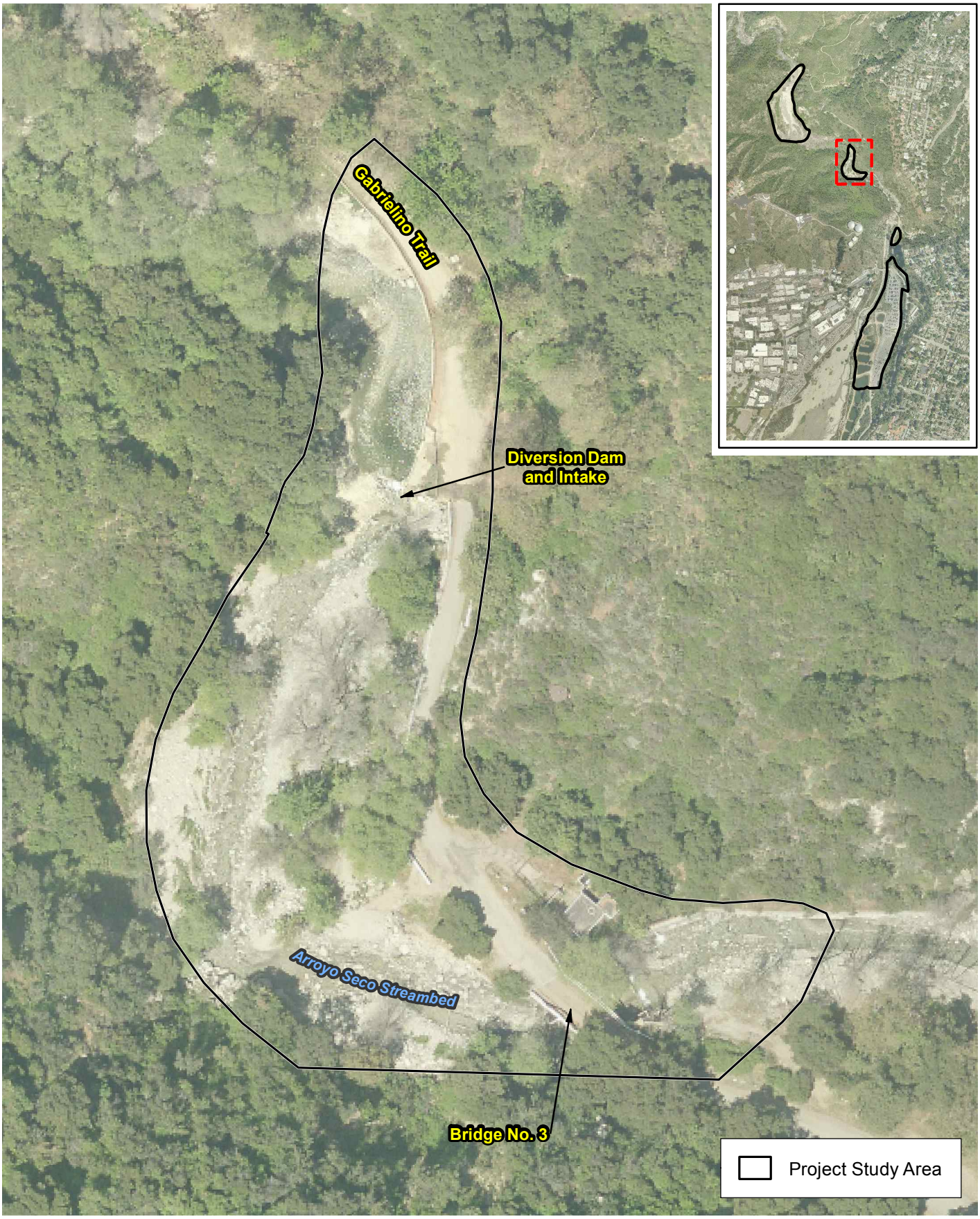
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Area 2 – Arroyo Seco Intake

Exhibit 2-3b

Arroyo Seco Canyon Project

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Temporary Staging Site

Exhibit 2-3c

Arroyo Seco Canyon Project

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access road (North Arroyo Boulevard) that leads into the Arroyo Seco Canyon area. Area 3 is located within the HWP boundaries.

A series of 15 spreading basins are located northeast of the Devil's Gate Reservoir; west of the JPL East Parking Lot; approximately 650 feet south of the JPL Bridge; and approximately 2,200 feet north of Devil's Gate Dam. Area 3 includes only the four upper spreading basins that are located west of the JPL East Parking Lot. A 12-inch diameter water line serves NASA JPL, a series of 30-inch-diameter hume line and a 16-inch-diameter ductile iron pipeline connect the Intake to the spreading basins, and two 24-inch-diameter pipelines and an 8-inch-diameter sludge line from the Behner Water Treatment Plant cross the parking lot to the spreading basins. Additionally, the Altadena Drain, a storm drain line from the Altadena area, crosses Area 3 to the Arroyo Seco within a Los Angeles County storm drain easement. An aerial photograph of Area 3 is depicted in Exhibit 2-3d, Area 3 – JPL East Parking Lot.

2.2.2 BIOLOGICAL RESOURCES

The Arroyo Seco Canyon has a north-south alignment with steep east- and west-facing slopes. Chaparral and coastal sage scrub/sumac scrub are the dominant vegetation types on these steep slopes, although there are pockets of coast-live oak woodlands on the east-facing slopes. A perennial stream with a pool and riffles meanders through the canyon bottom and supports a dense riparian woodland before exiting the canyon and crossing alluvial flats towards the Devil's Gate Dam.

Vegetation types within the Project site disturbance limits include California buckwheat scrub, California buckwheat scrub/annual brome grasslands, California buckwheat scrub/laurel sumac scrub, coast-live oak woodland, California sagebrush scrub/laurel sumac scrub, California sagebrush scrub/California buckwheat scrub, disturbed, disturbed/annual brome grasslands, mule fat thickets, annual brome grasslands, coast live oak/California sycamore woodland, poison oak scrub, riparian herb, riparian herb/unvegetated wash, scrub oak chaparral, arroyo willow thickets, laurel sumac scrub, California sycamore woodland, white alder grove/California sycamore woodland, and arroyo willow thickets/mule fat thickets.

Area 1 is dominated by arroyo willow thicket and white alder grove/California sycamore woodlands; Area 2 is dominated by white alder grove/California sycamore woodland; Area 3 is dominated by developed and disturbed/annual brome grasslands; and the temporary staging site is dominated by California sagebrush scrub/California buckwheat scrub. The vegetation primarily consists of native trees and plants, although minimal amounts of non-native vegetation such as giant reed (*Arundo donax*) and tree tobacco (*Nicotiana glauca*) were observed in the disturbed portions of Area 1.

The native vegetation and the presence of naturally occurring pooled and running water gives the site potential to support many wildlife species. Amphibians observed or expected to occur on the Project site include the coast range newt (*Taricha torosa torosa*), California chorus frog (*Pseudacris cadaverina*), Pacific chorus frog (*Pseudacris regilla*), and western toad (*Anaxyrus boreas*). Reptiles observed or expected to occur on the Project site include western fence lizard (*Sceloporus occidentalis*), western whiptail (*Cnemidophorus tigris*), side-blotched lizard (*Uta stansburiana*), gopher snake (*Pituophis catenifer*), and western rattlesnake (*Crotalus oreganus*). The Project site is also expected to draw a multitude of bird species (residents and migrants). Bird species that were observed or expected to occur on the site include residents such as the California quail (*Callipepla californica*), western screech-owl (*Megascops kennicottii*), great horned owl (*Bubo virginianus*), Anna's hummingbird (*Calypte anna*), acorn woodpecker (*Melanerpes formicivorus*), western scrub-jay (*Aphelocoma californica*), oak titmouse (*Baeolophus inornatus*), bushtit (*Psaltriparus minimus*), house wren (*Troglodytes aedon*),



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Area 3 – JPL East Parking Lot

Exhibit 2-3d

Arroyo Seco Canyon Project

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California towhee (*Melozone crissalis*), lesser goldfinch (*Spinus psaltria*), and migrants such as black-chinned hummingbird (*Archilochus alexandri*), western wood-pewee (*Contopus sordidulus*), Pacific-slope flycatcher (*Empidonax difficilis*), cliff swallow (*Petrochelidon pyrrhonota*), black-throated gray warbler (*Setophaga nigrescens*), Wilson's warbler (*Cardellina pusilla*), white-crowned sparrow (*Zonotrichia leucophyrys*), and Bullock's oriole (*Icterus bullockii*).

In addition, the Project site is expected to have a high abundance of small and large mammals. Mammals observed or expected to occur on the Project site include large mammals such as the mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), mountain lion (*Puma concolor*), American black bear (*Ursus americanus*), bobcat (*Lynx rufus*), and small mesopredators such as striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and small herbivores like the desert cottontail (*Sylvilagus audubonii*), California ground squirrel (*Otospermophilus beecheyi*), and Botta's pocket gopher (*Thomomys bottae*). A variety of bats are also expected to occur, including the California bat (*Myotix californicus*), hoary bat (*Lasiurus cinereus*), big brown bat (*Eptesicus fuscus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*). A comprehensive list of observed plant and animal species is provided in Attachment B of Appendix B.

2.2.3 LAND USE

On-Site and Surrounding Land Uses

Areas 1 and 2 are located within an open space area that is accessible to the general public, including hikers, bicyclists, and equestrians, via the Gabrielino Trail. There are no occupied land uses in these areas. Areas 1 and 2 are surrounded by open space associated with the Angeles National Forest (ANF). There are no residences or other permanent land uses in the vicinity, other than the residences associated with the USFS Ranger Station adjacent to Area 1.

Area 3 contains the existing spreading basins and the JPL East Parking Lot. The City owns the JPL East Parking Lot, but leases the lot to NASA JPL. The parking lot is currently restricted for use by NASA JPL employees and visitors, with a shuttle carrying employees and visitors across the access bridge to the NASA JPL campus and back. Area 3 is surrounded by single-family residential neighborhoods to the east, including several schools located primarily within the unincorporated Altadena area, although some residential areas are located within City of Pasadena boundaries. All residential properties to the west of the Project site are located within the City of La Cañada Flintridge, including the NASA JPL. Property to the southwest includes portions of Hahamongna Watershed Park (formerly Oak Grove Park), which spans both sides of the Hahamongna Basin within the City of Pasadena, followed by residential land uses within the City of La Cañada Flintridge on the opposite (west) site of the Hahamongna Basin.

Applicable Land Use Plans

City of Pasadena General Plan and Zoning Code

As previously discussed, all Project components are located entirely within the City of Pasadena. The Upper Arroyo Seco is designated and zoned as Open Space and a portion of Area 3 is zoned Planned Development – 16 in the City of Pasadena's Land Use Plan and Zoning Map (Pasadena 2009, 2012b). Although the Arroyo Seco originates in the ANF and although Area 1 is located within the mapped boundary of the ANF, the portions of the Project site within the ANF boundary are designated in the USFS Land Management Plan as Non-Forest System Land and are not subject to the jurisdiction of the USFS (USFS 2005a).

Hahamongna Watershed Park Master Plan

The Arroyo Seco Master Plan is a master planning document that consists of four elements: (1) Hahamongna Watershed Park Master Plan, (2) Central Arroyo Seco Master Plan, (3) Lower Arroyo Seco Master Plan, and (4) Design Guidelines for the Arroyo Seco. The *Hahamongna Watershed Park Master Plan* (HWMP) and the *Arroyo Seco Design Guidelines* are applicable documents that address certain components of the proposed Project.

The HWMP sets forth objectives for the future use and development of HWP, which includes approximately 1,300 acres of open space that extends up the Arroyo Seco Canyon from the Devil's Gate Dam. The lower watershed, the 330 acres roughly defined as the floodplain and basin behind the Dam, is the focus of the HWMP. The HWMP establishes a framework for flood management, water conservation, habitat restoration, recreation, and cultural resources protection in this area. A conceptual approval of the HWMP was given by the City in 1999, with the HWMP adopted in 2003 and an amendment approved in 2010.

Only Area 3 of the Project site is within the HWMP's HWP study area. The projects specified in the HWMP include the conversion of the JPL East Parking Lot to a small public parking area at the north end and the expansion of the existing spreading grounds through the creation of new spreading basins on the central and southern portions of the parking lot. The HWMP also calls for a new restroom at the northern end of Area 3; a sunset overlook south of Area 3; a bridge crossing for the North Perimeter Trail from an existing trail across Area 3; storm drain improvements; and habitat restoration around the spreading basins. A number of other improvements are planned in the HWMP for areas outside Area 3 and on the west side of the Arroyo Seco.

Arroyo Seco Design Guidelines

The Arroyo Seco Design Guidelines document comprises one of the four elements of the Arroyo Seco Master Plan and includes design criteria and guidelines for improvements in the Arroyo Seco. The guidelines address the following components:

- Habitat Restoration and Land Improvements
- Architecture
- Cultural Resource Preservation
- Recreation
- Signage
- Walls, Fences, and Gates
- Walkways, Paths, and Trails
- Parking and Traffic Control
- Public Art
- Site Furnishings

The proposed improvements in Area 3 would be subject to these design guidelines. For consistency, improvements subject to public use (e.g., rock walls, benches, signs, picnic tables) in Areas 1 and 2 will be designed according to these guidelines.

2.3 PROJECT BACKGROUND AND PURPOSE

The purpose of the proposed Project is to take a multi-benefit approach to repair/replace facilities that were damaged or destroyed by Station Fire-related events; to increase the existing utilization of surface water rights held by the City; improve water quality in the canyon; improve biological habitats; restore hydrological function and fish passage; and improve ecosystem health through the following enhancements:

- Remove exposed portions of existing infrastructure designed for sediment removal (Area 1)
- Naturalize the Arroyo Seco streambed (Area 1)
- Restore and improve the intake facilities (Area 2)
- Expand recharge operations by creating additional spreading basins (Area 3)
- Reduced barriers to fish passage
- Enhance recreational facilities
- Improve water quality through the proposed restroom
- Improve stormwater quality through a smaller decomposed granite parking lot

2.3.1 2009 STATION FIRE

The Station Fire burned a total of 161,189 acres (or nearly 252 square miles) of the Angeles National Forest in 2009. The fire burned vegetation and soils on steep side slopes within the Los Angeles River, San Gabriel River, Mojave River, and Santa Clara River Watersheds. This led to substantial erosion, debris flows, and flooding during subsequent winter storm seasons and summer storm events. PWP facilities in and near the Arroyo Seco have been significantly damaged, and the streambed has been altered by accumulated sediment due to the major debris flows following the Station Fire. It is estimated that over 1 million cubic yards of sediment accumulated behind the Devil's Gate Dam during the storms, which passed through the PWP's Headworks and diversion structures.

As a result of the damage generated by the sediment-laden flows following the Station Fire, the Project involves enhancing the existing diversion and intake structures in Area 2 to improve sediment removal and eliminate the need for the Headworks facility in Area 1 and naturalize the Arroyo Seco streambed through restoration activities in Area 1.

2.3.2 SURFACE WATER DIVERSION AND INFILTRATION

The spreading basins in Area 3 cover approximately 13 acres and can hold approximately 39 acre-feet of water, which is nearly equal to the existing average annual daily recharge volume of 35.75 acre-feet (af) per day. The average percolation rate of the basins is estimated to be 18 cfs after the basins have filled with water and allowed time for the ground to become saturated. Historically, approximately 2,300 af of water were recharged annually prior to the 2009 Station Fire. The City receives groundwater pumping credit equal to approximately 60 percent of the amount of water recharged into the groundwater basin.

An analysis conducted by Carollo Engineers in 2013 examined 23 years' worth of rainfall and recharge data and determined that, on average, PWP is regularly forfeiting a portion of its surface water rights due to a combination of high concentration of sediment deposits following initial storm events and spreading capacity constraints. Based on the analysis of flows during the 3 wettest

years between 1990 to 2012 (which were 1998, 2005, and 2011), it was determined that approximately 25 af of additional spreading basin capacity would be needed to capture all forfeited flows and that the additional basin capacity would have been utilized about 40 days per year during these 3 wettest years (Carollo 2013). Activities proposed within Area 3, including the reconfiguration and expansion of the existing spreading basins, would reduce the forfeiture of surface water.

2.4 CEQA REVIEW PROCESS

This IS/MND has been prepared to analyze the impacts associated with (1) the proposed habitat restoration, (2) reconstruction, and expansion of facilities for water conservation and (3) the recreational amenities at three separate areas along the Upper Arroyo Seco. Review of previous related environmental documentation was made to determine whether the proposed improvements have been addressed in previous documents and if there is a need or ability to tier off these documents.

The review indicated that the Master Environmental Impact Report (Master EIR) for the Arroyo Seco Master Plan analyzed the impacts of proposed improvements in Area 3, but the impacts of improvements proposed in Areas 1 and 2 have not been analyzed in any environmental document. As such, this IS/MND analyzes the impacts of the Project in all three areas, and compares the impacts in Area 3 with those in the Master EIR. Applicable mitigation measures from the Master EIR are then incorporated into this IS/MND. As necessary, such measures are updated and/or supplemented with additional mitigation to specifically address Project-related impacts.

The City of Pasadena is serving as the Lead Agency for the CEQA environmental review process and has submitted this IS/MND to responsible and trustee agencies and other potentially affected agencies and adjacent property owners. A Notice of Intent to Adopt an MND was also sent to the State Clearinghouse and the Los Angeles County Registrar-Recorder/County Clerk. The IS/MND and associated technical reports can be viewed online at the City's website at http://www.cityofpasadena.net/Planning/Environmental_Notices/ and the Arroyo Seco Foundation website at http://www.arroyoseco.org/ascp/ismnd/htm. Notices were also posted at the site and in the surrounding neighborhood.

In accordance with Section 15073 of the State CEQA Guidelines, a Negative Declaration or Mitigated Negative Declaration must be subject to a 30-day public review period when submitted to the State Clearinghouse for review by State agencies. The public review period for this IS/MND has been set from October 9, 2014 to November 8, 2014.

In reviewing the IS/MND, the reviewer should focus on the sufficiency of the document in identifying and analyzing the potential impacts on the environment and ways in which the Project's potentially significant effects are avoided or mitigated. Comments should be sent in writing and postmarked by November 8, 2014, by mail, email or fax to Mr. Jose Jimenez of the City of Pasadena at the address below.

Jose Daniel Jimenez
City of Pasadena
Planning and Community Development
175 North Garfield Avenue
Pasadena California 91101-1704
phone: (626) 744-7137
fax: (626) 396-8998
email: josejimenez@cityofpasadena.net

In accordance with Section 15074 of the State CEQA Guidelines, prior to approving the Project, the Hearing Officer will consider the IS/MND together with any comments received during the public review process. The City will adopt the IS/MND only if it finds that that there is no substantial evidence in the record that the Project will have a significant adverse effect on the environment and that the IS/MND reflects the independent judgment and analysis of the City. A Notice of Determination will be filed with the County Clerk and the State Clearinghouse after adoption of the MND.

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SECTION 3.0 PROJECT DESCRIPTION

The proposed Project involves minimizing the overall area for surface water diversion, spreading, and sedimentation management and locating it closer to the base of the Arroyo Seco Canyon. This would simplify sediment management and maintenance activities that are currently constrained by difficult access into the canyon. Instead of reconstructing the damaged Headworks structure in the Arroyo Seco stream, the Project would replace the diversion and intake structures in the Arroyo Seco Canyon to allow for capture of up to 25 cfs into the spreading basins and the bypass of debris and sediment during high flows. The facilities and improvements that would be constructed as part of the Arroyo Seco Canyon Project would be located at three areas along the Arroyo Seco: Area 1 – Arroyo Seco Headworks; Area 2 – Arroyo Seco Intake; and Area 3 – JPL East Parking Lot (refer to Exhibit 2-2).

3.1 PROJECT COMPONENTS

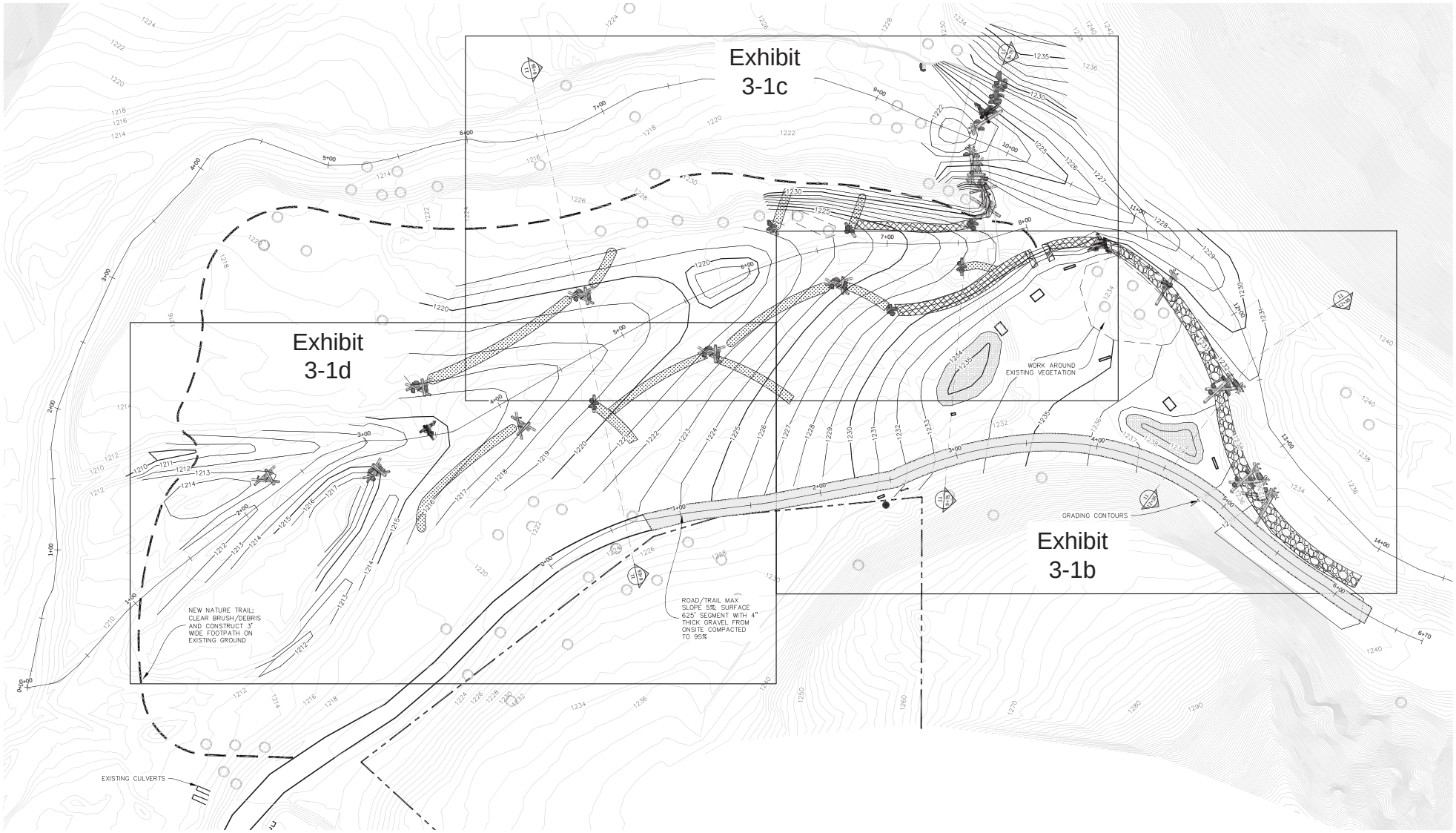
3.1.1 AREA 1 – ARROYO SECO HEADWORKS

The exposed portions of the Headworks structure will be removed, and improvements in Area 1 will focus on rehabilitating an approximate 6-acre area of the Arroyo Seco floodplain that was significantly impacted by flooding in 2010. The conceptual design for Area 1 is provided in Exhibit 3-1a, Area 1 Conceptual Design, which depicts the entire Area 1 plan, and provides a legend for the more detailed views of the plans that follow, depicted as Exhibits 3-1b, 3-1c, and 3-1d. Stream restoration would involve native plant revegetation and invasive species removal on approximately 1,000 feet of the stream. In addition, the Project includes construction of a rock bank revetment; bank stabilization; creation of planting islands; and installation of woody debris clusters.

Exhibit 3-1b, Area 1 Conceptual Design, depicts the proposed improvements to the most upstream portion of Area 1, including the planted boulder revetment, which would assist in directing creek flows around the proposed picnic area (located outside the five-year floodplain), large wood structures, and boulders. These improvements would facilitate natural sedimentation and would provide opportunities for natural revegetation. In addition, benches, picnic tables, and steps that descend over the bio-block revetment (to allow access from the nature trail to the picnic area), willow baffles, and an equestrian water trough and post are proposed in this area.

The large wood structures would be made of raw logs available from nearby lumber mills or down trees that are not rotten. The logs would be anchored and bolted together into woody debris clusters. These clusters would be positioned to collect debris at the edge of the stream below the two-year water surface elevation. At points of high velocities and shear forces, these clusters would be kept in place with boulders. The proposed picnic tables and benches would be made of heavy duty wood with weatherproofing and would be bolted to buried concrete blocks. Trash cans would have bear-proof lids. Signage would be made of wood or boulders, or other materials including metal and plastic. A signage plate would be placed near the picnic area that describes the dynamic conditions of the Upper Arroyo and river restoration components. Signage would also be located along the nature trail, which would meander and cross the streambed, to describe the native animals, aquatic life, and plants.

Exhibit 3-1c, Area 1 Conceptual Design, depicts the portion of Area 1 that contains the main creek channel, including the locations of the large wood structures and boulders, the bio-block revetment, and the nature trail alignment. This new trail is proposed across the Arroyo Seco from the lower portion of Area 1 and would meander between the Arroyo Seco main channel and the re-created riparian zone and would cross the stream at the northern section, with steps leading



Source: Carollo 2014

Area 1 Conceptual Design

Exhibit 3-1a

Arroyo Seco Canyon Project

BonTerra PSOMAS

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Source: Carollo 2014

Area 1 Conceptual Design

Exhibit 3-1b

Arroyo Seco Canyon Project

BonTerra PSOMAS

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Source: Carollo 2014

Area 1 Conceptual Design

Exhibit 3-1c

Arroyo Seco Canyon Project

BonTerra PSOMAS

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to the rest area/picnic area. It would be approximately three feet wide and would consist of the existing ground cleared of brush and debris. Exhibit 3-1d, Area 1 Conceptual Design, depicts the downstream portion of Area 1, including the locations of the willow baffles and wood structures and boulders. Additionally, a number of interpretive signage on the local watershed and native species would be installed, and a portion of the existing chain-link fence on the west side of the Gabrielino Trail/access road of Area 1 would be removed, and the trail/road would be leveled.

The preliminary planting palette includes four main restoration areas, including Riparian Floodplain, Natural Uplands, Irrigated Picnic Area, and Willow Baffles. The restoration planting palette would involve a mix of seeds and container species. The proposed planting layout for Area 1 shows that riparian tree species would be distributed along a moisture gradient. Trees such as willow and white alder would be planted near or at the water's edge. Other tree species, like California sycamore or coast live oak, would be planted where the soil is drier and the water table is at greater depths. Other common native riparian tree species that are native to the upper Arroyo Seco area would be planted in the understory of Area 1. A meandering nature trail would be developed in this restoration area and would cross the streambed.

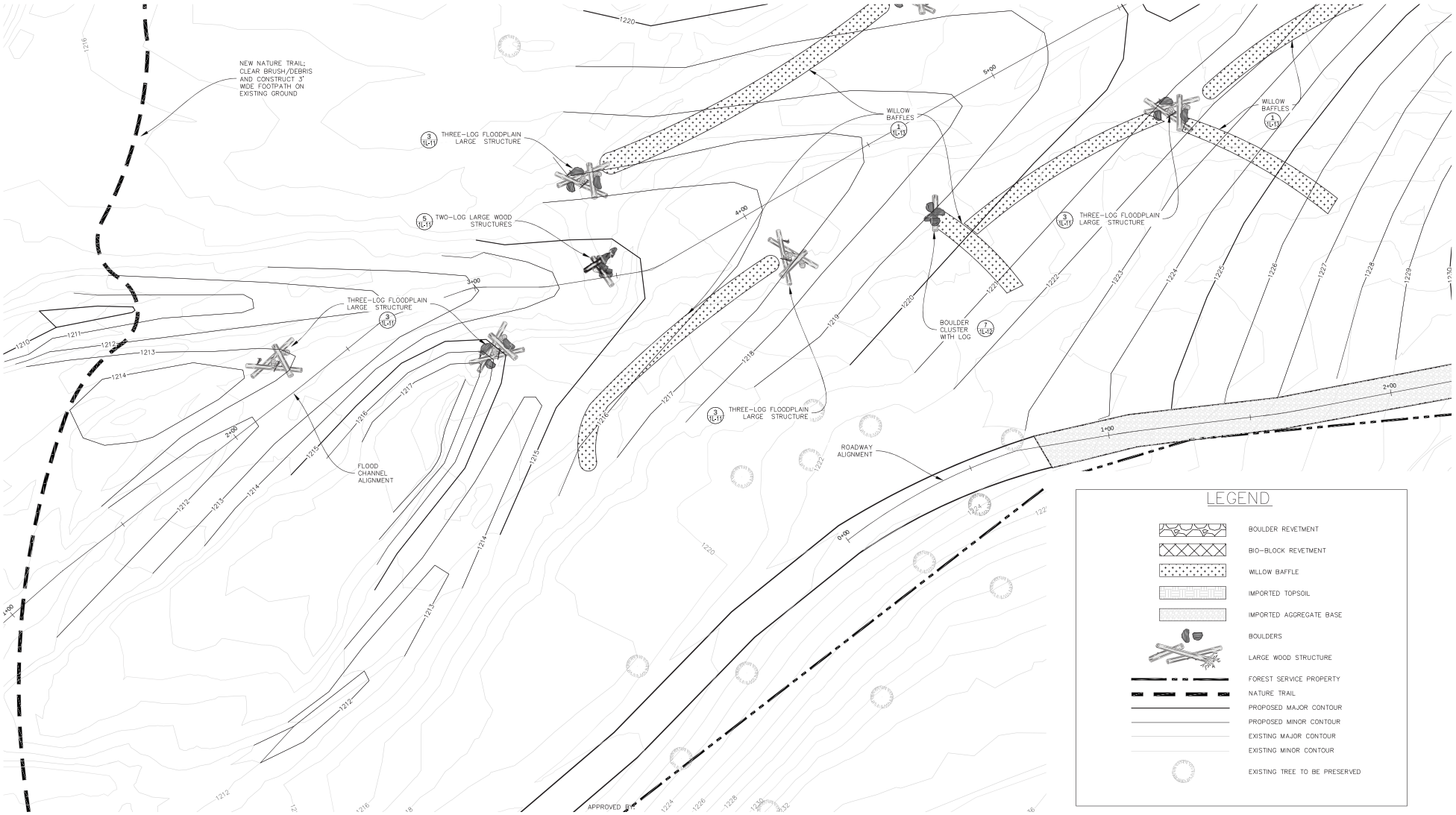
Trees to be planted in Area 1 would include coast live oak, California sycamore, Fremont cottonwood, California bay laurel, or other suitable native trees, with an associated irrigation system to support the tree establishment. Riparian planting in the rest area/picnic area would be temporarily irrigated. Water line connections would be made from the adjacent USFS Ranger Station to the proposed rest area/picnic area for the existing water fountain, restoration vegetation establishment, and the horse water trough.

3.1.2 AREA 2 – ARROYO SECO INTAKE

Exhibit 3-2a, Area 2 – Preliminary Site Plan, depicts the proposed improvements in Area 2, which include the replacement of the diversion weir and intake structures and reconstruction of the access road. The access road south of the intake structure in Area 2 would be stabilized through the reconstruction of the slope and the provision of protective riprap. The road would be repaved with asphalt and the existing river rock wall would be extended north towards the diversion structure. The use of arroyo stone for the rock wall along the access road is consistent with the style found throughout the Arroyo Seco and is an essential characteristic of Arroyo culture. A cross-section of the proposed road reconstruction is included in Exhibit 3-2a.

The existing diversion structure would be replaced with either a pneumatically operated spillway gate, as depicted in Exhibit 3-2b, or a motorized crest gate, as depicted in Exhibit 3-2c. Either option would allow an increase in the amount of water that could be diverted to the spreading basins in Area 3 and to better manage sediment buildup behind the diversion structure. The gate/weir would have a sluice or slide gate (with an electric or a hydraulic actuator); a 35-foot-wide and 10-foot-long diversion sill, a trash rack, and a fine screen. The new gate/weir could be effectively removed from the flow path during large storm events to minimize the amount of sediment that builds up at the diversion structure. At other times, the weir/gate would be raised to allow stream flow to be diverted through the intake structure into the spreading basins. A small educational signage plate would be located adjacent to the intake structure describing the storm water diversion operation, the fish screen, and its beneficial impact on aquatic life.

An equipment building located north of the intake structure was damaged by the 2010 winter storms and will be replaced. The proposed control equipment enclosure would be approximately 6 feet by 10 feet and would house the controls for the diversion structure. Electric power for the diversion structure and control equipment enclosure would be supplied by an existing power line at the travelling screen building (southeast of the intake structure).



Source: Carollo 2014

Area 1 Conceptual Design

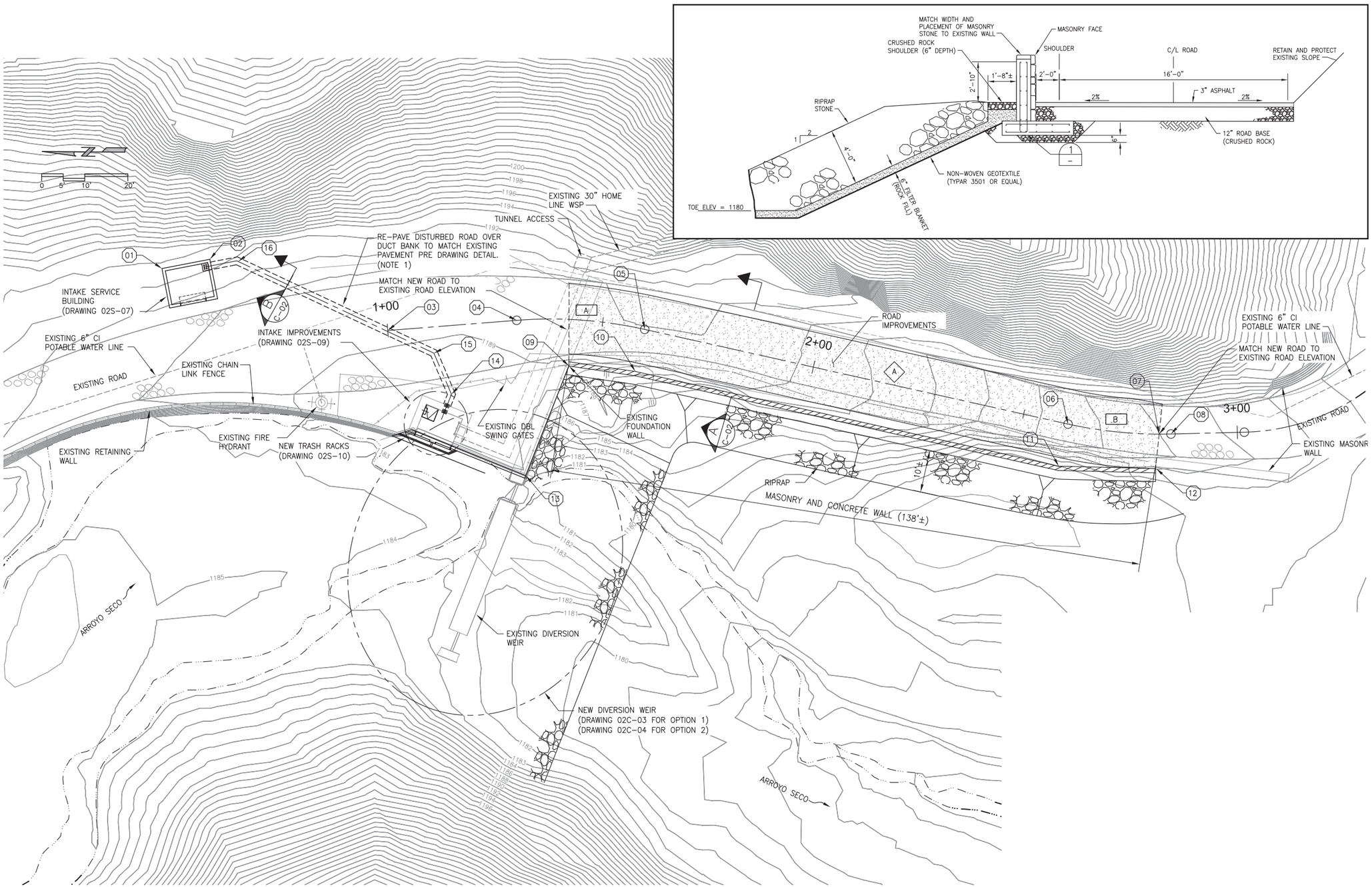
Exhibit 3-1d

Arroyo Seco Canyon Project

BonTerra PSOMAS

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Source: Carollo 2014

Area 2 – Preliminary Site Plan

Exhibit 3-2a

Arroyo Seco Canyon Project

Map not to scale

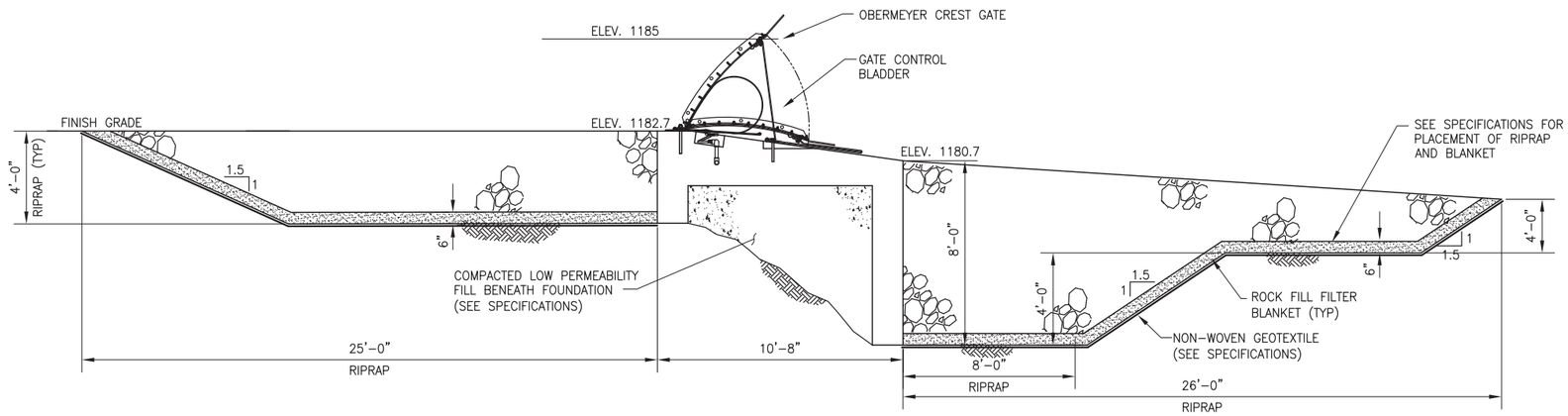
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PLAN



Source: Carollo 2014

Area 2 - Option 1: Pneumatic Spillway Gate

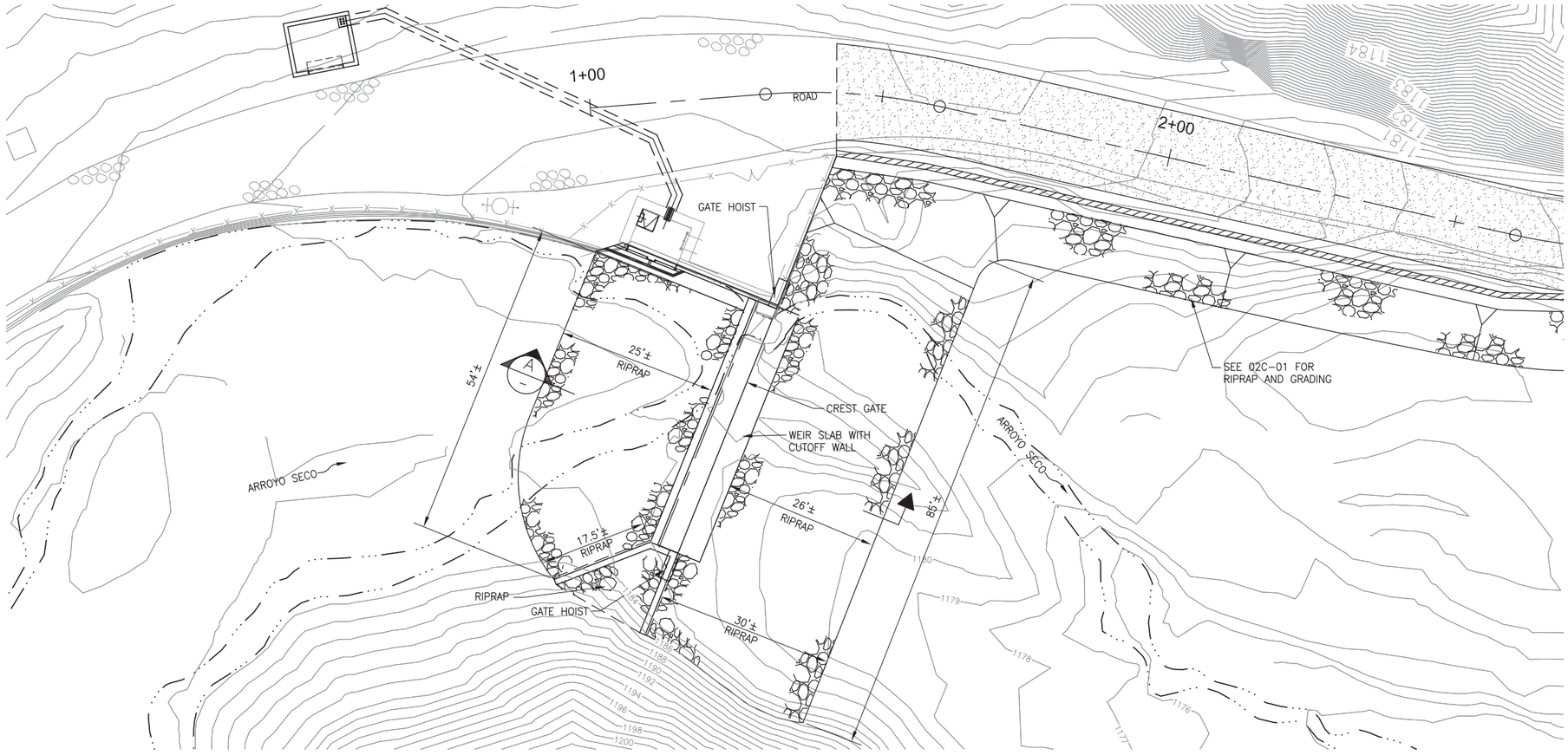
Exhibit 3-2b

Arroyo Seco Canyon Project

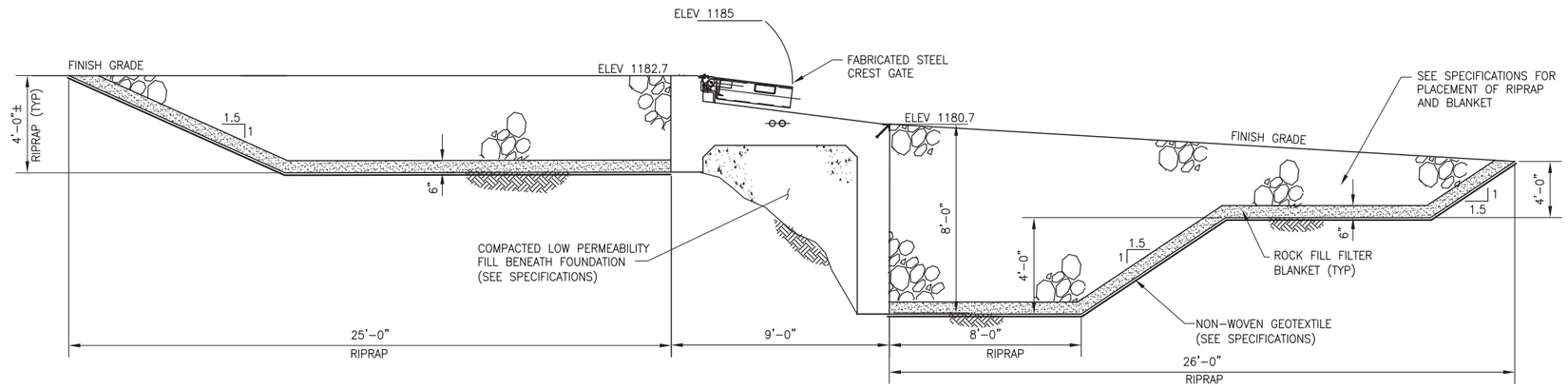
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PLAN



Source: Carollo 2014

Area 2- Option 2: Motorized Steel Crest Gate

Exhibit 3-2c

Arroyo Seco Canyon Project

BonTerra PSOMAS

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3.1.3 AREA 3 – JPL EAST PARKING LOT

Improvements proposed in Area 3 include a public recreational parking lot with up to 100 parking stalls paved with decomposed granite or other pervious materials; enlarging existing spreading basins; new sedimentation basins; an access road; a potential future pedestrian pathway; an existing trail/equestrian pathway; interpretative signage; a pet waste disposal station; a guard station near the JPL Bridge access point; and a public restroom that is compliant with the Americans with Disabilities Act (ADA). The restroom would include a trash receptacle and a recycling bin.

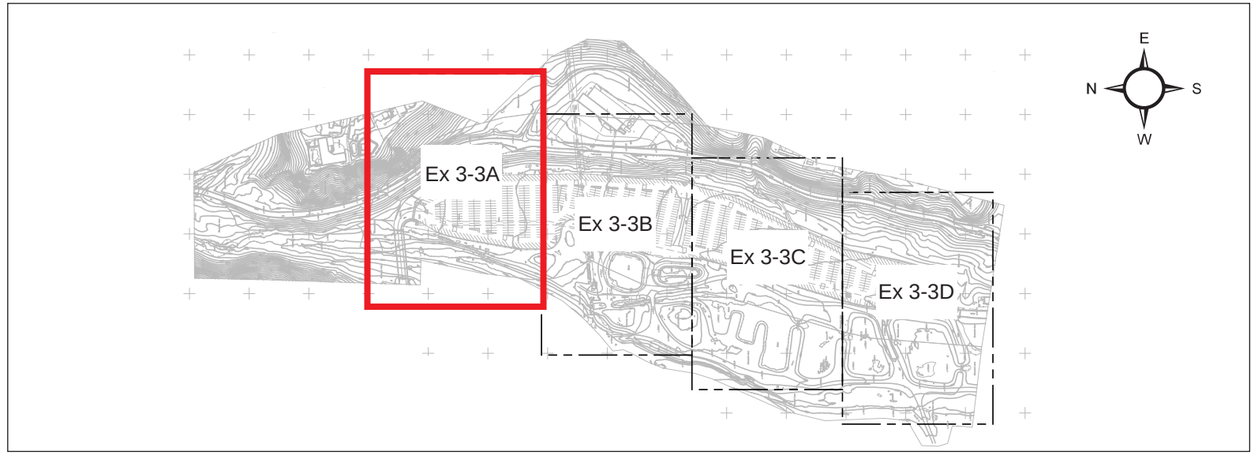
Exhibit 3-3a, Parking Lot, Restroom and Piping Plan, depicts the proposed parking in Area 3, which would be consolidated at the north end (1.25 acres) of the existing parking lot area and a 2-lane, 24-foot wide paved access road along the eastern edge of Area 3. The road would include a two-foot curb and gutter along the eastern edge, and a five-foot "pull over" area along the western edge of the road. At the northernmost end of this road is the proposed guard station that would monitor access to the NASA-JPL property to the west, including a proposed roundabout that would allow vehicles to turn around without needing to cross the existing JPL Bridge. The piping plan depicts the 30-inch-diameter inlet line that transports creek flows into the spreading basins, as well as to the downstream basin inlets.

Native shade trees (e.g., California sycamore or similar species) would be provided along with native shrubs and grasses in parking islands of the parking lot and an irrigation system would be installed. The public restroom and a pet waste disposal station would be constructed at the north end of the new parking lot. The restroom would have two gender-neutral stalls, fire-retardant shingles, door locks, dead bolts, and a storage room. A sewer lift station on a concrete pad would be located directly adjacent to the restroom building. A potential future pedestrian pathway/trail could be constructed from the north end of the parking lot to connect to the existing Gabrielino Trail/access road to the northeast. In addition, a signage kiosk would be located at the top of the existing Gabrielino Trail/access road overlooking the spreading basins and would describe the spreading basin operations and inform visitors of the benefits of local water supplies and groundwater recharge. A security fence would be installed on both sides of the bridge and the proposed roundabout.

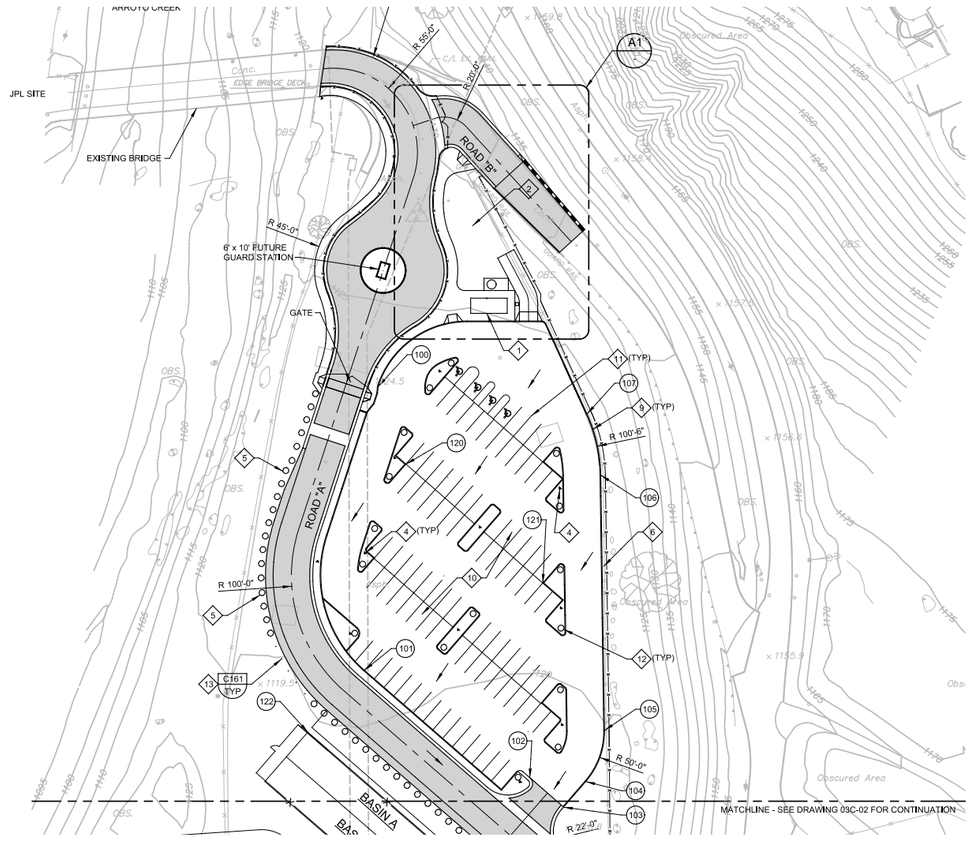
Two sedimentation basins would be constructed to serve both the existing and enlarged spreading basins. The proposed sedimentation basins in Area 3 would each be rectangular, basins that are approximately 160 feet long by 20 feet wide by 10 feet deep. The proposed spreading basins would generally have an operating water depth of 1 foot and freeboard of 2 feet with basin wall slopes of 3:1, which will provide an additional 25 af capacity of spreading volume. A 15-foot-wide dirt access road would be provided around each basin that is expanded or built. With the area's sloping terrain, maximum depths of the basins would range from 5.5 feet to 6.5 feet. To maximize the effective recharge area for the spreading basins, three existing basins would be combined with the new basins, which are proposed immediately to the east of the existing basins, except for the proposed Basin J. Spillways, pipelines, culverts, and valves would be provided to connect the basins to each other.

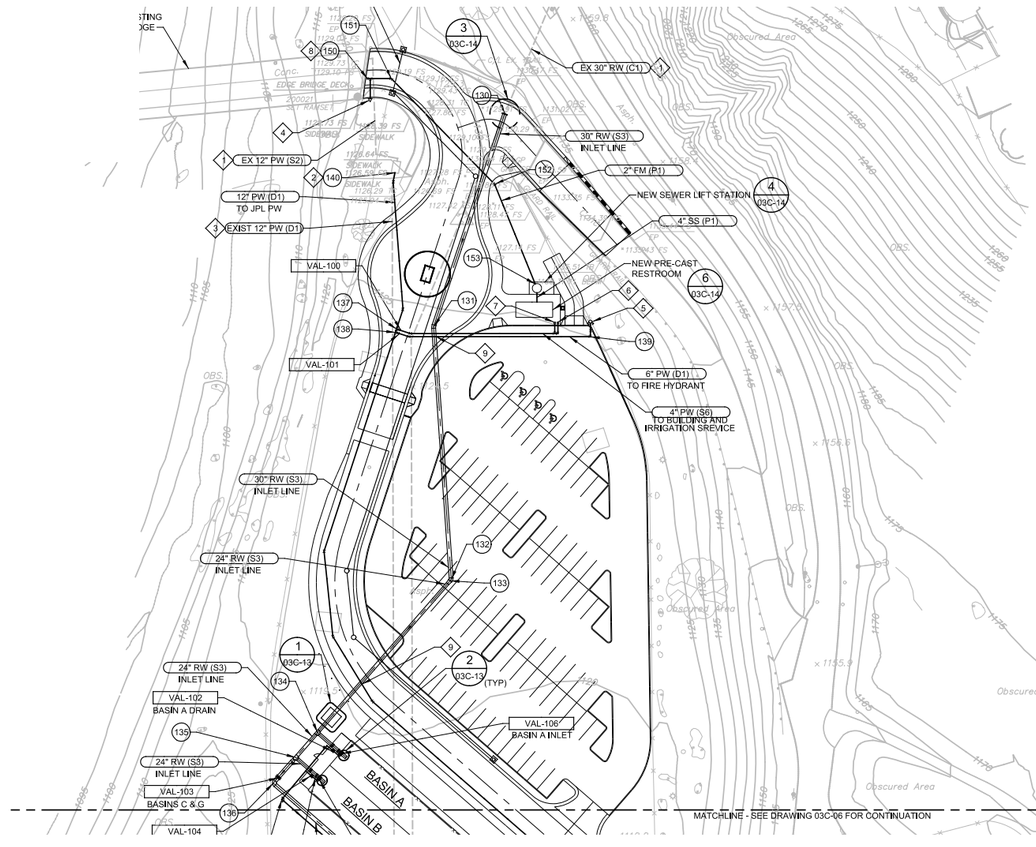
Exhibit 3-3b, Area 3 – Basins A–F and Piping Plan, depicts the locations and sizes of the two proposed pre-sedimentation basins (Basins A and B), four of the proposed spreading basins, and the access road alignment. The Piping Plan depicts the 30-inch-diameter inlet line, overflow lines, drain lines, and inlet/outlet connections between spreading basins.

Exhibit 3-3c, Area 3 – Basins F–I and Piping Plan, depicts the locations and sizes of three of the expanded spreading basins and the access road alignment. The Piping Plan depicts the 30-inch-diameter inlet line, inlet/outlet connections between spreading basins, and relocation of



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Source: Carollo 2014

Area 3 – Parking Lot, Restroom, and Piping Plan

Exhibit 3-3a

Arroyo Seco Canyon Project

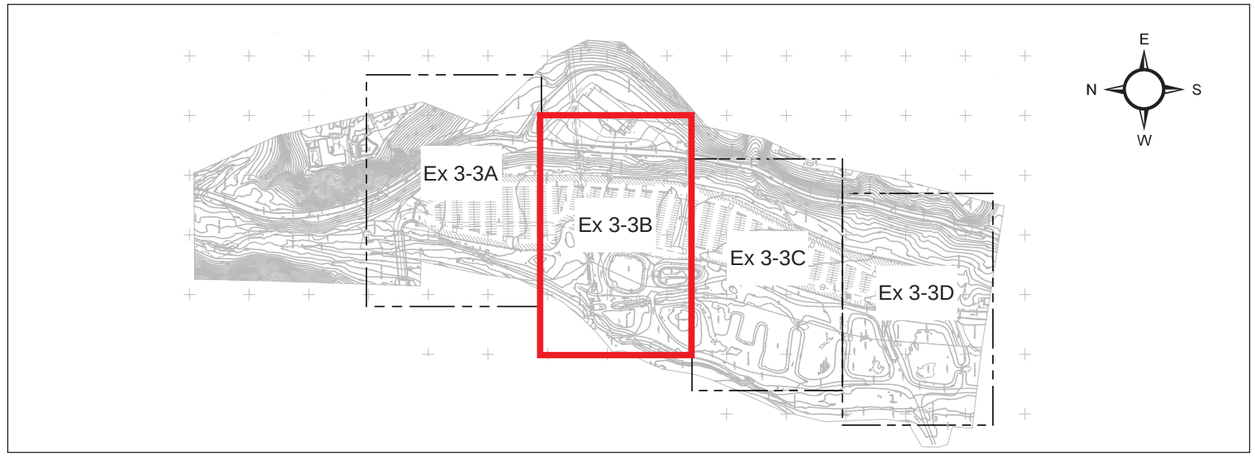
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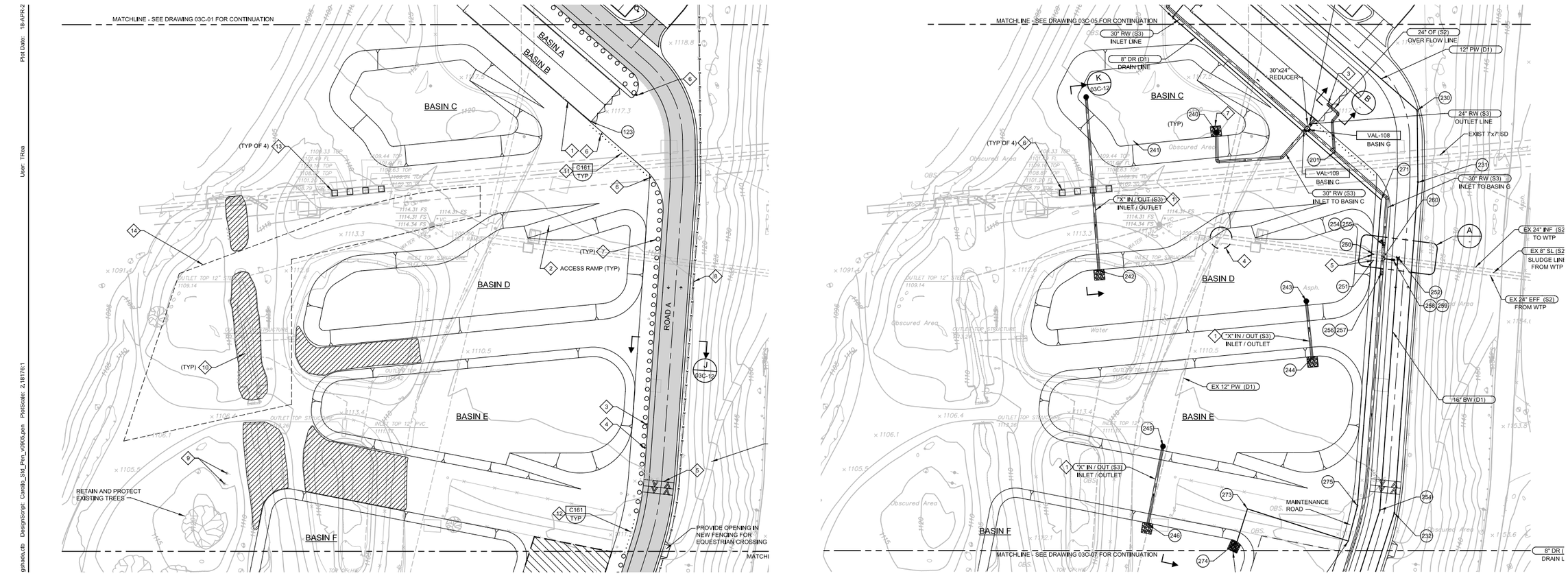
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the 12-inch-diameter potable water line to the NASA-JPL property. The following would also be installed: a new 12-inch-diameter line along the relocated access road to serve a future groundwater well beside Basin F; a 16-inch-diameter utility line to serve existing wells in the Arroyo and the existing Monk Hill Treatment Plant; and a 12-inch diameter discharge main for the existing Arroyo Booster. Exhibit 3-3d, Area 3 – Basin J and Piping Plan, depicts the location and size of the proposed Basin J spreading basin and the access road alignment. The Piping Plan depicts the inlet/outlet connections between spreading basins and the Project's various pipelines.

Table 3.1-1 compares the improvements proposed in and near Area 3 as contained in the adopted HWMP and the improvements analyzed in the Final Master EIR for the Arroyo Seco Master Plan (ASMP) with those proposed by the Arroyo Seco Canyon Project.





Source: Carollo 2013

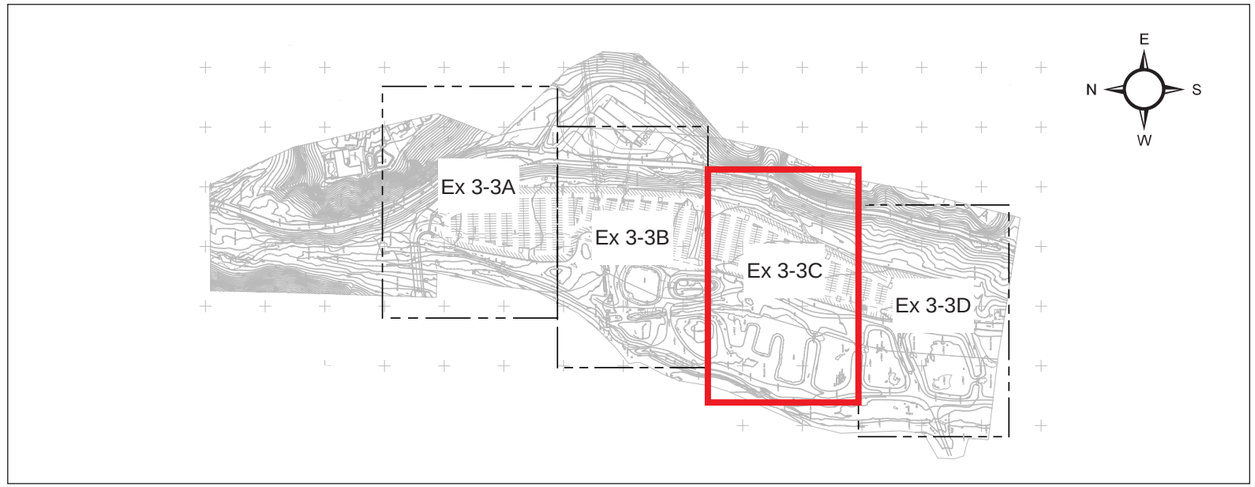
Area 3 – Basins A – F and Piping Plan

Arroyo Seco Canyon Project

Exhibit 3-3b

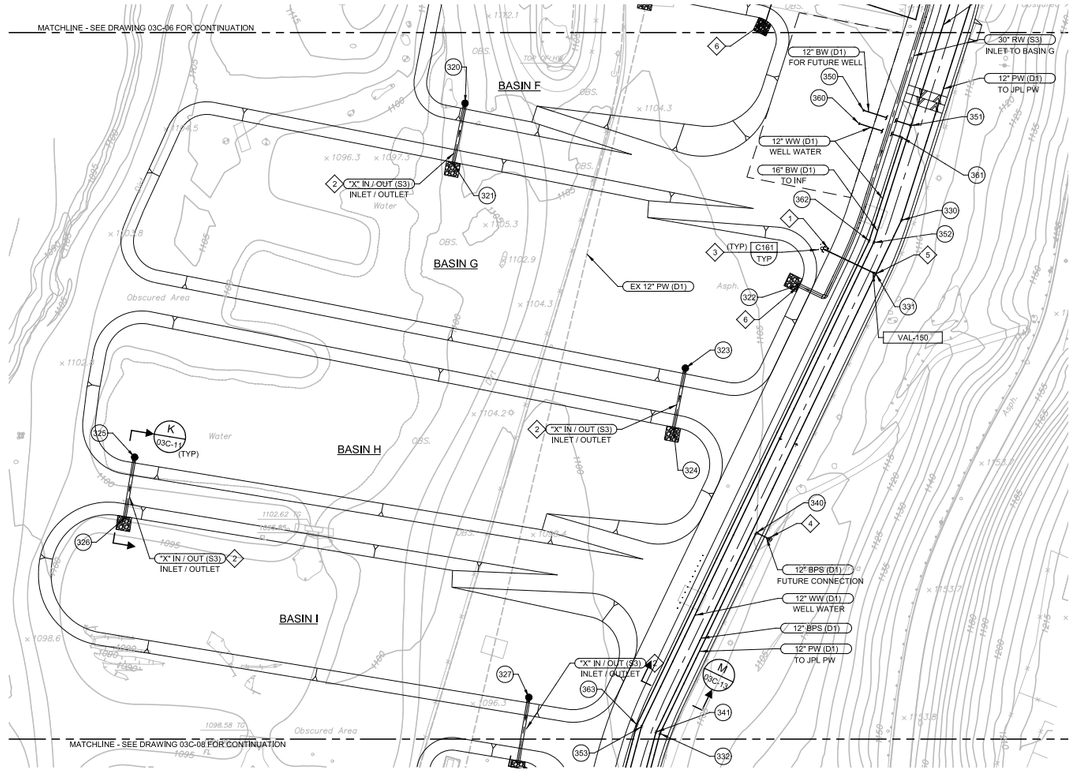
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User: TRea
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Source: Carollo 2014

Area 3 - Basins F - I and Piping Plan

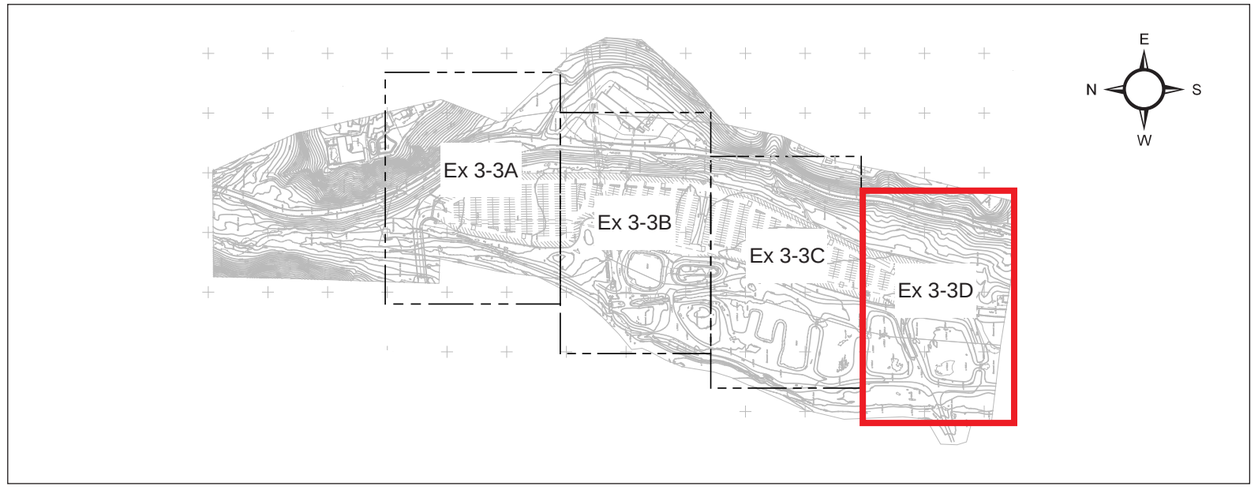
Arroyo Seco Canyon Project

Exhibit 3-3c

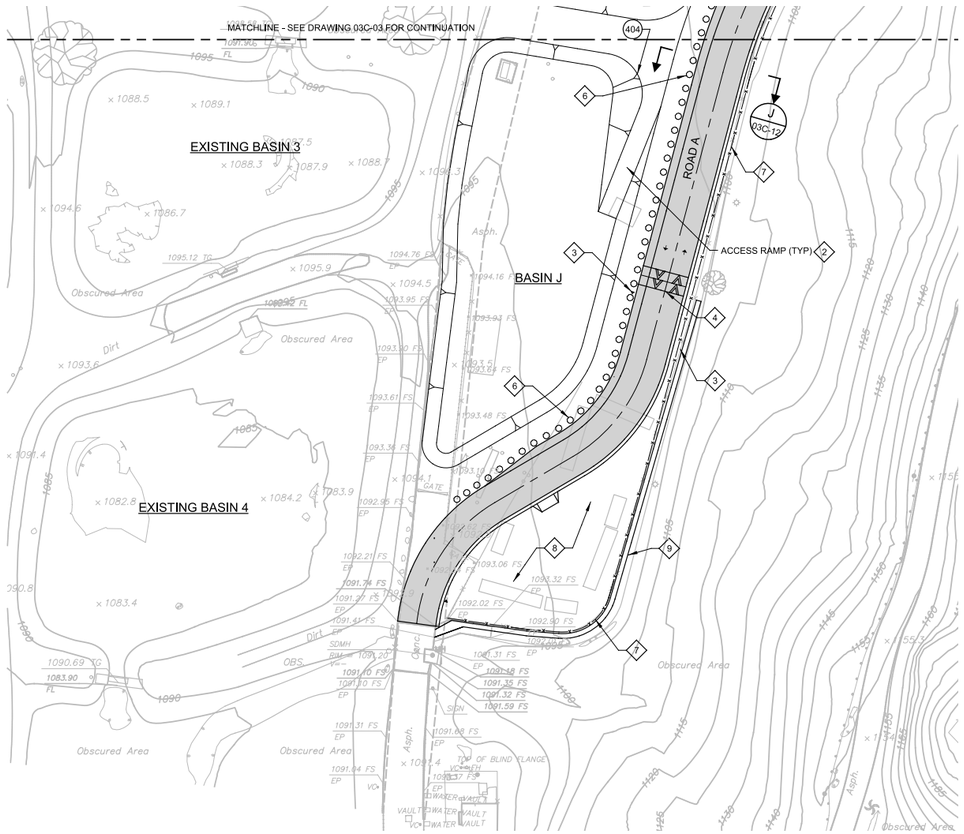
BonTerra CONSULTING

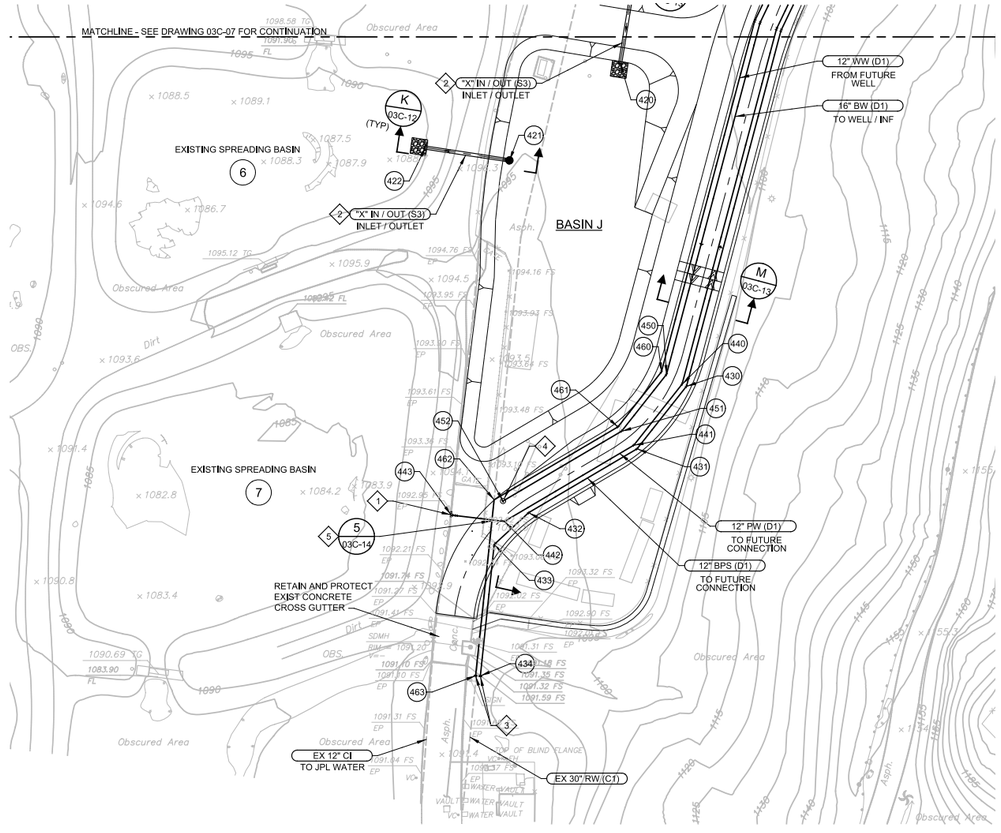
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Source: Carollo 2014

Area 3 – Basin J and Piping Plan

Exhibit 3-3d

Arroyo Seco Canyon Project

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TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	**Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)**	**Arroyo Seco Canyon Project**
JPL East Parking Lot	Relocate JPL parking, remove southern ¾ of parking lot and convert northern ¼ into public parking.	6-story, 1,200-space parking structure on JPL west parking lot (2.3.1.11.1 and 3.1.4.1.1).	*(Note: This parking structure is under construction by JPL and is not part of the Project.)*
		Convert JPL parking to 200-space public parking (2.3.1.15.1).	Up to 100-space decomposed granite recreational parking lot. (*Note: This is 100 parking spaces fewer than the parking lot analyzed in the Master EIR.)*
New public restroom	New restroom (with 1 urinal and 1 stall for men and 2 stalls for women) at northern end of parking lot, with storage area, public telephone, underground power connection, and sewage lift station and force main leading to the JPL line across the JPL bridge.	New restroom (with 1 urinal and 1 stall for men and 2 stalls for women) at northern end of parking lot, with storage area, trash enclosure, emergency phone, sewage lift station, and force main leading to the sewer line at the JPL campus through JPL bridge (2.3.1.15.2).	New restroom at northern end of parking lot with 2 gender-neutral stalls and sewage lift station and sewer connection leading to the JPL sewer line across JPL bridge. *(Note: This is 1 urinal and 1 stall fewer than the restroom analyzed in the Master EIR.)*
Bridge Crossing	New bridge crossing for the North Perimeter Trail, vehicles, and utilities.	Northern Bridge Crossing across Arroyo Seco that is 12 feet wide and 150 feet long (2.3.1.16.3).	Not proposed, but the existing pedestrian access path across the JPL bridge will be maintained and will connect to the new parking lot.
Spreading Basins	Expand 4 existing basins.	Expand 4 existing basins into the JPL parking lot (2.3.1.4.5).	Expand 4 existing basins.
	Relocate 2 sludge ponds.	Relocate and expand 2 sludge basins (2.3.1.4.5).	Replace 2 sludge ponds with 2 new spreading basins.
	Build 2 new basins.	Build 2 new basins (2.3.1.4.5).	Construct 2 sedimentation basins and 2 spreading basins. (*Note: This is 2 basins more than analyzed in the Master EIR. While the basins would be located in the same area, the area would have a different basin configuration.)*
		Convert 2 basins into a lake (2.3.1.4.5 and 2.3.1.13).	Not proposed.

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	**Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)**	**Arroyo Seco Canyon Project**
Trails	New trail that runs from the north end of the JPL parking lot to the Gabrielino Trail.	4 trail connections from East Rim Trail to Perimeter Trail, including a new trail at the north end of the parking lot (2.3.1.16.5).	Potential future pedestrian pathway from the north end of the parking lot through the slope area to Gabrielino Trail
	Extend East Rim Trail from Arroyo Well to VOC Water Treatment Plant and from Arroyo Well to both the Altadena Crest Trail and the Gabrielino Trail (along back of JPL parking lot).	East Rim Trail is approximately 2,600 linear feet of new trail that runs from the VOC Water Treatment Plant through Johnson Field to the Arroyo Well before ending at the Altacrest Trail on backside of the existing parking lot (2.3.1.16.4).	Pedestrian pathway/trail along the eastern edge of the parking lot, with a potential future extension north to join the Gabrielino Trail north of Area 3.
	Relocate existing trail to the maintenance road.	Relocate the existing trail to the maintenance road (2.3.1.18.2).	Proposed maintenance roads around new spreading basins will be open for public use.
Trailhead	Gabrielino Trailhead area with a new restroom, picnic tables, public parking, and interpretive signage.	Interpretive and picnic area at the intersection of the Arroyo Well and Johnson Field Road, with parking spaces (2.3.1.12.7).	Restroom, pet waste station, and signage proposed at the Gabrielino Trailhead area.
Habitat restoration	Realign stream corridor and restore habitat on banks west of the parking lot and basins.	Move, expand, and restore the stream corridor by the Altadena drain (2.3.1.18.1.1).	No improvements are proposed on the banks west of the parking lot.
	Establish habitat at spreading basins.	Habitat establishment at spreading basins (2.3.1.18.1.3).	Not proposed.
	Establish habitat at the East Entrance.	Habitat establishment at the East Entrance and at Sunset Overlook (2.3.1.18.1.5).	Not proposed.
Pipeline Relocation and Demolition	None specified.	None specified.	Replace and realign Hume line from the north end of parking lot to the spreading basins.
			Relocate the JPL water line to the new access road.
			Demolish a portion of the influent and effluent line from the Behner Water Treatment Plant
			Relocate the 12-inch diameter Arroyo Booster pipeline to the new access road.
			Remove sludge lines.

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	**Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)**	**Arroyo Seco Canyon Project**
Storm Drain Improvements	Shorten the Altadena storm drain and armor embankment to reduce erosion and restore habitat.	Shorten the Altadena drain and restore the stream corridor (2.3.1.4.6).	Not proposed.
	Extend the Altacrest storm drain as an underground pipe into the stream with inlets from the access road and the parking lot.	Extend the Altacrest drain as an underground drain between basins and that empties into the stream, with inlets to receive runoff from the parking lot (2.3.1.4.7).	Altacrest drain extension is not proposed
			County Storm Drain remains in place.
Overlook	Construct Sunset Overlook with interpretive signage and park amenities north of the East entrance.	Construct Sunset Overlook with picnic tables, seating, signage, and parking near east park entrance (2.3.1.14).	Not proposed.
Park Entrance	Relocate and improve the park entrance at Windsor/Explorer/Ventura intersection to Windsor/Mountain View.	Relocate the park entrance to Windsor/Mountain View, add a retaining wall, and restore habitat (2.3.1.3.1).	Not proposed.
	Relocate the parking area south of the entrance to the JPL parking lot	Relocate the parking area to the northern end of the JPL parking lot (2.3.1.3.1).	Not proposed.
		Reconstruct Windsor/Ventura intersection; add an interpretive area and a parking area (2.3.1.3.3)	Not proposed.
Access Road	Realign to the east side of the basins.	Realign along eastern edge of the parking lot (2.3.1.3.2).	Realign along eastern side of the basins and south and west of the new parking lot.
	Widen the road to Johnson Field.	Widen the Johnson Field Road to 2 lanes (2.3.1.3.3).	Not proposed.
Pump-Back system	Inlet at dam; pipe at the bottom eastern slope; and outlet at the highest east side basin and across the new bridge to the west side basins	Inlet, pump, and pipes to basins and lakes (2.3.1.4.2).	Not proposed.
Water line	Water line connections to new restrooms, campsite sinks, drinking fountains, and buildings.	None specified.	Connect the restroom and parking lot irrigation system to a metered service from the relocated JPL water main.

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	**Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)**	**Arroyo Seco Canyon Project**
Overhead power and communication lines	Relocate to the North Bridge crossing or within the utility easement.	Relocate power and communication lines.	Not proposed.
	Power connections to new restrooms and pump-back system.	None specified.	Connect the restroom, irrigation controls, and basin metering structure to a new service drop using an existing overhead line in Area 3 (where the biggest load will come from the lift station).
	Underground PWP overhead distribution lines from the VOC Water Treatment Plant to Arroyo Well and from the VOC Water Treatment Plant to Johnson Field.	Underground 3,000 feet of power and communication lines from the VOC Water Treatment Plant to Arroyo Well and from the VOC Water Treatment Plant to Johnson Field (2.3.1.19.1).	Not proposed.
	Relocate SCE lines running from the JPL substation to the Windsor/Ventura intersection.	Realign the SCE power line across the basins to the North Bridge, Gabrielino Trail, Ventura Street, and ultimately to the existing line on Altadena Drive (2.3.1.19.2).	Not proposed.
Septic Tanks and Sewer lines	Abandon all septic tanks and construct a sewer collection system.	Connect a new restroom near Johnson Field to the sewer line on Lehigh Street (2.3.1.12.3) and connect a new restroom at the JPL parking lot to the sewer line in JPL campus (2.3.1.15.2).	Connect a restroom to sewer line in JPL campus.
Security gates	Add security gates at all vehicular entries and at the tunnel from the dam parking lot.	Add gates and fencing at the East Entrance and along west side of Windsor Avenue (2.3.1.20).	Not proposed.
		Add fencing at end of Altadena Drive (2.3.1.20).	Not proposed.
			Add security gates at the north end of the parking lot, with a roundabout and a guard house

TABLE 3.1-1
AREA 3 IMPROVEMENTS

Area 3 Improvements	Description of Improvements		
	Hahamongna Watershed Park Master Plan	**Final Master EIR for Arroyo Seco Master Plan* (Master EIR section)**	**Arroyo Seco Canyon Project**
Lighting	Add lighting on built structures and at major park entrances only.	Add safety lights at the new parking lots and at the new restrooms (3.1.4.1.1).	Add restroom interior and exterior lighting.
Public telephones	Add near improved restrooms and recreation amenities.	Add at the new restroom at north end of the public parking lot (2.3.1.15.2).	Not proposed.

JPL: Jet Propulsion Laboratory; VOC: volatile organic compounds; PWP: City of Pasadena Water and Power; SCE: Southern California Edison.

* Based on the Final Master EIR that includes Draft Master EIR and Clarifications and Revisions to Draft Master EIR (Section 12.0 of the Final Master EIR).

As shown, the Project would implement some of the improvements proposed by the HWMP and analyzed in the Final Master EIR for the Arroyo Seco Master Plan. However, the Project proposes a recreational parking lot and a restroom that are smaller than those analyzed in the Final Master EIR. There is also a variation to the spreading basin configuration within the same location and area. Other proposed improvements in Area 3 (e.g., proposed trails, walkway, hume line relocation, JPL water line relocation, utility line demolition in the proposed basin area, water line connection, security gates, roundabout, and guard station at north end of parking lot) are not discussed in the HWMP or the Final Master EIR. At the same time, the Project does not preclude the future implementation of other improvements in Area 3 (e.g., storm drain improvements, trail relocation, pumpback system, and utility line relocations) as contained in the HWMP or analyzed by the Final Master EIR but not proposed by the Project. Accordingly, this IS/MND is a stand-alone document and does not tier off of the Master EIR.

3.2 PROJECT DEMOLITION AND CONSTRUCTION

Construction of the permanent Project improvements is anticipated to take approximately 16 months, starting in Summer 2015 with construction of the temporary bridges beginning one month before the start of construction activities in Areas 1 and 2. Designated staging areas will be fenced to prevent safety hazards, as well as deter to vandalism and theft. Project completion is expected by Fall 2016, with temporary bridge demolition occurring at the end of construction activities in Areas 1 and 2. Planned construction activities are broken out by Area below.

During grading activities in Area 3, a total of approximately 23,000 cy of cut materials is anticipated. In the interest of minimizing export from the Project site, the City may implement a mechanical shaker to sort and sift through excavated soils. The shaker would separate finer soils from larger rocks, thereby allowing for the beneficial reuse of the excavated soils as engineered fill materials during the construction of the spreading basins. The shaker would be in operation for 8-hour days over the last 2 months of grading activities. If the City utilizes the shaker option, approximately 23,000 cy of cut materials would be processed through the shaker, resulting in approximately 21,000 cy of material for fill (to be used on-site) and approximately 2,000 cy of larger rock materials. These 2,000 cy of rock materials may be used on-site for decorative/landscaping purposes throughout the Project study area, or may be exported off-site. For the sake of providing a conservative analysis, both the Air Quality, Noise and Traffic sections of the IS/MND assume export of these materials.

Table 3.2-1, Construction Activity Assumptions, summarizes the anticipated construction activities for each area.

TABLE 3.2-1
CONSTRUCTION ACTIVITY ASSUMPTIONS

	Area 1	Area 2	Area 3
Temporary Bridge Construction[a]			
Start	Summer 2015	Summer 2015	N/A
Length of activity	4 weeks	4 weeks	N/A
Equipment in use[b]	1 crane, 1 welder, 1 forklift	1 crane, 1 welder, 1 forklift	
Number of truckloads	10 truckloads	10 truckloads	N/A
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	N/A

TABLE 3.2-1
CONSTRUCTION ACTIVITY ASSUMPTIONS

	Area 1	Area 2	Area 3
Site Preparation – Clearing and Grubbing			
Start	Summer 2015	Summer 2015	Summer 2015
Length of activity	3 weeks	2 weeks	1 month
Equipment in use[b]	1 dozer, 2 dump trucks	1 dump truck	1 dozer, 1 excavator, 2 dump trucks
Amount of export	80 cy of debris	80 cy of debris	2,400 cy of debris
Number of truckloads for export	10 truckloads (16 cy truck- half loads)	10 truckloads (16 cy truck- half loads)	150 truckloads (16 cy trucks)
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	Scholl Canyon Landfill
Demolition			
Start	Fall 2015	Fall 2015	Fall 2015
Structures to be demolished	Headworks structure (1,800 sf)	Portions of diversion and weir structures and the retaining wall (500 sf)	Maintenance shed (100 sf), concrete vaults, head gates (300 sf), and paving on temporary access road (a portion of the 7 ac. Parking lot)
Length of activity	1 month	1 month	2 weeks
Equipment in use[b]	2 saws, 1 excavator with hammer, 2 dump trucks	2 saws, 1 excavator with hammer, 2 dump trucks	2 saws, 1 excavator with hammer, 2 dump trucks
Cubic Yards of Export	64 cy Demo wastes	16 cy of Demo wastes	4,000 cy of Demo wastes
Number of truckloads for export	8 truckloads (16 cy truck- half loads)	2 truckloads (16 cy truck- half loads)	250 truckloads (16 cy trucks)
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	Scholl Canyon Landfill
Grading			
Start	Fall 2015	Fall 2015	Fall 2015
Length of activity	4 months	1 month	5 months
Area to be graded	8 ac	9,000 sf	20 ac
Cut and fill	0	180 cy cut (road base)	23,000 cy cut and 21,000 cy fill (net cut of 2,000 cy)
Equipment in use[b]	1 excavator, 1 dump truck	1 excavator, 1 dump truck	2 excavators, 2 front-end loaders, 2 dump trucks For 2 months: 1 shaker and 1 front-end loader
Amount of export	0	180 cy	2,000 cy (rocks)
Number of truckloads[c]	0	36 truckloads (10 cy trucks half-load)	210 truckloads (10 cy trucks)
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	Scholl Canyon Landfill
Length of hauling	0	3 days	4 weeks
Underground Infrastructure/Utilities			
Start	N/A	Winter 2015	Fall 2015
Length of activity	N/A	3 months	4 months
Equipment in use[b]	N/A	1 excavator, 1 concrete truck, 1 concrete pumper truck, 1 crane	1 excavator, 2 dump trucks, 1 plate compactor

TABLE 3.2-1
CONSTRUCTION ACTIVITY ASSUMPTIONS

	Area 1	Area 2	Area 3
Paving			
Start	N/A	Spring 2016	Spring 2016
Length of activity	N/A	1 month	2 months
Pavement	N/A	asphalt	asphalt and DG
Area to be paved	N/A	5,000 sf	67,000 sf asphalt and 72,000 sf DG
Equipment in use[b]	N/A	1 vibratory roller, 1 paver, 1 grader, 1 belly dump, 1 dump truck	1 vibratory roller, 1 curb builder, 1 paver, 1 grader, 1 road striping machine, 1 belly dump, 1 dump truck
Building Construction			
Start	N/A	Summer 2016	Summer 2016
Length of activity	N/A	1 month	3 months
Equipment in use[b]	N/A	1 crane, 1 concrete truck	1 crane, 1 concrete truck, 1 concrete pumper truck
Architectural Coatings			
Length of activity	N/A	1 day interior	5 days interior
Temporary Bridge Demolition[a]	Fall 2016	Fall 2016	N/A
Start	Fall 2016	Fall 2016	N/A
Length of activity	4 weeks	4 weeks	N/A
Equipment in use[b]	1 crane, 1 welder, 1 forklift	1 crane, 1 welder, 1 forklift	
Number of truckloads	10 truckloads	10 truckloads	N/A
Disposal site	Scholl Canyon Landfill	Scholl Canyon Landfill	N/A

sf: square feet; ac: acres; cy: cubic yards; N/A: not applicable.

[a] Assumes 2 temporary bridges will be built, with a temporary bridge over Bridge No. 1 and another temporary bridge over Bridge No. 3.

[b] In addition to the listed equipment, the following equipment would be shared among any 1 of the 3 work areas: medium-duty trucks (<10), all-terrain forklift (1), front-end loader (1), water truck, portable generator, and hand tools (e.g., grinders, drills, compressors).

[c] In order to provide a conservative assessment to account for the unknown variation in the amount of soil that could be re-used onsite for engineered fill versus exported off-site, the number of truck trips was increased by assuming the use of 10 cy trucks instead of the standard 16 cy trucks.

Source: Carollo 2013.

Trucks hauling soils and debris to Scholl Canyon Landfill are expected to come to the site from I-210 at the Windsor Avenue off-ramp and head north on Windsor Avenue to Explorer Road into Area 3. From Area 3, trucks would turn southeast and north to the access road (North Arroyo Boulevard) to reach Areas 1 and 2. From these areas, the trucks would head south and pass through Area 3, Explorer Road, Windsor Avenue, and onto the westbound on-ramp on I-210. From I-210, trucks would head west on SR-134; exit at the Figueroa Street/Scholl Canyon Road off-ramp; head north-northeast toward the landfill. Trucks would come back from the landfill entering the eastbound on-ramp on the SR-134 at Figueroa Street and head east; trucks would then go west on I-210 to Windsor Avenue to Explorer Road and, ultimately, to the site.

3.2.1 AREA 1 – ARROYO SECO HEADWORKS

Temporary bridges would be constructed in Summer 2015 over Bridge No. 3 across the Arroyo Seco and over Bridge No. 1 across Millard Creek to allow heavy equipment to reach Areas 1 and 2 during construction. These temporary bridges would accommodate construction vehicles and prevent any damage to Bridge No. 1 and Bridge No. 3. The assembly process will be executed in such a way to ensure that the bridges are set upon disturbed trail areas only and would not extend into the creek or adjacent vegetated areas. These bridges would be removed after construction of the proposed improvements in Areas 1 and 2.

At the start of construction, a temporary cofferdam (temporary enclosure to keep water out) would be placed across the stream at the upstream end of Area 1, with a sump pump that would convey water through a pipe along the western edge of Area 1 and discharge water downstream of Area 1, when necessary. Portions of the Headworks structure and an existing slab are proposed to be removed from the streambed and banks with the use of hammers and breakers. Some portions of the structure that are below the proposed finish grade or that extend into the regraded canyon walls may not be removed. The channel would be recontoured within the two- to five-year floodplain areas to allow the Arroyo Seco to flow naturally through the area.

Site preparation for Area 1 would start in Summer 2015, with clearing, grubbing, and demolition of the Headworks structure starting in Fall 2015. Grading activities on approximately eight acres would start in the Fall of the same year for two months of rough grading and two months of fine grading and embankment revetment; these activities would be completed by Winter 2016. The planting and seeding task in Area 1 could involve volunteers from the community through coordination with the ASF. For safety reasons, planting and seeding activities (which would be completed by volunteers) would be performed when construction equipment is not in operation.

3.2.2 AREA 2 – ARROYO SECO INTAKE

The temporary bridges that would be constructed across the Arroyo Seco and Millard Creek to allow heavy equipment to reach Area 1 would also be used during construction in Area 2. In addition, a temporary cofferdam would be installed in the Arroyo Seco upstream of Area 2 using on-site materials to divert flows away from the construction area and from construction equipment. A sump pump and temporary pipeline would allow water flows to temporarily bypass the stream in Area 2.

The Project would involve the removal of sediment and debris that has accumulated upstream and downstream of the existing weir and the demolition of the top two feet of the weir. In the same location and alignment, a new reinforced concrete sill would be cast with an integral cutoff wall on the downstream edge. The sill's upstream, downstream, and right and left abutments would be protected from erosion by a combination of heavy riprap stone and reinforced concrete. A pneumatic or electric operated spillway gate or a crest gate would be placed on the sill.

The existing concrete training wall on the east side of the streambed would remain in place but would be bolstered by the addition of riprap and concrete. In several locations, additional steel surfaces would be installed to protect the concrete from scour. The existing intake trash rack and gate slot guides would be removed and, as an option, the valve ahead of the pipeline may also be removed. A new trash rack with horizontal bars would be installed over the intake opening. The downstream end of the trash rack would be left partially open so that debris would have some opportunity to pass without requiring manual cleaning. Behind the trash rack would be a fine screen made of heavy wedge wire screen with 0.125- to 0.25-inch openings that are vertically oriented. The fine screen would be manually cleaned and would serve to keep all but the smallest debris out of the conveyance system. Immediately behind the screen would be an isolation gate

that can be automatically closed during high flow events. The gate would prevent the fine screen and downstream facilities from being filled with sediment.

Existing K-rails would be removed along an approximate 150-foot-long segment of the existing access road between Bridge No. 3 and the intake structure. The access road would be stabilized through reconstruction of the stream embankment and provision of riprap protection, with a rock wall extension above the road at the streamside to provide fall protection for users of the trail/access road. The road would be repaved with asphalt and would be sloped to direct surface runoff away from the stream towards the hillside.

Site preparation for Area 2 would also start in Summer 2015, with clearing, grubbing, and demolition of the diversion weir and retaining wall starting in Fall 2015. Grading activities on approximately 9,000 square feet of area near the diversion structure and on the access road would start in the Fall of the same year. Approximately 180 cubic yards (cy) of road base materials would be disposed of off-site (requiring a maximum of 36 truck trips with half loads). Infrastructure construction (e.g., formwork and concrete work, new weir gates, trash racks, valving, and embankment improvements) would occur for 3 months starting in Fall 2015. Construction of the control equipment enclosure would begin in Summer 2016, and access road paving would occur for 1 month starting in Spring 2016.

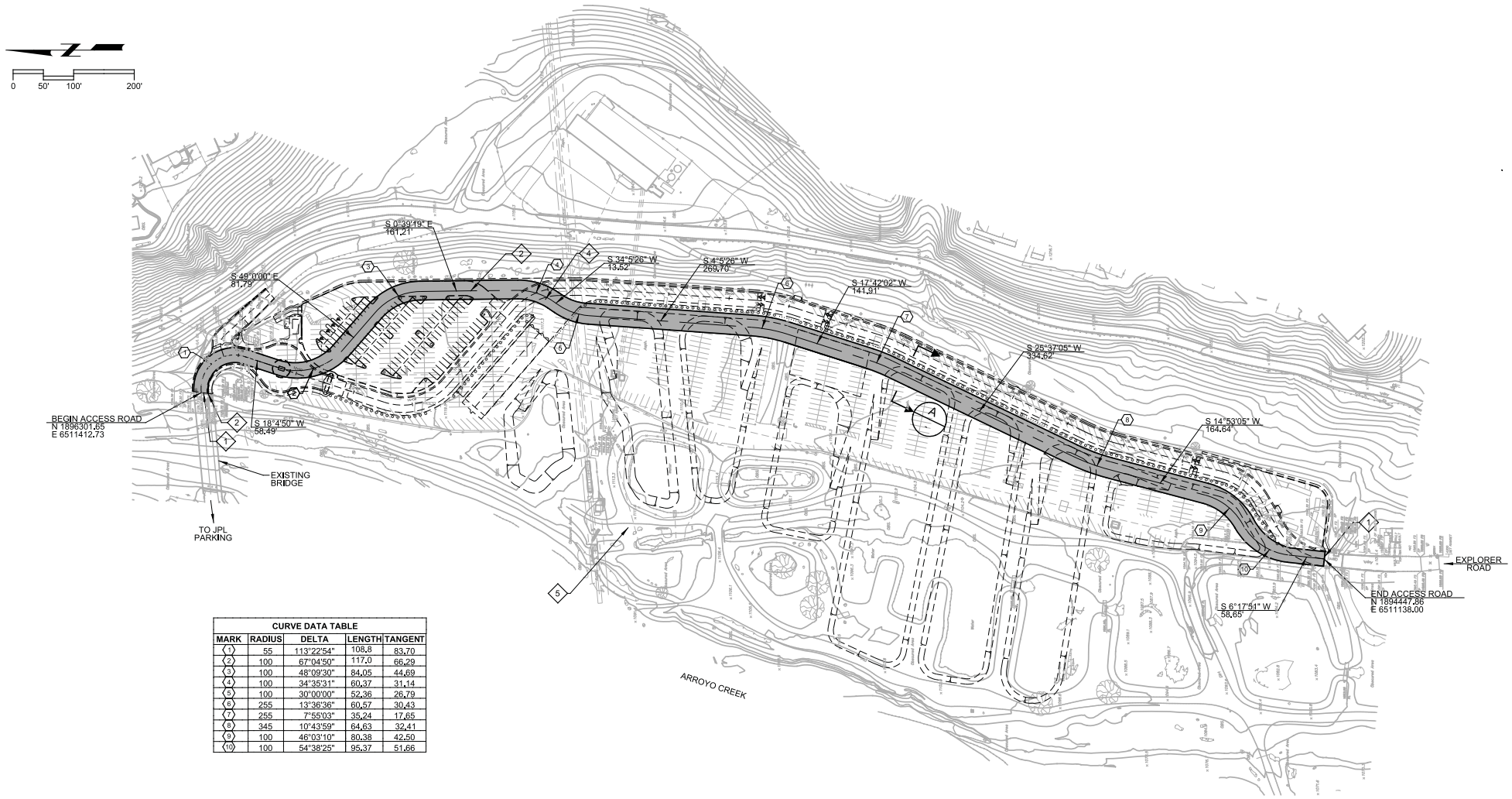
After Area 1 and Area 2 improvements are constructed, the temporary bridges would be demolished. This demolition work is expected to take approximately 4 weeks and a total of 20 truck trips in Fall 2016.

3.2.3 AREA 3 – JPL EAST PARKING LOT

Parking Lot Removal by JPL

As a part of the City's termination of the lease agreement for the JPL East Parking Lot, and not as a component of the proposed Project, JPL is required to remove all constructed improvements on the parking lot site, unless otherwise directed by the City (JPL 2012). As such, all existing facilities—including bus stops, fencing, bollards, signs, lighting, JPL overhead power lines, and the paved parking lot—are expected to be removed by JPL after completion of the JPL On-Site Parking Structure at the JPL campus in August 2014 as a part of this existing lease agreement. Of the 9.58 acres (417,305 square feet) that JPL is leasing from the City, approximately 357,347 square feet is currently paved. Of this, approximately 47,164 square feet of paving would remain in place for a 26-foot-wide temporary access roadway that would provide vehicle access for JPL employees to the new JPL On-Site Parking Structure. Dedicated access times during commuting hours may be enforced during construction activities in Area 3. JPL employees and visitors would have to use JPL's West Entrance during restricted access hours (i.e., outside peak commute hours).

JPL would remove all other paving and base materials and return the site to existing grade. As such, at the time that Project construction begins in Summer 2015, it is expected that the JPL East Parking Lot would no longer exist and is therefore not considered part of the baseline condition; only 47,164 square feet of paving on the temporary access road would remain as an existing, and therefore baseline, condition on the Project site. This temporary access road would be aligned and maintained in accordance with the Standard Specifications for Public Works Construction (Greenbook) and the City's Supplements and Modifications to the Greenbook (RR TRA-1) and, therefore, would not pose hazards to those using the road. Exhibit 3-4, Temporary Access Road Plan, shows the alignment of the temporary access road that will remain in place until the final roadway alignment is completed.



CURVE DATA TABLE				
MARK	RADIUS	DELTA	LENGTH	TANGENT
1	55	113°22'54"	108.8	83.70
2	100	67°04'50"	117.0	66.29
3	100	48°09'30"	84.05	44.69
4	100	34°35'31"	60.37	31.14
5	100	30°00'00"	52.36	26.79
6	255	13°36'36"	60.57	30.43
7	255	7°55'03"	35.24	17.65
8	345	10°43'59"	64.63	32.41
9	100	46°03'10"	80.38	42.50
10	100	54°38'25"	95.37	51.66

Source: Carollo 2014

Temporary Access Road Plan

Exhibit 3-4

Arroyo Seco Canyon Project

BonTerra PSOMAS

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Construction Activities

Area 3 construction would begin with the removal of existing pipelines, except JPL's 12-inch-diameter potable main. This main would remain in place and in service until the new replacement main is installed, pressure tested, disinfected, and ready for connection to the existing water meter. The new JPL 12-inch-diameter potable water pipeline, the 12-inch-diameter JPL well line, the 16-inch-diameter utility service line, and the 12-inch-diameter Arroyo Booster line would be installed beneath the alignment of the new access road along the eastern edge of Area 3. The existing 30-inch-diameter hume line would stop at the northern section of Area 3 and would connect to the new 30-inch-diameter concrete, mortar-lined, and coated steel pipe along the eastern edge and across the new parking lot to sedimentation basins (Basins A and B); there would also be another direct connection to two spreading basins (Basins C and G). Portions of the Behner Water Treatment Plant's influent and effluent lines between the future access road and the existing 30-inch-diameter hume line would be removed, as these lines are not in use. The 8-inch-diameter sludge line from the Behner Water Treatment Plant would also be removed in Area 3. The County storm drain line would remain in place.

As the pipeline work is being completed, excavation for the new spreading basins would begin, especially in the areas abutting the new roadway alignment. The amount of excavated soils (from the spreading basin construction) to be hauled off site would be minimized by creating shallow embankments around proposed basins and raising the elevation of the access road and the new parking lot. This would consist of excavating approximately one foot below the existing grade and constructing two-foot-high berms around the basins. The electrical building near the sludge ponds would also be removed.

After the pipeline work, the new JPL access road would be built along the eastern edge of Area 3. When this road is completed, the temporary access road would be removed and construction of the spreading basins would continue. The decomposed granite parking lot would also be constructed at the northern end of Area 3 after the pipeline work. During these improvements, JPL employees and their visitors would have access through Area 3 to enter JPL using the temporary access road or the new access road (when it is completed) in Area 3.

Fencing, gates, a roundabout, a guard station, a restroom, a trail pathway, signs, and other improvements at the northern end of the parking lot would be constructed and/or installed. The proposed restroom would be constructed either on site or using a pre-fabricated building. The restroom would be connected to the relocated JPL potable line upstream of JPL's service meter.

Wastewater from the proposed restroom would be conveyed to an existing sewer line on the JPL campus through a new lift station and a new sewer line within the JPL Bridge. The sewer line will extend from the restroom; will be placed into the JPL Bridge's support structure; and will connect to the larger sewer trunk line within the JPL campus. A new lift station would be constructed in association with the restroom. Construction for the sewer line extension would involve trenching within the existing roadway on the eastside of the JPL Bridge and excavating through the existing asphalt approach to the bridge's sub-structure. There would be no access required from the creekbed or surrounding vegetated slopes. This temporary disturbance of the bridge would require detours for JPL employees to a single-lane crossing over the bridge.

Construction in Area 3 would also start in Summer 2015, with site preparation, clearing, and grubbing occurring in the same month. Approximately 150 truckloads of debris, dirt, and vegetation would be removed and disposed of at Scholl Canyon Landfill. Demolition activities for a maintenance shed, concrete vaults, head gates, and asphalt paving from the asphalt access road would begin in Fall 2015 and would extend for two weeks. Grading activities on approximately 20 acres for the spreading basins would continue for 5 months, with approximately

2,000 cubic yards of rock and/or excess soils requiring off-site disposal at Scholl Canyon Landfill. If the rocks are not beneficially reused on the Project site, a total of approximately 125 truck trips would be needed to haul the materials to Scholl Canyon Landfill, assuming use of a 16-cy truck. Because it is unknown exactly how much soils will be able to be beneficially reused on the Project site, and how much may be required for off-site disposal, a total of 210 truck trips was assumed in the Air Quality, Noise, and Traffic analyses within this IS/MND.

Infrastructure construction would occur for four months starting in Fall 2015. Building construction would start in Summer 2016. Access road paving (67,000 square feet) and parking lot paving with decomposed granite (72,000 square feet) would occur for approximately 2 months starting in Spring 2016. Project construction would be completed by Fall 2016.

3.3 LONG-TERM OPERATIONS

A 20 to 25 percent increase in the number of trail users and recreational visitors are conservatively anticipated with the Project, such that up to approximately 150 users per day on weekdays (an increase of 25 users per day) and 500 people per day on weekends (an increase of 100 users per weekend day) are expected to use the recreational facilities located in the Project area. As many as 1,000 people per day (an increase of 200 users per weekend day) may use the proposed improvements and nearby recreational facilities and trails during major holidays (e.g., Memorial Day weekend).

3.3.1 AREA 1 – ARROYO SECO HEADWORKS

The rest area/picnic area in Area 1 would serve users of the existing trail system. The picnic tables are expected to accommodate 4 persons per table (assuming a total of 3 proposed tables), or 12 people at any time. Therefore, there could be a slight increase in the number of people using recreational facilities in Area 1 due to the proposed picnic amenities. Trash collection would be conducted at least once a week by existing City personnel.

3.3.2 AREA 2 – ARROYO SECO INTAKE

The PWP typically does not divert water for recharge during large storm events (when flows are greater than 25 cfs) due to high total suspended solids (TSS) in the water. If water with high TSS levels is used for recharge, the ground surface in the basins can be “blinded” or plugged by fine material such as clays and silts. This would then reduce recharge rates and require removal of the top layer of fine material in order to recover the basins’ original recharge rates. Letting water with high TSS levels bypass without recharge is not preferred from a water supply perspective, but helps reduce maintenance issues associated with excessive cleanup of the basins.

The new diversion structure would capture all flows during small storm events and dry weather flows in the Arroyo Seco and up to 25 cfs during large storm. During larger storm events when the water is too turbid, the stream (with its associated sediment load) will bypass the structure. Operation during high flows would be facilitated by the adjustable height weir or crest gate. At low flows, the gate would start in the ‘up’ position and as flows increase, the gate would be lowered to maintain a constant water surface level in the diversion pool.

The existing intake is protected by a trash rack that withstands approach velocities of approximately 2.1 ft/sec and has openings of approximately 2 inches. This current arrangement does little to protect fish. The improved intake would have an approach velocity of 1.4 ft/sec and fine screens with openings of 3/32-inches. This proposed arrangement is expected to reduce the potential for fish to enter the intake. Additionally, the new intake is designed to be easily cleaned to prevent regions of high velocity on portions of the intake associated with debris build-up. Lastly,

the removal of the headworks in Area 1 would eliminate an impediment to fish movement and would re-establish the feasibility of fish passage through this area. As a result, Project effects on fish species are expected to be potentially beneficial.

City personnel would continue to provide maintenance of the diversion and intake structures as occurs under existing conditions.

3.3.3 AREA 3 – JPL EAST PARKING LOT

Once the parking structure on the JPL campus is completed and in use, JPL will no longer be running the shuttle buses from Area 3 to the JPL campus. Parking in Area 3 would be reduced from 1,132 spaces to a maximum of 100 spaces for recreational users in the Arroyo Seco Canyon area. Prior to the start of Project construction, no JPL employee or JPL visitor parking would occur in Area 3. JPL employees and JPL visitors would pass through Area 3 (through an access easement from the City) and over the JPL Bridge to access the new JPL On-Site Parking Structure at the JPL campus (on the west side of the Arroyo Seco). Thus, no change in JPL traffic volumes would occur in Area 3.

With the Project, vehicle access to the recreational parking lot and to the JPL Bridge would be provided from the south by the new two-lane asphalt road that would be located east of the new spreading basins. The road would then run northerly and divert to the western edge of the new recreational parking lot and connect to the new JPL security guardhouse before providing access across the bridge by JPL employees and visitors. A roundabout would be provided at the JPL guardhouse for vehicles not cleared for entry into the JPL property to allow vehicles to turn around and return to Windsor Avenue.

The new recreational parking lot, pet waste station, and restroom in Area 3 would be available for use by visitors of the Hahamongna Watershed Park and the ANF. Approximately 2,000 gallons per day of wastewater from the proposed restroom would be directed into the JPL sewer line. Restroom cleaning would be provided at least twice a week and trash would be collected at least once a week by existing City personnel.

The upper two new sedimentation basins (Basins A and B) would be operated independently or in parallel as surface water flows into the sedimentation basins prior to entering the spreading basins. The sedimentation basins would only be operated during storm events or when the water is too turbid to bypass the sedimentation basins. However, if one of the sedimentation basins is taken offline for maintenance, the entire flow would be received by the other basin. Sediments in Basins A and B would be periodically removed and hauled off to a disposal site, with the amount of sediment varying based on hydrology. The sediment volume is estimated to require off-site disposal at approximately 100 truckloads per year. This would replace the majority of sediment removal in the existing and new spreading basins.

Under normal operations when the water is clear, the sedimentation basins would be bypassed and surface water would be directed into the first spreading basin (Basin C). The new spreading basins would operate in series by filling the top-most basin and having water cascade down to the lower basin as each upper basin reaches its operating level. Approximately 3.1 acres of recharge area within the existing 4 spreading basins would be replaced with 8 spreading basins with 7.2 acres of recharge area. The increase in the recharge area by 4.1 acres would supplement the existing 2,300 ace-feet per year (afy) of recharge by an estimated additional 1,100 afy.

The frequency in which the spreading basins are cleaned would depend on the rate at which percolation degrades due to silts and clays in the diverted water. The City typically scrapes and tills the existing basins about once per year so the incremental maintenance needs for the

additional recharge area would not be significantly more, considering the benefit of the new sedimentation basins. When necessary, cleaning of the basins would continue to be accomplished by mechanically scraping the top layer of soil using front-end loaders, graders, or scrapers. Following removal, the surface would be disked or harrowed to loosen any soil compaction caused by cleaning. An estimated 100 truckloads of soil from the existing and proposed spreading basins would have to be disposed of off-site every 5 years.

3.4 FUNDING

The City of Pasadena and the ASF obtained a Proposition 84 grant in the amount of $3.271 million from the California Department of Water Resources for the Hahamongna Multi-Use Basin Project. The funds were awarded through an Integrated Regional Water Management Program Implementation Grant to the Greater Los Angeles Region. The Project is one of a suite of projects that were rolled up into a single grant agreement for the region that is being managed by the Los Angeles County Flood Control District. This grant would be used for the replacement of the intake structure to increase its capacity and for the construction of recreational amenities in the HWP.

The PWP would be funding the rest of the proposed improvements (i.e., Headworks removal, habitat restoration, and expansion of spreading basins).

3.5 AGENCY APPROVALS AND PERMITS

This IS/MND is intended to serve as the primary environmental document pursuant to CEQA for the Arroyo Seco Canyon Project, including discretionary approvals requested or required to implement the Project. In addition, this is the primary reference document for the formulation and implementation of a mitigation monitoring program for the Project.

As the Lead Agency, the Hearing Officer may adopt the IS/MND if it finds, on the basis of the whole record, that there is no substantial evidence that the Project would have a significant effect on the environment.

The Arroyo Seco is under the jurisdiction of various resource agencies, including the United States Army Corps of Engineers (USACE), the Los Angeles RWQCB, and the California Department of Fish and Wildlife (CDFW). Additionally, Area 1 includes land located within the ANF on property owned by the City of Pasadena. Also, the JPL campus is located on federal land in the City of La Cañada Flintridge.

Table 3.5-1 lists all the agencies that are known or expected to have permit or approval authority over the Project. Moreover, this IS/MND covers all federal, state, local government, and quasi-government approvals that may be needed to construct, implement, or operate the project, whether or not they are specifically identified in Table 3.5-1 or elsewhere in this IS/MND.

TABLE 3.5-1
AGENCY APPROVALS AND REQUIREMENTS

Agency	Approval/Permit Required	Purpose	Notes
City of Pasadena	Project approval	Approve the proposed Project and allocate City funds.	Including use of Proposition 84 grant funds.
	Easement	Authorize easement for JPL use of City land for vehicle access, guard shack, security fencing, utilities, and roundabout in Area 3	JPL access through Area 3 and use of access road, guard shack and roundabout
	Easement Amendment	Allow public access and utilities across JPL Bridge	Including public access on the JPL bridge sidewalk and allowing for sewer, electrical, and communications utilities and other public utility purposes in the JPL bridge
	Other agreement(s) to convey interest	Allow for agreement(s) with JPL as needed to construct and/or implement project	Agreement(s) may be needed for maintenance, right of entry, etc. to construct and/or operate project components
	Design Review	Approve the design of the proposed restroom building	In compliance with the Arroyo Seco Design Guidelines
	Conditional Use Permit	Allow for park and recreational facilities in the Open Space zone	In compliance with the City's Zoning Code
	Tree removal authorization	Allow removal of trees in areas to be disturbed.	In compliance with City Trees and Tree Protection Ordinance
USACE	Section 404 Nationwide Permit	Allow the discharge of dredge and fill material into "waters of the U.S.".	Nationwide Permit (NWP) required for stream and wetland restoration in Areas 1 and 2, and for maintenance of existing water diversion facilities in Area 2.
Los Angeles RWQCB	Section 401 Water Quality Certification	Protect water quality within "waters of the U.S.".	Water Quality Certification required for discharges to the Arroyo Seco associated with construction activities in Areas 1 and 2 and maintenance activities in Area 2.
CDFW	Section 1600 Streambed Alteration Agreement	Authorize changes to the natural flow or the bed, channel, or bank of any river, stream, or lake and associated impacts to biological resources.	Streambed Alteration Agreement required for habitat restoration in Area 1, disturbance of the stream channel during construction, and maintenance in Area 2 (existing permit expired in 2005).
USFS	Agreement	Allow water line connection	Water line connection from USFS Ranger Station to horse water trough and temporary irrigation system in Area 1
ASF	Approval	Use of Proposition 84 grant.	Must approve project as a Proposition 84 co-grantee with the City of Pasadena.

TABLE 3.5-1
AGENCY APPROVALS AND REQUIREMENTS

Agency	Approval/Permit Required	Purpose	Notes
JPL/NASA	Agreement(s) to convey interest	Allow for agreement(s) with City of Pasadena as needed to construct and/or implement project	Agreement(s) may be needed for maintenance, right of entry, etc. to construct and/or operate project components
	Easement Amendment	Allow public access and utilities across JPL Bridge	Including public access on the JPL bridge sidewalk and allowing for sewer, electrical, and communications utilities and other public utility purposes in the JPL bridge
	Easement Acceptance	Accept easement from City for JPL use of City land for vehicle access, guard shack, security fencing, utilities for power and communication, and roundabout in Area 3	JPL access through Area 3 and use of access road, guard shack and roundabout
Los Angeles County Sanitation Districts	Sewer Service Connection	Allow for the discharge of wastewater into the Sanitation District's wastewater treatment system.	The City or JPL shall consult with the District to determine if sewer service to the restroom in Area 3 requires a permit; payment of a connection fee; and/or an annual service fee.

USACE: U.S. Army Corps of Engineers; NWP: Nationwide Permit; Los Angeles RWQCB: Los Angeles Regional Water Quality Control Board; CDFW: California Department of Fish and Wildlife; USFS: United States Forest Service; ASF: Arroyo Seco Foundation; JPL: Jet Propulsion Laboratory; NASA: National Aeronautics and Space Administration.

SECTION 4.0 ENVIRONMENTAL ASSESSMENT

This section includes the completed CEQA environmental checklist form, as provided in Appendix G of the State CEQA Guidelines, as well as substantiation and clarification for each checklist response. The checklist form is used to assist in evaluating the potential environmental impacts of the Arroyo Seco Canyon Project and identifies whether the Project is expected to have potentially significant adverse impacts.

1. Project Title:	**ARROYO SECO CANYON PROJECT**
2. Lead Agency Name and Address:	City of Pasadena Planning and Community Development 175 North Garfield Avenue Pasadena California 91101-1704
3. Contact Person and Phone Number:	Jose Daniel Jimenez (626) 744-7137
4. Project Location:	In and along the Upper Arroyo Seco, upstream of Devil's Gate Dam and north of the intersection of Windsor Avenue and Ventura Street in Pasadena, Los Angeles County, CA: Area 1 – Arroyo Seco Headworks; Area 2 – Arroyo Seco Intake; and Area 3 – JPL East Parking Lot
5. Project Sponsor's Name and Address:	City of Pasadena Department of Water and Power 150 South Los Robles Avenue, Suite 200 Pasadena, California 91101
6. General Plan Designation/Zoning:	Open Space/Open Space and Planned Development-16

7. Description of Project: Restoration of a portion of the Arroyo Seco, reconstruction of surface water diversion facilities; expansion of spreading basins; and construction of recreational and educational amenities. See Section 3.0 for details.

8. Surrounding land uses and setting: The areas included in the Arroyo Seco Canyon Project are bound by residential uses in Pasadena and the community of Altadena to the east and south; open spaces in the ANF to the north; Devil's Gate Dam and Reservoir to the southwest; and the Arroyo Seco stream corridor, Oak Grove Park, and other recreational areas, the JPL campus, and residential areas in the City of La Cañada Flintridge on the west.

9. Other public agencies whose approval is required: USACE; Los Angeles RWQCB; CDFW; USFS; ASF; JPL; and Los Angeles County Sanitation Districts (See Table 3.5-1 above)

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this Project, involving at least one impact that requires mitigation, as indicated on the following pages.

- ☐ Aesthetics
- ☐ Air Quality
- ☒ Cultural Resources
- ☐ Geology and Soils
- ☒ Hazards and Hazardous Materials
- ☐ Land Use and Planning
- ☒ Noise
- ☐ Public Services
- ☒ Transportation/Traffic
- ☒ Mandatory Findings of Significance
- ☐ Agriculture and Forest Resources
- ☒ Biological Resources
- ☐ Energy
- ☐ Greenhouse Gas Emissions
- ☐ Hydrology and Water Quality
- ☐ Mineral Resources
- ☐ Population and Housing
- ☒ Recreation
- ☐ Utilities and Service Systems

DETERMINATION:

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Gary Takara
Signature of Lead Agency Representative

10/07/2014
Date

GARY TAKARA
Printed name

Pasadena Water and Power Department
Agency

Negative Declaration/Mitigated Negative Declaration adopted on: _____

Adoption attested to by: _____
Printed name/Signature

_____
Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact' is appropriate if there is substantial evidence that an effect is significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Unless Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less than Significant Impact." The Lead Agency must describe the mitigation measures and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section 21, "Earlier Analysis," may be cross-referenced).

5) Earlier analysis may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. See CEQA Guidelines Section 15063(c)(3)(D). Earlier analyses are discussed in Section 21 at the end of the checklist.

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier documents and the extent to which address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) The explanation of each issue should identify:

   a) The significance criteria or threshold, if any, used to evaluate each question; and

   b) The mitigation measure identified, if any, to reduce the impact to less than significant

4.1 AESTHETICS	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☒	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

4.1.1 EXISTING CONDITIONS

General Visual Character

The Project site is in an area that offers views of the San Gabriel Mountains and Arroyo Seco. The Upper Arroyo Seco is an open space area that features developed (mostly passive) recreational areas and a reservoir just north of Devil's Gate Dam and within the HWP. The area upstream of the dam transitions into a more natural environment, with the Arroyo Seco flowing through the canyon near the base of the San Gabriel Mountains. Water is perennial in the braided stream, with a large amount of cobbles and boulders. The Project site has views of the Arroyo Seco and is part of the natural landscape of the Upper Arroyo Seco.

Area 1 is defined by a bend in the stream channel with a damaged Headworks structure across the channel; a slightly raised terrace where the sedimentation basins were once located; and a paved/dirt Gabrielino Trail/access road along the eastern edge of the terrace. This area is flanked by vegetated hillsides to the east and west; and the USFS Ranger Station with three residences to the southeast.

Area 2 is a portion of the Arroyo Seco with a diversion structure across the channel; a training wall along the east side of the stream, upstream of the diversion structure; an intake structure at the southern end of the training wall; the Gabrielino Trail/access road along the eastern edge; and a bridge crossing the stream at the southern end. This area is also flanked by vegetated hillsides to the east and west. Two historic bridges (Bridge No. 2 and Bridge No. 3) cross the Arroyo Seco at the southern end of Area 2.

Area 3 is an elongated paved parking lot surrounded by a chain-link fence, with a rising slope to the east and large open sludge ponds/spreading basins to the west. Dirt roads surround the ponds/basins. The Arroyo Seco stream channel is west of the ponds/basins and is not within the Area 3 boundary. There are overhead power and communication lines that cross Area 3 to serve the various developments in the surrounding area and the light poles in the parking lot. A concrete bridge goes over the Arroyo Seco at the northern end of Area 3, leading into the JPL campus. An access road (Explorer Road) extends south from the southern end of Area 3 along a slope and ends at the intersection of Windsor Avenue and Ventura Street.

Due to the minimal amount of aboveground structures, views of the areas where improvements are proposed are generally confined to viewers on nearby roads and trails. These viewers include hikers; bicyclists; equestrians; maintenance personnel; public service responders; residents near Area 1; employees and visitors of JPL that park in Area 3; and other visitors that specifically go to these areas.

Scenic Resources

Several freeways and highways have been included in the California Scenic Highway System as "Officially Designated Scenic Highways" or "Eligible State Scenic Highways". The nearest Officially Designated Scenic Highway is SR-2, which runs through the San Gabriel Mountains from I-210 in La Cañada Flintridge to the San Bernardino County line (Caltrans 2013a). SR-2 is located approximately 1.2 miles northwest of Area 1 at its nearest point, but does not have views of the Arroyo Seco Canyon or HWP due to distance, slopes, and intervening vegetation.

The California Scenic Highway Program also designates I-210 as an Eligible Scenic Highway from the I-5 to the SR-134 (Caltrans 2013a). This freeway runs along the southern edge of Devil's Gate Dam. Travelers on the I-210 can see some of the vegetation within the Devil's Gate Reservoir and the distant mountains, but the spreading basins and parking lot in Area 3 and the more distant Arroyo Seco Canyon are not visible to travelers on I-210.

The Pasadena Comprehensive General Plan includes a Scenic Highways Element that seeks to provide an aesthetic visual experience for travelers on the City's street system. It includes objectives and policies to preserve the aesthetic qualities of streets and highways in Pasadena. The Scenic Highways Element does not designate any roads or highways in the City as Scenic Highways or Scenic Corridors. The Element provides guidelines for the development of a scenic corridor plan and includes a map that shows a portion of the Angeles Crest Highway (in the City) as an Official State Scenic Highway and two "Los Angeles County Recommended Scenic Highways (Unofficial): Linda Vista Avenue and Highland Drive (south of the I-210) and Huntington Drive (from Fremont Street to I-210).[3] These roads do not offer views of the Upper Arroyo Seco.

4.1.2 IMPACT ANALYSIS

Project Design Features

PDF AES-1 Public improvements in Areas 1 and 2 will be designed to comply with the Arroyo Seco Design Guidelines that address habitat restoration and landscaping using high value native plant species that would contribute to the genetic material of the Arroyo Seco, walls, signs, and site furnishings that are consistent with those found in the Hahamongna Watershed Park (HWP), subject to design review and approval by the City's Planning Division.

Regulatory Requirements

RR AES-1 The proposed improvements in Area 3 are required to be designed to comply with applicable criteria in the Arroyo Seco Design Guidelines, subject to design review and approval by the City's Planning Division.

[3] These roads are designated in the 1974 Los Angeles County Scenic Highways Element as Second Priority Routes proposed for further study. The Scenic Highways map in the 2014 Draft Conservation and Natural Resources Element no longer shows these roads as adopted or eligible Scenic Highways.

Impact Discussion

a) Would the project have a substantial adverse effect on a scenic vista?

c) Would the project substantially degrade the existing visual character or quality of the site and its surroundings?

Less Than Significant Impact.

Area 1 and Area 2 Impacts. Views of the Arroyo Seco and surrounding natural areas from the Gabrielino Trail can be considered a scenic vista. The visual character of the area can generally be described as including a relatively undisturbed natural stream and associated vegetation in a heavily-wooded canyon setting. The beauty of the area provides an important amenity for many recreational users. The Project proposes to restore a portion of the Upper Arroyo Seco in Area 1 in order to provide a more natural riparian corridor with native vegetation and natural elements. A nature trail through the riparian corridor would be provided, leading to a rest area/picnic area that would be constructed beside the stream. The Project would not involve the removal of any unique natural features. However, the Project would disturb vegetative cover, including riparian thickets and oak and sycamore woodlands. A total of 17 trees that are protected by the City's Tree Ordinance and the California Fish and Game Code are also expected to be removed. Removal of vegetation and trees is discussed further in Section 4.4, Biological Resources.

The proposed revegetation efforts and preliminary planting palette include four main restoration areas: Riparian Floodplain, Natural Uplands, Irrigated Picnic Area, and Willow Baffles. The trees to be planted would include coast live oak, California sycamore, Fremont cottonwood, California bay laurel, or other suitable native trees, with an associated irrigation system to support the tree establishment. The picnic tables, benches, signs, and horse water trough would utilize natural materials and/or be designed to blend with the landscape in accordance with the Arroyo Seco Design Guidelines (see PDF AES-1) and would not degrade the visual quality of the Arroyo Seco Canyon. The proposed improvements would create a more natural landscape for Area 1 and would provide greater opportunities to enjoy the area's natural open space. Aesthetic impacts related to long-term operations in Area 1 would be less than significant.

A new weir/sluice gate would span the width of the stream in Area 2, along with wing walls; riprap on both sides of the weir/sluice gate; and a control equipment enclosure near the Gabrielino Trail. The eroded portion of the Gabrielino Trail/access road would also be rebuilt to include riprap protection and a rock wall. While these structures would not complement the surrounding landscape, the man-made training wall, intake structure, diversion structure, chain-link fence, and control equipment enclosure in Area 2 have been in place for a long time. The new facilities are replacements for existing damaged infrastructure and are not new structures in a pristine setting. As such, flood control facilities are a component of the existing setting in Area 2 and the proposed Project would not result in an impact that could adversely affect a scenic vista or substantially degrade the visual character of the area. Additionally, the Project would reconstruct and improve these facilities, and the public facilities (e.g., signs, walls, fences, etc.) would be designed in accordance with the Arroyo Seco Design Guidelines (see PDF AES-1). Aesthetic impacts related to long-term operations within Area 2 would be less than significant.

Construction activities would detract from the natural setting, albeit not pristine, as construction equipment, staging areas, excavation, grading activities, demolition, and construction work would be visible to persons near the disturbed areas during the construction phase. Construction equipment and activities are a temporary visual nuisance that are commonplace; however, this impact is more noticeable in the context of the natural setting in Area 1, which is visited by people wishing to experience a natural non-urban setting. Construction activities would temporarily

diminish the visual quality of the areas being disturbed, and possibly the scenic vistas from portions of the Gabrielino Trail. However, this impact would be a short-term visual nuisance. Also, security fencing that may be provided around construction work areas would shield views of construction activities. The security fencing would also be located around equipment staging areas, which includes parking for vehicles/equipment when not in use and stockpiled materials. Impacts would be less than significant.

Views of the historic bridges along the Gabrielino Trail (Bridge No. 2 and Bridge No. 3) would also be affected during construction. These bridges would be protected during construction activities through the construction of a temporary bridge over Bridge No. 3 and the placement of plywood along the railing and balustrades of Bridge No. 2. The temporary bridge and plywood cover would protect and preserve these bridges from damage from passing construction equipment and trucks and would be removed at the end of construction activities. Short-term impacts on views of the bridges would be less than significant. No long-term impacts related to views of the historic bridges would occur.

The visual impacts of construction activities in Area 1 and Area 2 would be short-term and less than significant.

Area 3 Impacts. Area 3 is not considered a scenic vista or a scenic resource. This area consists of a developed parking lot, sludge ponds and spreading basins. However, the area does allow for views of the surrounding scenic areas, including the reservoir behind Devil's Gate, the Arroyo Seco, and the foothills of the San Gabriel Mountains. The creation of a small parking lot for recreational users, a restroom, and a JPL security guard house, as well as expansion of the spreading basins, would lead to a change in visual quality of Area 3.

As stated above in Section 3.2, Project Demolition and Construction, at the time that Project construction begins in Summer 2015, it is anticipated that the JPL East Parking Lot would no longer exist; only 47,164 square feet of paving on the temporary access road would remain as an existing condition on the Project site. The ground surface would be scraped clear of the parking lot and substrate, leaving exposed soils upon removal of the JPL East Parking Lot. The creation of the spreading basins would expand views of open ground and open water, which would be more natural than the existing paved parking lot or the base ground that would remain after JPL removes the parking lot pavement. This could be interpreted by some to be a beneficial visual impact, as there may be the potential for increased use of the open water by waterfowl.

The proposed restroom would feature wood, stone, and earth-tone colors to match its natural surroundings. As required under RR AES-1, the proposed improvements, including trails, would be designed to comply with the Arroyo Seco Design Guidelines. Although these would be new facilities, they would be relatively small, and compliance with RR AES-1 would reduce the potential for visual conflict between proposed structures and the natural setting by reflecting the natural surroundings and cultural heritage of the Arroyo Seco. Aesthetic impacts related to long-term operations within Area 3 would be less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified significant adverse impacts related to aesthetics in the HWP due to the increase in parking areas, parking lot lighting, new restrooms, active recreation areas, and the equestrian refuse disposal area. The Master EIR stated that planned park entrance improvements, widening of the spreading basins, flood management, lakes, overlooks, trails, bicycle routes, habitat conservation, utility improvements, security fencing, and gates are not expected to degrade the visual qualities of the site.

The Project does not propose an expansion of parking areas, parking lot lighting, or active recreation areas, but does include the construction of a new restroom at the northern end of Area 3.

The Master EIR provided mitigation measures to reduce significant adverse aesthetic impacts. The mitigation measures for construction sites from the Master EIR (Measure Aesthetic-1 and Measure Aesthetic-2) are similar to the proposed screening of construction areas and the maintenance of staging areas for safety and security reasons. The mitigation measures in the Master EIR related to new structures and improvements (Measure Aesthetic-6 and Measure Aesthetic-7) are similar to RR AES-1, which would be implemented by the Project. The Master EIR stated that impacts on aesthetics would be less than significant after mitigation.

b) Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. The proposed improvements in Areas 1, 2, and 3 would not be visible from SR-2 (an Officially Designated Scenic Highway) or I-210 (an Eligible Scenic Highway). The Project site is not located within the viewsheds of SR-2 or I-210. Thus, no impacts on scenic resources along these scenic highways would occur.

There are no City-designated Scenic Corridors, and the unofficial Scenic Corridors on Huntington Drive, Highland Drive, and Linda Vista Avenue do not offer views of the Upper Arroyo Seco or the Project site. The Project does not propose a scenic corridor plan and would not affect unofficial scenic corridors or the City's traditional urban design form and historic character.

As discussed above, the Arroyo Seco would be disturbed by construction activities. However, improvements in Area 1 would improve the riparian corridor and natural setting of stream. While a number of mature trees would be removed as part of Project construction, which would affect views of the natural landscape along the Upper Arroyo Seco, replacement of these trees would be provided under PDF BIO-1 and RR BIO-2 (see Section 4.4, Biological Resources).

Views of the historic bridges along the Gabrielino Trail would also be affected during construction as temporary bridges are built over Bridge No. 1 and Bridge No. 3 and as plywood is placed along the railings and balustrades of Bridge No. 2. This impact would be short term and less than significant.

Thus, impacts on scenic resources in the Upper Arroyo Seco would be temporary and less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that no impacts to scenic vistas and scenic highways would occur with implementation of the Arroyo Seco Master Plan, including the HWMP.

d) Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. No new lighting is proposed in Areas 1 or 2. In Area 3, the existing JPL East Parking Lot is lighted; however, JPL would remove the parking lot improvements, including the light poles prior to the start of construction activities for the Project analyzed herein.

No lighting is proposed in the new recreational parking lot, along the access road, or near the spreading basins or trails; also, there would not be any reflective surfaces that could result in glare. The proposed guard station and restroom in Area 3 would have interior and exterior lighting, but these structures are relatively small and would be surrounded by the access road, the new parking lot, the existing slopes, and the trails. In compliance with the Arroyo Seco Design Guidelines (RR AES-1), no lighting is proposed in natural areas; all proposed lighting fixtures would be focused downward and include appropriate shields; and proposed lights would serve both safety and aesthetic purposes. Also, no construction activities are proposed during the nighttime hours. Therefore, there would be less than significant impacts related to light and glare and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that parking lot lighting would result in significant adverse impacts. The Master EIR included mitigation measures (Measure Aesthetic-3 and Measure Aesthetic-4) to reduce significant impacts related to new sources of light. With compliance with the design standards for lighting in the Arroyo Seco Design Guidelines, Measure Aesthetic-3 and Measure Aesthetic-4 would not be necessary to further reduce the impacts of proposed lighting in Area 3 to below a level of significance.

4.1.3 MITIGATION MEASURE

Impacts on aesthetics would be less than significant; therefore, no mitigation measures are required.

4.2 AGRICULTURE AND FOREST RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220[g]), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104[g])?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

4.2.1 EXISTING CONDITIONS

The California Department of Conservation administers the Farmland Mapping and Monitoring Program (FMMP) pursuant to Section 65570 of the *California Government Code.* Due to the predominance of urban development in the southern and central sections of Los Angeles County (which includes the City of Pasadena), this area was not included in the mapping effort by the FMMP (FMMP 2011). As such, there are no designated farmlands in or near the Arroyo Seco Canyon. Also, there are no existing or ongoing agricultural activities in or near the Arroyo Seco Canyon.

The Upper Arroyo Seco is designated and zoned as Open Space and a portion of Area 3 is zoned Planned Development – 16 in the City of Pasadena's Land Use Plan and Zoning Map (Pasadena 2009, 2012b). The Arroyo Seco originates in the ANF, and Area 1 is located within the boundaries of the ANF, while Areas 2 and 3 are located just south of the ANF. Area 1 is designated in the USFS Land Management Plan as Non-Forest System Land (USFS 2005a).

4.2.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

b) Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

e) Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

No Impact.

Areas 1, 2 and 3 Impacts. As discussed above, there is no designated Farmland or Farmland Soils within or near the Upper Arroyo Seco where the Project is proposed. Thus, no impacts on Farmland or Farmland Soils would occur. The Arroyo Seco Canyon and the surrounding area are not zoned for agricultural use, and there are no Williamson Act contracts in the City. Therefore, the Project would not conflict with an agricultural zone or Williamson Act contract. Also, there are no agricultural activities in or near the Upper Arroyo Seco, and no farmland conversion or impacts to agricultural uses would accompany the Project. Therefore, no impacts on agricultural resources would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts on agricultural resources since the Initial Study for the Arroyo Seco Master Plan had determined earlier that no significant impacts to agricultural resources are anticipated.

c) Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code, Section 12220[g]), timberland (as defined by Public Resources Code, Section 4526), or timberland zoned Timberland Production (as defined by Government Code, Section 51104[g])?

d) Would the project result in the loss of forest land or conversion of forest land to non-forest use?

e) Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

No Impact.

Areas 1, 2 and 3 Impacts. There are no timberland or timberland production zones in the City. The Open Space designation and zone for the Upper Arroyo Seco applies to active and passive public recreational facilities and natural open spaces that are environmentally and ecologically significant, while the Planned Development zone applies to sites developed with a particular mix of uses, appearance, land use compatibility, or special sensitivity to neighborhood character (Pasadena 2004). The proposed improvements would occur along the Arroyo Seco, where no forest or timberland resources have been identified in the City of Pasadena Comprehensive General Plan.

While Area 1 is located within the ANF, it is designated as Non-Forest System Land. The Project would not conflict with the adjacent Low Density Residential (LD) or the Open Space-National Forest (O-NF) designation of unincorporated County land to the north and east of Area 1 (LACDRP 2009). The Project would not conflict with the Back Country Motorized Use Restricted (BCMUR) zone north of Area 1, as designated in the ANF's Land Management Plan. The BCMUR zone considers the restoration of vegetation condition as a suitable activity or use and supports non-motorized dispersed recreational opportunities, including camping, hiking, biking, hunting and fishing (USFS 2005b).

No loss of forest resources or conversion of forest land to non-forest use will occur with the Project as the improvements in Area 1 would restore the riparian habitats to protect native plant and animal species and would provide recreational amenities to support recreational uses in the area. Long-term recreational activities in the Arroyo Seco Canyon and operation and maintenance activities on the PWP facilities would not adversely affect nearby forest resources. No impact on forest resources would occur with the Project and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts on forest resources.

4.2.3 MITIGATION MEASURES

There would be no impacts on agriculture and forest resources; therefore, no mitigation measures are required.

4.3 AIR QUALITY	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

4.3.1 EXISTING CONDITIONS

The Project site is located in the Los Angeles County portion of the South Coast Air Basin (SoCAB) and, for air quality regulation and permitting, is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). Both the State of California (State) and the U.S. Environmental Protection Agency (USEPA) have established health-based Ambient Air Quality Standards (AAQS) for air pollutants, which are known as “criteria pollutants”. The AAQS are designed to protect the health and welfare of the populace within a reasonable margin of safety.

The AAQS for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), inhalable particulate matter with a diameter of 10 microns or less (PM10), fine particulate matter with a diameter of 2.5 microns or less (PM2.5), and lead are shown in Table 4.3-1.

TABLE 4.3-1
CALIFORNIA AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards	Federal Standards	
			Primary[a]	Secondary[b]
O_3	1 Hour	0.09 ppm (180 µg/m^3)	–	–
	8 Hour	0.070 ppm (137 µg/m^3)	0.075 ppm (147 µg/m^3)	Same as Primary
PM10	24 Hour	50 µg/m^3	150 µg/m^3	Same as Primary
	AAM	20 µg/m^3	–	Same as Primary
PM2.5	24 Hour	–	35 µg/m^3	Same as Primary
	AAM	12 µg/m^3	12.0 µg/m^3	Same as Primary
CO	1 Hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	–
	8 Hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	–
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)	–	–
NO_2	AAM	0.030 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)	Same as Primary
	1 Hour	0.18 ppm (339 µg/m^3)	0.100 ppm (188 µg/m^3)	–
SO_2	24 Hour	0.04 ppm (105 µg/m^3)	–	–
	3 Hour	–	–	0.5 ppm (1,300 µg/m^3)
	1 Hour	0.25 ppm (655 µg/m^3)	0.075 ppm (196 µg/m^3)	–
Lead	30-day Avg.	1.5 µg/m^3	–	–
	Calendar Quarter	–	1.5 µg/m^3	Same as Primary
	Rolling 3-month Avg.	–	0.15 µg/m^3	
Visibility Reducing Particles	8 hour	Extinction coefficient of 0.23 per km – visibility ≥ 10 miles (0.07 per km – ≥30 miles for Lake Tahoe)	**No Federal Standards**	
Sulfates	24 Hour	25 µg/m^3		
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)		
Vinyl Chloride	24 Hour	0.01 ppm (26 µg/m^3)		

O_3: ozone; µg/m^3: micrograms per cubic meter; PM10: large particulate matter; AAM: Annual Arithmetic Mean; PM2.5: fine particulate matter; CO: carbon monoxide; mg/m^3: milligrams per cubic meter; NO_2: nitrogen dioxide; SO_2: sulfur dioxide; ppm: parts per million; km: kilometer; –: No Standard.

[a] *National Primary Standards:* The levels of air quality necessary, within an adequate margin of safety, to protect the public health.

[b] *National Secondary Standards:* The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Note: More detailed information in the data presented in this table can be found at the CARB website (www.arb.ca.gov).

Source: CARB 2013b.

Regional air quality is defined by whether the area has attained State and federal air quality standards, as determined by air quality data from various monitoring stations. Areas that are considered in "nonattainment" are required to prepare plans and implement measures that will bring the region into "attainment". When an area has been reclassified from nonattainment to attainment for a federal standard, the status is identified as "maintenance", and there must be a plan and measures established that will keep the region in attainment for the next ten years.

For the California Air Resources Board (CARB), an "unclassified" designation indicates that the air quality data for the area are incomplete and there are no standards to support a designation of attainment or nonattainment. Table 4.3-2 summarizes the attainment status of the SoCAB for the criteria pollutants.

TABLE 4.3-2
DESIGNATIONS OF CRITERIA POLLUTANTS IN THE SOUTH COAST AIR BASIN

Pollutant	State	Federal
O_3 (1-hour)	Nonattainment	No Standard
O_3 (8-hour)		Extreme Nonattainment
PM10	Nonattainment	Attainment/Maintenance
PM2.5	Nonattainment	Nonattainment
CO	Attainment	Attainment/Maintenance
NO_2	Nonattainment[a]	Attainment/Maintenance
SO_2	Attainment	Attainment
Lead	Nonattainment/Attainment[a,b]	Nonattainment/Attainment
All others	Attainment/Unclassified	No Standards

O_3: ozone; PM10: respirable particulate matter with a diameter of 10 microns or less; PM2.5: fine particulate matter with a diameter of 2.5 microns or less; CO: carbon monoxide; NO_2: nitrogen dioxide; SO_2: sulfur dioxide.

[a] CARB Executive Order R-14-001 (February 25, 2014) reclassifies the SoCAB to Attainment for NO_2 and Lead. The redesignation will become effective July 1, 2014.

[b] Los Angeles County is classified as nonattainment for lead; the remainder of the SoCAB is in attainment of the State and federal standards.

Sources: CARB 2014a, 2014b; USEPA 2013c.

The nearest sensitive receptors (i.e., residential homes) to the Project site include the USFS Ranger Station, which includes three dwelling units providing housing for USFS Rangers; these are located just east of the Gabrielino Trail in Area 1. The nearest sensitive receptors to Area 2 include single-family residences located along Canyon Dell Drive and Aralia Road approximately 800 feet to the east in the community of Altadena. The nearest sensitive receptors to Area 3 include single-family residences located along Ridgeview Drive, approximately 225 feet to the east in the community of Altadena.

4.3.2 IMPACT ANALYSIS

Regulatory Requirements

RR AQ-1 During construction, the Contractor is required to comply with the South Coast Air Quality Management District's (SCAQMD's) Rule 403, Fugitive Dust, which requires the implementation of best available control measures (BACM) for any activity or man-made condition capable of generating fugitive dust including, but not limited to, earth-moving activities, construction/demolition activities, disturbed surface area, or heavy- and light-duty vehicular movement. The BACMs include stabilizing soil; watering surface soils and crushed materials; covering hauls or providing freeboard; preventing track-out; and limiting vehicle speeds and wind barriers, among others.

RR AQ-2 In accordance with Section 2449(d)(3) of the California Air Resources Board's (CARB's) Regulation for In-Use Off-Road Diesel-Fueled Fleets, construction equipment and vehicles are required to limit idling times to no more than five consecutive minutes.

Impact Discussion

a) Would the project conflict with or obstruct implementation of the applicable air quality plan?

No Impact.

Areas 1, 2 and 3 Impacts. The SCAQMD develops rules and regulations; establishes permitting requirements for stationary sources; inspects emissions sources; and enforces such measures through educational programs or fines, when necessary. It is directly responsible for reducing emissions from stationary (area and point), mobile, and indirect sources and has prepared an Air Quality Management Plans (AQMP) that establishes a program of rules and regulations directed at attaining the National Ambient Air Quality Standards (NAAQS) and California Ambient Air Quality Standards (CAAQS).

On December 7, 2012, the SCAQMD adopted the 2012 AQMP, which is a regional and multi-agency effort (SCAQMD, CARB, Southern California Association of Governments [SCAG], and USEPA). The 2012 AQMP incorporates the latest scientific and technical information and planning assumptions, including the 2012 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS); updated emission inventory methodologies for various source categories; and SCAG's latest growth forecasts. On December 20, 2012, the 2012 AQMP was submitted to CARB and the USEPA for concurrent review and approval for inclusion in the SIP (SCAQMD 2013a). The 2012 AQMP was approved by the CARB on January 25, 2013 (CARB 2014c).

The main purpose of an AQMP is to bring an area into compliance with the requirements of federal and State air quality standards. For a project to be consistent with the AQMP, the pollutants emitted from the project should not (1) exceed the SCAQMD CEQA air quality significance thresholds or (2) conflict with or exceed the assumptions in the AQMP. As shown in Threshold 4.3(b) below, pollutant emissions from the proposed Project would be less than the SCAQMD thresholds and would not result in a significant impact. The Project is consistent with the Zoning and General Plan Land Use designations for the site and is therefore consistent with the growth expectations for the region. Further, the proposed Project would not result in development or new land uses that have not been anticipated in the AQMP. No conflict with the 2012 AQMP would occur with the proposed Project. No impact is expected and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify a potential conflict with the AQMP.

b) Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. The SCAQMD has adopted significance thresholds to assess the regional impact of air pollutant emissions in the SoCAB. Table 4.3-3, SCAQMD Criteria Pollutant Mass Emissions Significance Thresholds, summarizes the SCAQMD's mass emissions thresholds, which are presented for both short-term construction and long-term operational emissions. A project with emissions rates below these thresholds is considered to have a less than significant effect on air quality.

TABLE 4.3-3
SCAQMD CRITERIA POLLUTANT SIGNIFICANT MASS EMISSIONS SIGNIFICANCE THRESHOLDS (LBS/DAY)

Criteria Pollutant	Construction	Operation
VOC	75	55
NOx	100	55
CO	550	550
SOx	150	150
PM10	150	150
PM2.5	55	55

SCAQMD: South Coast Air Quality Management District; lbs/day: pounds per day; VOC: volatile organic compounds; NOx: oxides of nitrogen; CO: carbon monoxide; SOx: oxides of sulfur; PM10: respirable particulate matter with a diameter of 10 microns or less; PM2.5: fine particulate matter with a diameter of 2.5 microns or less.

Source: SCAQMD 2011.

Regional Construction Impacts

The SCAQMD has established methodologies to quantify air pollutant emissions associated with construction activities, such as air pollutant emissions generated by operation of on-site construction equipment; fugitive dust emissions related to trenching and earthwork activities; and mobile (tailpipe) emissions from construction worker vehicles and haul/delivery truck trips. Emissions would vary from day to day, depending on the level of activity; the specific type of construction activity occurring; and, for fugitive dust, prevailing weather conditions.

A construction-period mass emissions inventory was compiled based on an estimate of construction equipment as well as scheduling and Project phasing assumptions. More specifically, the mass emissions analysis takes into account the following:

- Combustion emissions from operating on-site stationary and mobile construction equipment.
- Fugitive dust emissions from demolition, site preparation, and grading phases.
- Mobile-source combustion emissions and fugitive dust from worker commute and truck travel.

For the purposes of estimating emissions associated with construction activities, a conservative timeframe of March 2015 through April 2016 was applied to the modelling (as later dates would generally result in less emissions). Emissions were calculated using the California Emissions Estimator Model (CalEEMod) emissions inventory model (SCAQMD 2013b). CalEEMod is a computer program accepted by the SCAQMD that can be used to estimate anticipated emissions associated with land development projects in California. CalEEMod has separate databases for specific counties and air districts, and the Los Angeles County database was used for the proposed Project. Consistent with the requirements of SCAQMD Rule 403 (RR AQ-1), watering for dust control is assumed in the emissions calculations.

The mass emissions thresholds (see Table 4.3-3) are based on the rate of emissions (i.e., pounds of pollutants emitted per day). Therefore, the quantity, duration, and the intensity of construction activities are important in ensuring analysis of worst-case (i.e., maximum daily emissions) scenarios. Project activities (e.g., demolition, grading, building construction) are identified by start date and duration, as described in Table 3.2-1. Each activity has associated off-road equipment (e.g., dozers, backhoes, cranes) and on-road vehicles (e.g., haul trucks, concrete trucks, worker

commute vehicles). The City may choose to add a shaker during the grading of Area 3 to separate excavated aggregate and an additional front-end loader to support the shaker. The emissions calculations assume the shaker and loader would be operating. Detailed construction assumptions and CalEEMod inputs and outputs can be found in Appendix A.

Maximum daily emissions during the peak work day are shown in Table 4.3-4, Estimated Maximum Daily Construction Emissions. Actual emissions could be less than those forecasted due to the conservative nature of the assumptions incorporated into the CalEEMod program regarding phasing. If construction is delayed or occurs over a longer time period, emissions could be reduced because of (1) a more modern and cleaner-burning construction equipment fleet mix and/or (2) a less intensive buildout schedule (i.e., fewer daily emissions occurring over a longer time interval). As shown, all criteria pollutant emissions from Project construction would be less than their respective thresholds. Thus, impacts would be less than significant and no mitigation is required.

TABLE 4.3-4
ESTIMATED MAXIMUM DAILY CONSTRUCTION EMISSIONS
(LBS/DAY)

	VOC	NOx	CO	SOx	PM10	PM2.5
Maximum daily emissions in 2015	8	53	68	<0.5	7	4
Maximum daily emissions in 2016	7	60	48	<0.5	5	3
SCAQMD Daily Thresholds	***75***	***100***	***550***	***150***	***150***	***55***
Exceeds SCAQMD Thresholds?	**No**	**No**	**No**	**No**	**No**	**No**

lbs/day: pounds per day; VOC: volatile organic compound(s); NOx: nitrogen oxides; CO: carbon monoxide; SOx: sulfur oxides; PM10: respirable particulate matter with a diameter of 10 microns or less; PM2.5: fine particulate matter with a diameter of 2.5 microns or less; SCAQMD: South Coast Air Quality Management District.

Source: SCAQMD 2011 (thresholds).

Localized Construction Impacts

The localized effects from the on-site portion of daily emissions were evaluated at sensitive receptor locations that would be potentially impacted by the Project; these were evaluated according to the SCAQMD's localized significance threshold (LST) methodology, which utilizes on-site mass emissions rate look up tables and Project-specific modeling, where appropriate. LSTs are applicable to the following criteria pollutants: NO_2, CO, PM10, and PM2.5.[4] LSTs represent the maximum emissions from a project that are not expected to cause or contribute substantially to an exceedance of the most stringent applicable federal or State ambient air quality standard. These are developed based on the ambient concentrations of that pollutant for each source receptor area and distance to the nearest sensitive receptor. For PM10 and PM2.5, LSTs were derived based on requirements in SCAQMD's Rule 403 regarding Fugitive Dust (RR AQ-1). The mass rate look-up tables were developed for each source receptor area and can be used to determine whether or not a project may generate significant adverse localized air quality impacts. The SCAQMD provides LST mass rate look-up tables for projects that are less than or equal to five acres. For projects that exceed five acres, the five-acre LST look-up values can be used as a screening tool to determine which pollutants require detailed analysis. This approach is conservative as it assumes that all on-site emissions would occur within a five-acre area and over-predicts potential localized impacts (i.e., more pollutant emissions occurring within a smaller area and within closer proximity to potential sensitive receptors).

[4] NO_2 impacts are addressed by evaluating nitrogen oxide (NOx) emissions.

When quantifying mass emissions for localized analysis, only emissions that occur on site are considered. Consistent with the SCAQMD's LST methodology guidelines, emissions related to off-site delivery/haul truck activity and employee trips are not considered in the evaluation of localized impacts.

As shown in Table 4.3-5, localized construction emissions for all criteria pollutants would be less than their respective SCAQMD LST significance thresholds. Thus, impacts would be less than significant and no mitigation is required.

TABLE 4.3-5
MAXIMUM LOCALIZED CONSTRUCTION POLLUTANT EMISSIONS
(LBS/DAY)

	NOx	CO	PM10	PM2.5
Area 1	15	11	3	2
SCAQMD LSTs[a]	***148***	***1,540***	***12***	***7***
Exceeds SCAQMD Thresholds?	**No**	**No**	**No**	**No**
Area 2	22	12	1	1
SCAQMD LSTs[b]	***104***	***2,229***	***58***	***18***
Exceeds SCAQMD Thresholds?	**No**	**No**	**No**	**No**
Area 3	28	15	5	2
SCAQMD LSTs[c]	***141***	***1,921***	***37***	***9***
Exceeds SCAQMD Thresholds?	**No**	**No**	**No**	**No**

lbs/day: pounds per day; NOx: nitrogen oxides; CO: carbon monoxide; PM10: respirable particulate matter with a diameter of 10 microns or less; PM2.5: fine particulate matter with a diameter of 2.5 microns or less; SCAQMD: South Coast Air Quality Management District; LST: Local Significance Threshold; SRA: Source Receptor Area.

[a] Thresholds are for 5-acre site with receptors located within 25 meters in SRA 8.
[b] Thresholds are for 1-acre site with receptors located within 200 meters.
[c] Thresholds are for 5-acre site with receptors located within 50 meters in SRA 8.

Source: SCAQMD 2009 (LSTs).

Toxic Air Contaminants Impacts

The greatest potential for toxic air contaminant (TAC) emissions during construction would be related to diesel particulate emissions associated with heavy equipment operations during site grading activities. The SCAQMD does not consider diesel-related cancer risks from construction equipment to be an issue due to the short-term nature of construction activities. Construction activities associated with the proposed Project would be short term (14 months at Area 3, less at Areas 1 and 2). The assessment of cancer risk is typically based on a 70-year exposure period. Because exposure to diesel exhaust would be well below the 70-year exposure period, construction of the proposed Project is not anticipated to result in an elevated cancer risk to exposed persons. As such, Project-related TAC impacts during construction would be less than significant and no mitigation is required.

Long-Term Operational Impacts

Operational emissions are comprised of area, energy, and mobile (i.e., vehicle) source emissions. The primary source of operational criteria pollutant emissions from the proposed Project would be vehicles used by the increased number of trail users and visitors to the Arroyo Seco Canyon that would utilize the improvements associated with the Project. In order to estimate vehicle emissions, it was assumed that trail users and visitors would increase by up to 25 vehicles on weekdays and 200 vehicles on holiday weekends. Other mobile sources include haul truck trips

for the regular removal of sediment from the sedimentation and spreading basins (estimated at 100 truckloads every year for sedimentation basin cleanup and 100 truckloads every 5 years for spreading basins cleanup) and trips for maintenance of the restrooms, trash cans, and pet waste stations (assumed to be at least weekly removal of trash and twice weekly cleaning of the restroom). Energy consumption for the Project was based on data for the same activity in city parks land use. Area source emissions include reapplication of architectural coatings and landscaping activities. Emissions were calculated with the CalEEMod model, as discussed above.

Estimated peak daily operational emissions from the Project, as shown in Table 4.3-6, would be substantially below the SCAQMD regional thresholds of significance. Therefore, the impact would be less than significant.

TABLE 4.3-6
PEAK DAILY OPERATIONAL EMISSIONS

Emissions Source	Emissions (lbs/day)				
	VOC	**NOx**	**CO**	**PM10**	**PM2.5**
Area sources	<0.5	<0.5	<0.5	<0.5	<0.5
Energy sources	<0.5	<0.5	<0.5	<0.5	<0.5
Mobile sources	1	2	8	1	<0.5
Total Operational Emissions	**1**	**2**	**8**	**1**	**<0.5**
SCAQMD Significance Thresholds	55	55	550	150	55
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**

lbs/day: pounds per day; VOC: volatile organic compounds; NOx: nitrogen oxides; CO: carbon monoxide; PM10: respirable particulate matter with a diameter of 10 microns or less; PM2.5: fine particulate matter with a diameter of 2.5 microns or less.

Totals may not add due to rounding

Notes: Emissions are higher of summer or winter seasons.
SOx and lead emissions are not shown; these emissions would be negligible for the Project.
CalEEMod model data sheets are included in Appendix A.

Source: SCAQMD 2011 (thresholds).

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that no significant air quality impacts from regional or local operational emissions would occur, but NOx and PM10 emissions during construction activities would be significant and unavoidable during the peak day and the peak quarter. The Master EIR identified 11 mitigation measures to reduce these impacts but determined that peak day and peak quarter NOx and PM10 emissions would still exceed SCAQMD thresholds and would remain significant even after mitigation.

The Project would implement RR AQ-1, which requires the implementation of the same best available control measures (BACMs) outlined in Measures Air-1 to Air-9 of the Master EIR. Measure Air-10 is not applicable since the Project would not exceed SCAQMD thresholds and the Project would implement RR AQ-2, which is similar to Measure Air-11. However, no mitigation measures are required to reduce these impacts to below a level of significance.

c) Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. The SCAQMD's approach for assessing cumulative impacts is based on the AQMP forecasts of attainment of ambient air quality standards in accordance with the requirements of the Federal and State Clean Air Acts. As discussed earlier in Threshold 4.3(a), the proposed Project would be consistent with the AQMP, which is intended to bring the SoCAB into attainment for all criteria pollutants.[5] In addition, the mass regional emissions calculated for the proposed Project (Tables 4.3-5 and 4.3-6) would be less than SCAQMD's daily significance thresholds that are designed to assist the region in attaining the applicable CAAQS and NAAQS.

Short-term cumulative impacts related to air quality could occur if Project construction and nearby construction activities were to be near or exceed the thresholds for significance and would occur simultaneously. In particular, with respect to local impacts, cumulative construction particulate (i.e., fugitive dust) impacts are considered when projects are located within a few hundred yards of each other. As described in Section 4.18, Mandatory Findings of Significance, there is one project, sediment removal at the Devil's Gate Reservoir, which could have overlapping construction with the Project. However, as shown in Table 4.3-4, Project construction emissions would be well below the SCAQMD regional significance thresholds; particularly, particulate matter emissions would be less than ten percent of the thresholds. The Project's relatively minor contribution to short-term air quality emissions would not result in a cumulatively considerable net increase of any criteria pollutant. Therefore, the incremental effect of Project-related construction emissions of nonattainment pollutants would not be cumulatively considerable and Project impacts would be less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that no significant air quality impacts from regional or local operational emissions would occur, but NOx and PM10 emissions during construction activities would be significant and unavoidable during the peak day and the peak quarter. The Master EIR identified 11 mitigation measures to reduce these impacts, but determined that peak day and peak quarter NOx and PM10 emissions during construction would still exceed SCAQMD thresholds and would remain significant even after mitigation.

As stated above, the Project would implement RR AQ-1, which requires the implementation of the same BACMs outlined in Measures Air-1 to Air-9, and RR AQ-2, which is similar to Measure Air-11. However, no mitigation measures are required to reduce these impacts to below a level of significance.

[5] Section 15064(h)(3) of the State CEQA Guidelines states "A lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program which provides specific requirements that will avoid or substantially lessen the cumulative problem (e.g., water quality control plan, air quality plan, integrated waste management plan) within the geographic area in which the project is located. Such plans or programs must be specified in law or adopted by the public agency with jurisdiction over the affected resources through a public review process to implement, interpret, or make specific the law enforced or administered by the public agency".

d) Would the project expose sensitive receptors to substantial pollutant concentrations?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. As described in Threshold 4.3(b), the proposed Project would not result in any substantial TAC air pollution impacts, and construction criteria pollutant emissions would be less than the conservative LSTs. Therefore, Project construction would not expose any nearby sensitive receptors to substantial pollutant concentrations.

A CO hotspot is an area of localized CO pollution that is caused by severe vehicle congestion on major roadways, typically near intersections. If a project increases average delay at signalized intersections that are operating at level of service (LOS) E or F or causes an intersection that would operate at LOS D or better without the project to operate at LOS E or F with the project, there is a potential for a CO hotspot.

As discussed in Section 4.16, Transportation and Traffic, under Threshold a), the Project is expected to generate relatively small amounts of new traffic in the long term, most of which will be generated during non-peak hours (for trail use and inspection and maintenance of the proposed improvements) and on weekends (for trail use). During construction, vehicle trips generated by the Project would also not create a CO hotspot since construction vehicle trips would be restricted to non-peak hours, as outlined in MM TRA-1. Therefore, the Project would not increase congestion at major signalized intersections.

There would be no impact and no exposure of sensitive receptors to Project-generated local CO emissions. As such, the proposed Project would have a less than significant impact and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that no significant impact to local CO concentrations would occur and that traffic increases would not be sufficient to increase CO levels above SCAQMD's allowable increase.

e) Would the project create objectionable odors affecting a substantial number of people?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. According to the SCAQMD's *CEQA Air Quality Handbook,* land uses associated with odor complaints typically include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding (SCAQMD 1993). The proposed Project does not propose any of these land uses and would not otherwise produce objectionable long-term operational odors.

Short-term construction equipment and activities would generate odors, such as diesel exhaust emissions from construction equipment and paving activities. There may be situations where construction activity odors would be noticeable by persons on the Gabrielino Trail, but these odors would not be unfamiliar or necessarily objectionable. The odors would be temporary and would dissipate rapidly from the source with an increase in distance. Therefore, the impacts would be short-term; would not be objectionable to a substantial number of people; and would be less than significant. All Project-related odors are construction related and short term in nature; no long-term operational odors would be created. As such, the proposed Project would have no impact in regards to objectionable odors.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that there are no known sources of odors in the Project area that will be released during construction.

4.3.3 MITIGATION MEASURES

There would be no significant adverse impacts related to air quality with compliance with RR AQ-1 and RR AQ-2; therefore, no mitigation measures are required.

4.4 BIOLOGICAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☒	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Vegetation mapping, general plant and wildlife surveys, habitat assessments for special status species, focused surveys, a tree report, and a jurisdictional delineation have been completed to determine the presence of biological resources that may be impacted by the Project. The findings of these studies are summarized below and the studies are provided in Appendix B.

4.4.1 EXISTING CONDITIONS

The Project site is located within Arroyo Seco Canyon on the southern front of the San Gabriel Mountains. This Canyon represents one of the largest in the area and drains a large portion of the Angeles National Forest north of the Project site. The Canyon has a north-south alignment with steep east and west facing slopes. Chaparral and coastal sage scrub/sumac scrub are the dominant vegetation types on these steep slopes, although there are pockets of coast-live oak woodlands on the east facing slopes. A perennial stream with pool and riffles meanders through the canyon bottom and supports a dense riparian woodland before exiting the Canyon and crossing alluvial flats towards the Devil's Gate Dam.

The survey area included four locations: Area 1 – Arroyo Seco Headworks; Area 2 – Arroyo Seco Intake; Area 3 – JPL East Parking Lot; and a Temporary Staging Site. These four locations are connected together by the Gabrielino Trail, which serves as a recreational trail, as well as a

vehicular access road to the Arroyo Seco Canyon for the City of Pasadena and the USFS. This area supports a variety of plant and wildlife species.

Twenty-two vegetation types and other areas (i.e., unvegetated areas) occur in the Project's study area and are depicted in the Vegetation Map included in Exhibits 4-1a, 4-1b, 4-1c, and 4-1d. Where one vegetation type overlaps another type of mapping unit (e.g., a tree canopy over water or roads), the area was mapped according to the uppermost canopy of vegetation. Nomenclature for vegetation types generally follows that of *The Vegetation Classification and Mapping Program: List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database*.

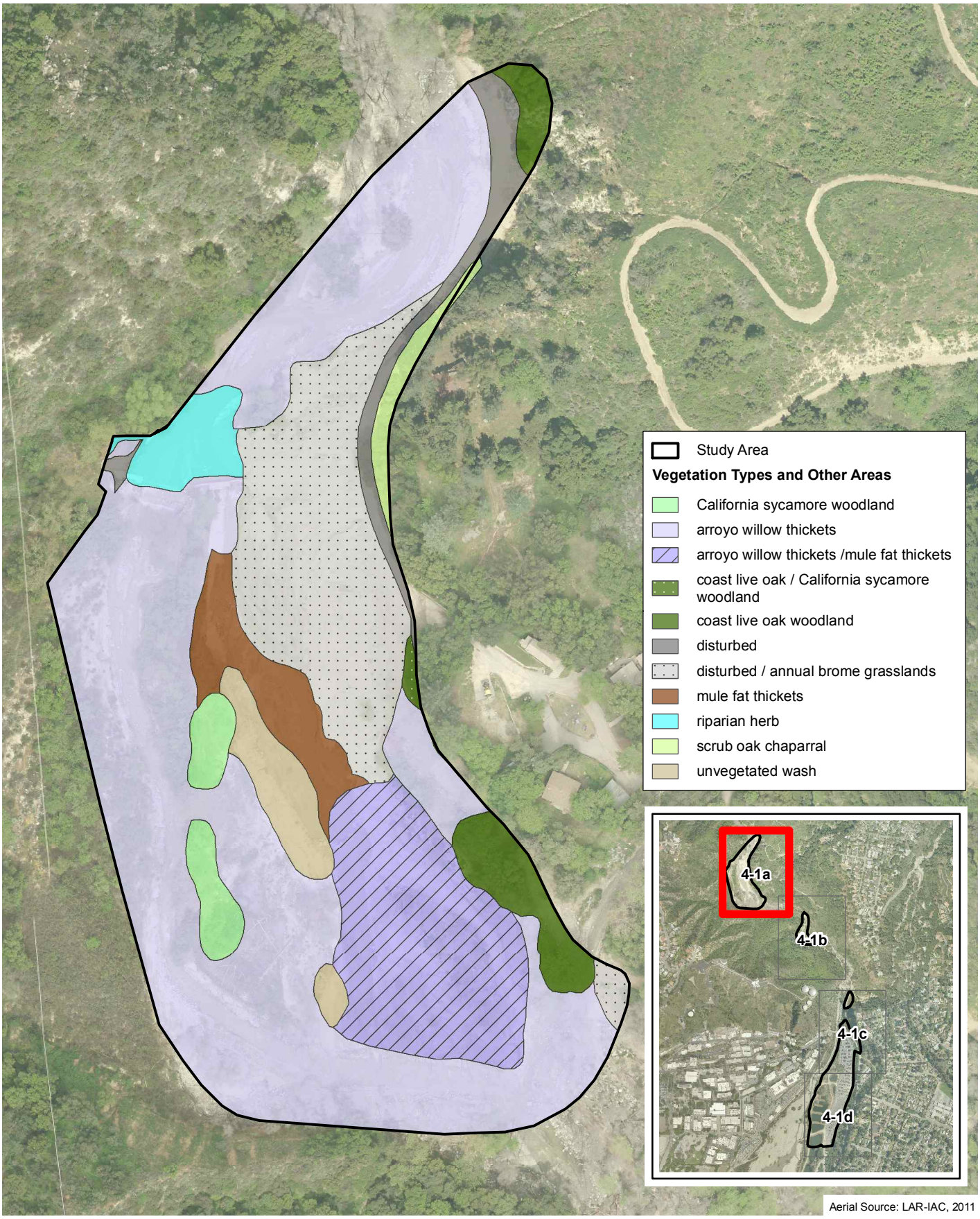
Vegetation types within the project site disturbance limits include California buckwheat scrub, California buckwheat scrub/annual brome grasslands, California buckwheat scrub/laurel sumac scrub, coast-live oak woodland, California sagebrush scrub/laurel sumac scrub, California sagebrush scrub/California buckwheat scrub, disturbed, disturbed/annual brome grasslands, mule fat thickets, annual brome grasslands, coast live oak/California sycamore woodland, poison oak scrub, riparian herb, riparian herb/unvegetated wash, scrub oak chaparral, arroyo willow thickets, laurel sumac scrub, California sycamore woodland; white alder grove/California sycamore woodland, and arroyo willow thickets/mule fat thickets. Area 1 is dominated by arroyo willow thicket and white alder grove/California sycamore woodlands; Area 2 is dominated by white alder grove/California sycamore woodland, Area 3 is dominated by developed and disturbed/annual brome grasslands; and the temporary staging site is dominated by California sagebrush scrub/California buckwheat scrub. Vegetation on the project site primarily consists of native trees and plants (as indicated by the vegetation types above), though minimal amounts of non-native vegetation such as eupatory (*Ageratina adenophora*), giant reed (*Arundo donax*), cape ivy (*Delairea oderata*), and tree tobacco (*Nicotiana glauca*) were observed in the disturbed portions of Area 1.

Wildlife

The native vegetation types discussed above combined with the presence of naturally occurring pooled and running water give the site potential to support many wildlife species. The following discussion is intended to provide a general description of wildlife species observed or expected to occur on the Project site.

Fish within the Project area are predominantly non-native mosquito fish (*Gambusia affinis*). One native fish, rainbow trout (*Oncorhynchus mykiss*) is known to occur in upstream and downstream pockets, although its genetic origin is unclear due to stocking which occurred for many years in the Arroyo Seco. One other native fish, arroyo chub (*Gila orcuttii)*, was recently reintroduced within the Devil's Gate Dam area and may persist at that location. Although habitat is potentially suitable, with pooling and flowing water in portions of the site year-round, native species have largely been extirpated from the project area. Post-Project conditions are expected to enhance suitability for fish occupation as a result of removing structures and diversions in Area 1 and the new weir design will reduce potential fish mortality and increase potential for passage throughout the area when and where flows are sufficient.

Amphibians spend at least part of their life cycle in water. Amphibians are expected on the Project site due to the presence of water. Amphibians observed or expected to occur on the Project site include the coast range newt (*Taricha torosa torosa*), California chorus frog (*Pseudacris cadaverina*), Pacific chorus frog (*Pseudacris regilla*), and western toad (*Anaxyrus boreas*).



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Area 1 Existing Vegetation

Exhibit 4-1a

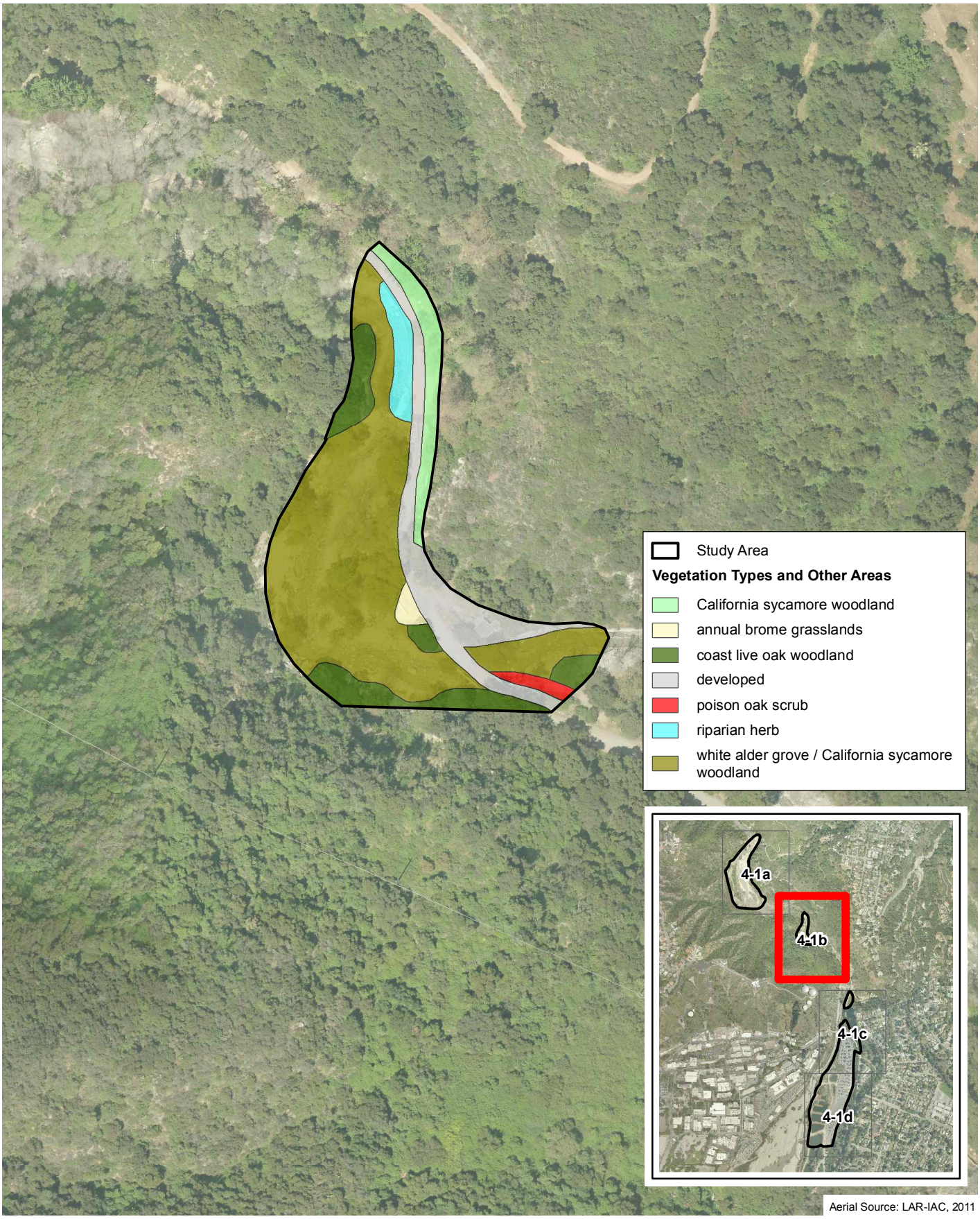
Arroyo Seco Canyon Project

N W E S

150 75 0 150 Feet

BonTerra PSOMAS

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Aerial Source: LAR-IAC, 2011

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Area 2 Existing Vegetation

Exhibit 4-1b

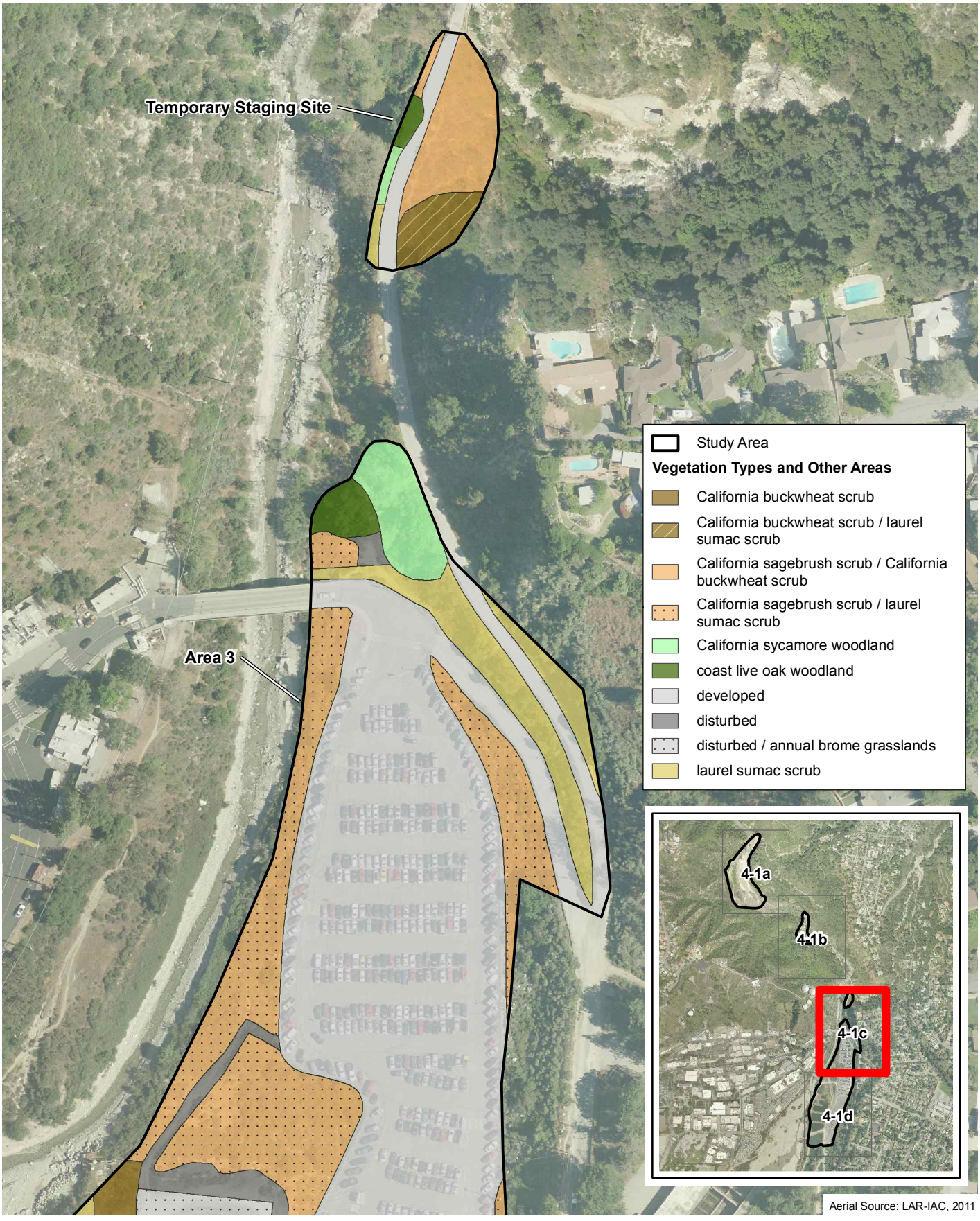
Arroyo Seco Canyon Project

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Aerial Source: LAR-IAC, 2011

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Area 3 Existing Vegetation

Exhibit 4-1c

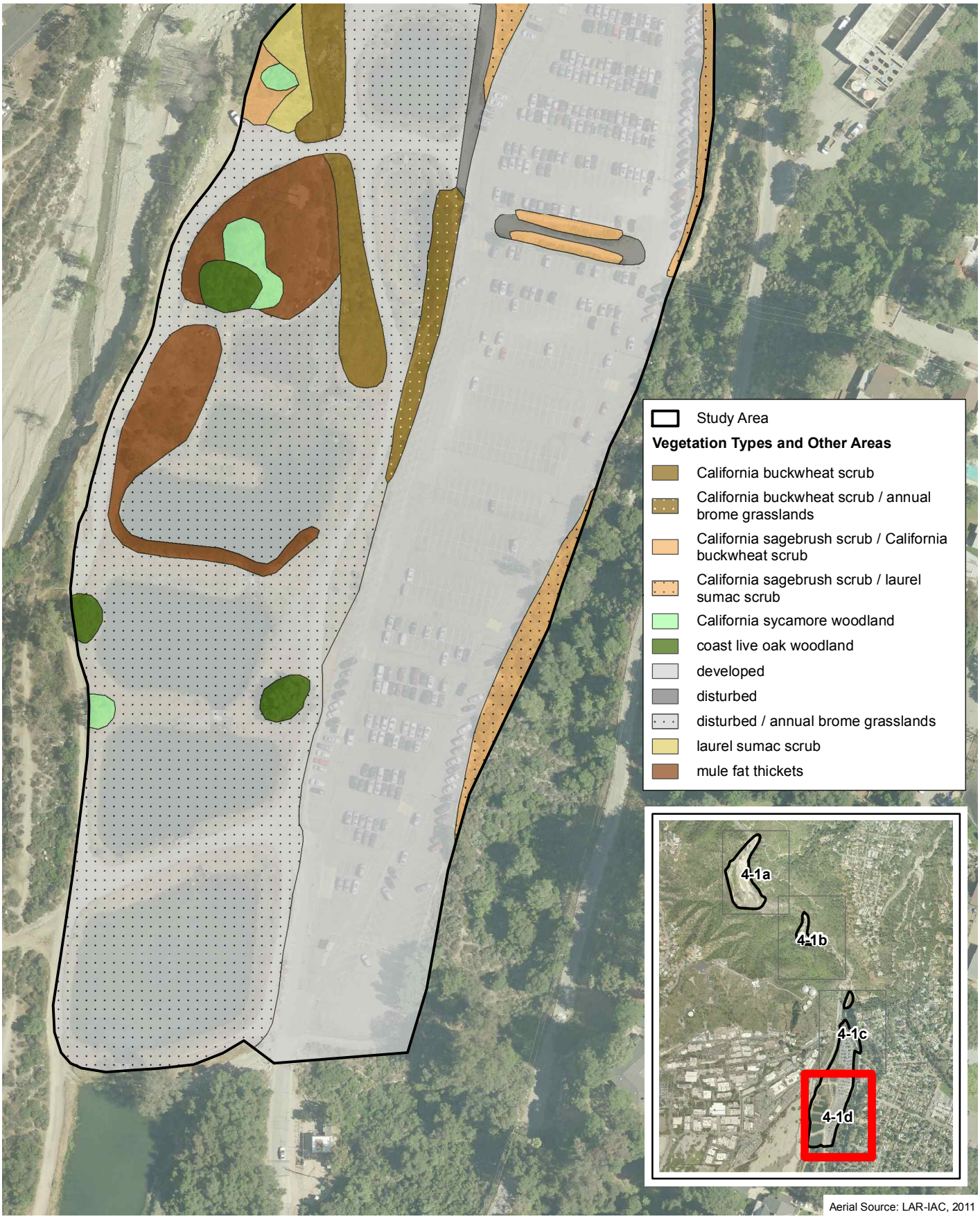
Arroyo Seco Canyon Project

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150 75 0 150 Feet

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Aerial Source: LAR-IAC, 2011

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Area 3 Existing Vegetation

Exhibit 4-1d

Arroyo Seco Canyon Project

N W E S

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Reptiles generally favor habitats with boulders, rocks, cobble and sand. These elements offer protection from predators and thermal insulation. The Project site contains these elements in the upland areas and the unvegetated portions of the stream. Reptiles observed or expected to occur on the Project site include western fence lizard (*Sceloporus occidentalis*), Western whiptail (*Cnemidophorus tigris*), side-blotched lizard (*Uta stansburiana*), gopher snake (*Pituophis catenifer*), and western rattlesnake (*Crotalus oreganus*).

The Project site contains and is contiguous with a large open space area. This association with a large open space area and a perennial source of water on the Project site is expected to draw a multitude of bird species (residents and migrants). Bird species that were observed or expected to occur on the Project site include residents such as the California quail (*Callipepla californica*), western screech-owl (*Megascops kennicottii*), great horned owl (*Bubo virginianus*), Anna's hummingbird (*Calypte anna*) acorn woodpecker (*Melanerpes formicivorus*), western scrub-jay (*Aphelocoma californica*), oak titmouse (*Baeolophus inornatus*), bushtit (*Psaltriparus minimus*), house wren (*Troglodytes aedon*), California towhee (*Melozone crissalis*), lesser goldfinch (*Spinus psaltria*), and migrants such as black-chinned hummingbird (*Archilochus alexandri*), western wood-pewee (*Contopus sordidulus*), Pacific-slope flycatcher (*Empidonax difficilis*), cliff swallow (*Petrochelidon pyrrhonota*), black-throated gray warbler (*Setophaga nigrescens*), Wilson's warbler (*Cardellina pusilla*), white-crowned sparrow (*Zonotrichia leucophyrys*), and Bullock's oriole (*Icterus bullockii*).

Mammals are also expected to utilize the Project site for the same reasons mentioned above. The Project site is expected to have a high abundance of small and large mammals. Mammals observed or expected to occur on the Project site include large mammals such as the mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), mountain lion (*Puma concolor*), American black bear (*Ursus americanus*), bobcat (*Lynx rufus*), small mesopredators such as striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and Virginia opossum (*Didelphis virginiana*); and small herbivores like the desert cottontail (*Sylvilagus audubonii*),California ground squirrel (*Otospermophilus beecheyi*), and Botta's pocket gopher (*Thomomys bottae*). A variety of bats are also expected to occur on the Project site including the California bat (*Myotix californicus*), hoary bat (*Lasiurus cinereus*), big brown bat (*Eptesicus fuscus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*).

Special Status Resources

A number of special status resources have the potential to occur on the Project site. These include the least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus)*, California red-legged frog (*Rana draytonii*), arroyo toad (*Bufo californicus*), special status plants, regulated trees, jurisdictional waters and their associated habitats, and nesting birds. Other special status species are known to occur or may potentially occur but are not expected to be impacted by the Project.

Least Bell's Vireo/Willow Flycatcher

The least Bell's vireo and willow flycatcher are Endangered species that have the potential to occur in the willow riparian woodlands along the Arroyo Seco drainage. Historically, the breeding habitat of the least Bell's vireo and southwestern willow flycatcher is primarily riparian dominated by willows with dense understory vegetation. The southwestern willow flycatcher differs from least Bell's vireo in that it shows a stronger dependency on willow thickets and surface water for all its requirements. According to findings by the U.S. Fish and Wildlife Service, the Project site is not located in designated critical habitat for the least Bell's vireo or southwestern willow flycatcher.

Protocol surveys for the least Bell's vireo and the southwestern willow flycatcher indicated that no breeding least Bell's vireos or southwestern willow flycatchers were present on or near the Project site. Also, no migrant least Bell's vireo or willow flycatchers were observed during the surveys. The survey report is provided in Attachment F of Appendix B.

California Red-Legged Frog

The California red-legged frog is an Endangered species that has the potential to occur in the open water of the Arroyo Creek that runs through the Project site. The California red-legged frog was a common native frog in parts of Los Angeles, San Bernardino, Orange, Riverside, and San Diego Counties. This frog historically occurred in the San Gabriel Wilderness Area of the ANF; until 1999, there were no post-1970 observations in this area or nearby parts of the ANF. In 1999, a population of California red-legged frogs was located on the ANF in the San Francisquito Drainage in the Santa Clarita area. Current population estimates suggest that there are between 15 and 25 adults. This population, however, is threatened by non-native predators, disease, and parasites. The nearest recorded population is located on the north side of the San Gabriel Mountains approximately 15 miles away from the Project site. The Project site is not located within designated critical habitat for this species.

Focused surveys for the California red-legged frog indicated that no red-legged frog was present on or near the Project site. The survey report is provided in Attachment E of Appendix B.

Arroyo Toad

The arroyo toad is a federally Endangered species that has the potential to occur in the open water of the Arroyo Seco stream that runs through the project site. The arroyo toad is found from northern San Luis Obispo County south to Baja California, with an elevational range that extends up to 1,950 meters. This species is found in semi-arid regions near washes or intermittent streams. Habitats used include valley-foothill and desert riparian as well as a variety of more arid habitats including desert wash, palm oasis, and Joshua tree, mixed chaparral, and sagebrush. Adults are active from March to July. Arroyo toads are found near rivers with sandy banks, willows, cottonwoods, and sycamores in valley-foothill areas, desert riparian habitats, and in loose gravelly areas of streams in drier portions of its range. The nearest recorded population is located near the center of the Angeles National Forest, over 12 miles away from the Project site.

Focused surveys for the arroyo toad indicated that no arroyo toad was present on or near the Project site. The survey report is provided in Attachment E of Appendix B.

Special Status Plants

Special status plants have the potential to occur in many of the Project site's activity areas. Various plants are considered to be special status by State and federal resource agencies, academic institutions, and various conservation groups. Determination of the sensitivity level is based on the Nature Conservancy Heritage Program Status Ranks, which ranks special status plants on a global and statewide basis according to the number and size of remaining occurrences and recognized threats.

Botanical surveys conducted in and near the Project site indicate that no special status plants were observed on site. Two special status plants listed on the California Rare Plant Rank (CRPR) Watch List (i.e. Southern California black walnut [*Juglans californica*] trees), were recorded near the site. One is adjacent to the Area 3 boundaries (slope to the east of the impact area) and the other is adjacent to the staging area. These two trees are not located within the Project's disturbance limits and would not be impacted by Project implementation.

The special status plant survey report is provided in Attachment C of Appendix B.

Jurisdictional Waters and Associated Habitats

Vegetation types found in the Project area may be subject to permit requirements, as regulated by the USACE, the CDFW, and the RWQCB pursuant to Section 404 of the Clean Water Act and Sections 1600 et seq. of the *California Fish and Game Code.* The USACE takes jurisdiction over areas considered "waters of the U.S.", which can consist of wetland and non-wetland areas. Non-wetland jurisdictional waters (identified in the table below as open water and other non-wetland "waters of the U.S.") are typically defined by the ordinary high water mark and other specific criteria. Wetlands, a subset of jurisdictional "waters of the U.S.", are defined as those that possess the following three parameters: (1) hydrology that provides permanent or periodic inundation by groundwater or surface water; (2) hydric soils; and (3) hydrophytic vegetation. RWQCB jurisdictional limits equal those of the USACE, but can also include "isolated waters" that do not have a connection to a traditional navigable waterway. CDFW jurisdictional limits extend to the top of bank and generally exceed the USACE jurisdictional limits. CDFW jurisdictional areas also include riparian habitat supported by a river, stream, or lake regardless of the presence or absence of hydric soils and saturated soil conditions. The limits of CDFW jurisdiction are often defined by riparian vegetation.

Table 4.4-1 shows the amount of jurisdictional resources that occur within Project study area. The jurisdictional report is provided in Attachment G of Appendix B.

TABLE 4.4-1
JURISDICTIONAL RESOURCES FOR EACH PROJECT AREA

	Jurisdictional Resources (acres)					
	USACE Jurisdiction					
	Open Water	Other Non-Wetland "Waters of the U.S."	Total	Isolated Waters	Total RWQCB Jurisdiction[a]	Total CDFW Jurisdiction
Area 1	0.52	5.26	5.78	0.00	5.78	6.90
Area 2	0.17	0.40	0.57	0.00	0.57	1.32
Area 3	0.00	0.00	0.00	3.87	3.87	3.87
Total	*0.69*	*5.66*	**6.35**	**3.87**	**10.22**	**12.09**

USACE: U.S. Army Corps of Engineers; RWQCB: Regional Water Quality Control Board; CDFW: California Department of Fish and Wildlife.

[a] RWQCB jurisdiction generally matches that of the USACE, but also includes "isolated waters".

Source: BonTerra Psomas 2014a.

Nesting Birds

The Migratory Bird Treaty Act (MBTA) protects the nests of all native bird species, including common species such as mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), and house finch (*Carpodacus mexicanus*). Nesting birds and raptors are also protected by Fish and Game Code. A variety of birds were observed during biological surveys and nesting birds have potential to occur in vegetation throughout the Project area.

Regulated Trees

Various trees are protected by the City of Pasadena's City Trees and Tree Protection Ordinance, as well as State resource agencies in conjunction with jurisdictional waters regulatory permits. Regulated trees have the potential to occur in many of the project site activity areas. Areas 1 and 2 occur within wooded riparian areas and support many native trees while Area 3 is less wooded and has lower potential for regulated trees. A total of 147 trees were documented within the survey area that met the minimum size requirement described in the City Trees and Tree Protection Ordinance and/or the *California Fish and Game Code*. Of the 147 trees included in this survey, 122 trees are "native" trees and 2 are categorized as "specimen" trees as described in the Ordinance (described above in Section 1.2). None of the trees in the survey area are "landmark" trees as described in the Ordinance. The native tree survey report is provided in Attachment D of Appendix B.

4.4.2 IMPACT ANALYSIS

Project Design Features

PDF BIO-1 Habitat restoration in Area 1 will utilize native plant species, in accordance with the Plant Palettes set forth in Appendix A of the Arroyo Seco Design Guidelines, which allow for substitutions with the concurrence of the Project's biologist/restoration specialist.

Regulatory Requirements

RR BIO-1 The City of Pasadena Department of Water and Power is required to obtain all necessary permits for impacts to "waters of the United States" and "waters of the State" from applicable resource agencies, including the United States Army Corps of Engineers (USACE), the Los Angeles Regional Water Quality Control Board (RWQCB), and the California Department of Fish and Wildlife (CDFW).

RR BIO-2 Tree pruning, removal, relocation, and replacement is required to be made in compliance with the City of Pasadena "City Trees and Tree Protection Ordinance" (Section 8.52 of the Pasadena Municipal Code), which requires that mature, public, landmark, landmark-eligible, native and specimen trees be protected and preserved. Work on protected trees must be approved by the City Manager or his/her designated personnel.

Impact Discussion

For the purposes of the impact discussions below, all Project impacts are categorized as being either permanent or temporary. Permanent impact areas are defined as changes to or removal of an existing vegetation type or "other areas," including disturbed or developed (e.g. paved areas) that are permanent as a result of Project implementation. Temporary access/impact areas are defined as areas that may be subject to traversing vehicles or other mobile equipment, staging of equipment, stockpiles of soil, and minor soil disturbance where there is no permanent alteration to the existing grade (e.g. no permanent holes, trenches, or berms), and no vegetation or tree removal is proposed.

a) Would the project have a substantial adverse effect, either directly or through habitat modification, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Less Than Significant With Mitigation.

Areas 1, 2 and 3 Impacts. The Project area provides potentially suitable habitat for the following seven federally and/or State Threatened and Endangered species: Braunton's milkvetch (*Astragalus brauntonii*), Nevin's barberry (*Mahonia nevinii*), San Fernando Valley spineflower (*Chorizanthe parryi* var. *Fernandina*), arroyo toad (*Anaxyrus californicus*), California red-legged frog (*Rana draytonii*), southwestern willow flycatcher (*Empidonax traillii extimus*), and least Bell's vireo (*Vireo bellii pusillus*). The results of the 2013 focused surveys were negative for all seven species; therefore, Project implementation is not expected to impact these species (BonTerra Psomas 2014c; BonTerra Consulting 2013a, 2013b). The southwestern willow flycatcher and least Bell's vireo are migratory bird species, however, that have the potential to occur in each spring/summer breeding season. Project activities occurring during future breeding seasons for these two bird species have the potential for impacts that would be considered potentially significant. Implementation of MM BIO-1 and MM BIO-2 would reduce this potential impact to less than significant because if these species are found during the pre-clearing sweep, work will temporarily be halted within 200 feet of the detected occupied habitat until the City can consult with the USFWS and CDFW and the City shall comply with any approvals and/or conditions imposed by these agencies.

The 2013 focused surveys identified two individuals of one special status plant species, Southern California black walnut (*Juglans californica* var. *californica*), in the Project area (BonTerra Psomas 2014c). The two Southern California black walnuts trees are located outside the impact areas for the Project; therefore Project implementation would not impact this species or any other special status plant. No mitigation is required.

The 2013 focused surveys and constraints analysis survey observed three additional non-listed special status wildlife species: coast range newt (*Taricha torosa torosa),* two-striped garter snake (*Thamnophis hammondii*), and yellow warbler (*Setophaga petechia*) (BonTerra Consulting 2013a, 2013b). All three species potentially occur within impact areas and may be adversely affected by Project implementation. The coast range newt and two-striped garter snake are aquatic species that may incur direct mortality of one or more individuals during the course of Project activities. However, due to the regional population size and distribution, and the relatively small number expected to be present at the Project site, these impacts are considered less than significant. Although not significant, implementation of the pre-clearing sweeps under MM BIO-1 would further reduce the potential for impacts to unlisted special status species.

Other special status species, such as the silvery legless lizard, may also occur in the Project area. Similar to the impacts on special status species described above, impacts are expected to be less than significant due to the limited extent and duration of disturbance and the relative regional population of this species. Potential impacts would be further reduced by the pre-construction sweeps conducted as part of MM BIO-1.

Project implementation would not be expected to result in the loss of individual yellow warblers; however, active nests of this species as well as all other native bird species are protected by the Migratory Bird Treaty Act (MBTA) and *California Fish and Game Code* and the loss of an active nest would be considered a potentially significant impact. Implementation of MM BIO-2, which requires pre-construction nesting bird surveys, and avoidance if applicable, would reduce this impact to a less than significant level.

Special status bat species, including silver-haired bat (*Lasionycteris noctivagans*), western red bat (*Lasiurus blossevillii*), and hoary bat (*Lasiurus cinereus*), potentially occur in the study area and may roost on the Project site. Potential roost sites for these species include tree cavities and exfoliating bark. Project construction has the potential for impacts to these species as a result of mortality of one or more individuals during tree removal activities. Due to the regional population size and distribution of these species, these impacts are considered less than significant. However, MM BIO-3, which requires a bat habitat assessment and a two-step tree removal process, will further minimize impacts on these species and ensure less than significant impacts.

Reduced Stream Flows

Project objectives include restoring the diversion capacity to its pre storm-damage level, as well as increasing diversions to capture an additional 1,100 acre-feet annually. As a result, Project flows downstream from the diversion point in Area 2 will be reduced to some degree relative to both current and historic conditions.

As described above, the Arroyo Seco stream continues downstream from the diversion as a mountainous boulder and riffle system shaded by a mixed riparian woodland canopy. Adjacent uplands are undeveloped and vegetated with native scrub and chaparral plant communities with dense oak woodlands on north- and northeast-facing slopes. Millard Canyon converges with the Arroyo Seco in this area, bringing additional flow throughout most of the year. Continuing downstream, the drainage exits the mouth of the canyon near the northern edge of Area 3. From this point moving south, the drainage changes dramatically as the creek flows across alluvial deposits with limited vegetation until reaching a large (0.25 mile by 0.40 mile) riparian woodland that occupies the occasionally flooded alluvial deposits in the reservoir behind Devil's Gate Dam in Hahamongna Watershed Park. The stream meanders through the willow woodland, creating braided channels that frequently shift as sediments fill the active channels. Large flood flows occasionally result in impounded water and filling of the reservoir. This occasional flooding is likely to be the primary source allowing for the large riparian woodland in the reservoir area. Low flows during most of the year persist on the surface for short distances beyond the canyon mouth before infiltrating the alluvium and flowing underground.

Plant and wildlife resources between the diversion point and the canyon mouth are expected to be very similar to those described for Areas 1 and 2. Due to the abundance of native vegetation, undeveloped lands, and riparian resources, the area is generally rich in native wildlife species diversity and abundance. A large portion of these species is likely to be dependent specifically on the stream and riparian habitat as a core resource. Exiting the canyon and crossing approximately 0.75 mile of mostly unvegetated sandy wash, plant and wildlife diversity is expected to drop off substantially as the area is suitable for fewer species and lower numbers of individuals. Reaching the riparian woodland of the reservoir, the species richness and population size is expected to increase substantially. Although the mostly developed surrounding area limits access of many species to only the more ubiquitous of the suburban setting, bird species are likely to be highly diverse as such a large riparian woodland area is rare in the region.

Continuing further downstream beyond Devil's Gate Dam, the Arroyo Seco stream flows through an urban landscape and is channelized for nearly the entire length to the Los Angeles River flood-control channel. Due to the lack of riparian habitat and difficulty of access, the lower Arroyo Seco is not expected to support riparian-dependent communities and is likely to be occupied by common wildlife in suburban environments in the region.

Based on a review of USGS gauging station data upstream of the Project site, City of Pasadena diversion records, and the Project Conceptual Design Report (Carollo 2013), diversion amounts have been highly variable through the years. Many factors appear to contribute to this variability,

such as available stream flows, season of availability, recharge basin saturation, flow volume, water rights thresholds, and others. As a result, consistent patterns in diversion are difficult to glean from the data. Adding to the complexity is the Station Fire sediment flows in late fall and winter of 2009, which damaged the diversion structure and altered the diversion regime due to the loss of design capacity. As a result, no water was diverted for many consecutive months in 2010. In general, diversions are highest, if available, from late fall through winter and into early spring. This corresponds with what is typically Southern California's wet season and highest stream flows. Due to the higher flows, the diversions represent a smaller percentage of the total stream flow compared with other times of the year. Conversely, stream flows taper off in early spring through summer and early fall. Although the diversion quantities appear to be generally lower at this time of the year, they represent a greater portion of the stream total. The average diversion is approximately 50 acre-feet per month for this period, which results in the diversion of 100 percent of stream flows in most months historically and rarely goes below 70 percent.

The post-Project diversions are expected to be similar in variation and complexity of factors involved in water management. The new diversion structure would allow for diverting up to 25 cfs (same as existing conditions). At the start of the rainy season, larger storm events have resulted in water that was too turbid and City staff avoided diverting stream flow to minimize transporting fine sediment into the spreading basins. Typically these stream flows were greater than the City's surface water rights of 25 cfs. When the water became less turbid, it was diverted and historically averaged 2,532 acre-feet per year (Table 2.2, Carollo 2013).

With the proposed improvements, post-Project diversions are estimated to result in an average increase of 17 percent under average year hydrologic conditions. Over a 10-year hydrologic period, the Project is estimated to divert on average an additional 1,100 acre-feet per year, which would reduce flows below the diversion point to some extent. It is assumed that the diversions would occur in a manner consistent with past diversions but with a greater amount of water diverted when available. Given that the late spring through early winter often resulted in high diversion percentages of the total stream flow, including many 100 percent diversions, it is probable that additional diversion would be experienced to a greater extent within the late Fall through mid-Spring months when greater flows are available. However, major storm flows exceeding 25 cfs would only allow up to 25 cfs of diversion with the Project, where major flows were historically passed through without diversion during the rainy season (Carollo 2013).

The effect of these reduced flows on biological communities downstream is difficult to measure. Reduced flows in general can cause shorter distances of available surface water; shorter duration of pooling; reduced extent of moist soils moving away from the streambed; and reduced stream velocities resulting in reduced sediment transport. These and other effects may impact species and vegetation communities dependent on such resources and processes.

Based on the Project's increased future diversions, reduced flows are expected as described. Although the damaged diversion structure has limited diversion in recent years, diversions have occurred historically prior to 1914 and it is expected that resources downstream have adapted to the flow regime with these diversions. However, the effects of a 17 percent increase in diversions above historical practice are uncertain. Given the uncertainty in the Project's level of effect, the impact on biological resources, including vegetation types and special status species potentially occurring, is considered potentially significant. Implementation of MM BIO-6, which requires monitoring the Arroyo Seco stream and associated riparian habitat from the intake structure (i.e. diversion point) downstream to Devil's Gate Dam and subsequent compensatory mitigation or corrective action to avoid or reduce any identified downstream impacts of the Project, would reduce this impact to a level considered less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potentially significant impacts to sensitive plant species, riparian habitats, wetlands, and the arroyo southwestern toad. The Master EIR included mitigation measures to reduce significant impacts related to sensitive biological resources. Measure Biological-1 requires surveys to be conducted to determine the presence of sensitive plant species. (BonTerra Psomas 2014c). Also, directed surveys of the Arroyo toad (Measure Biological-3) have been implemented and the Arroyo toad was not observed and is not expected to be present in the areas proposed for disturbance (BonTerra Consulting 2013a). Measure Biological-4 requires surveys for the Nevin's barberry in the Central Arroyo Seco and is not applicable to the Project.

b) Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Less Than Significant With Mitigation.

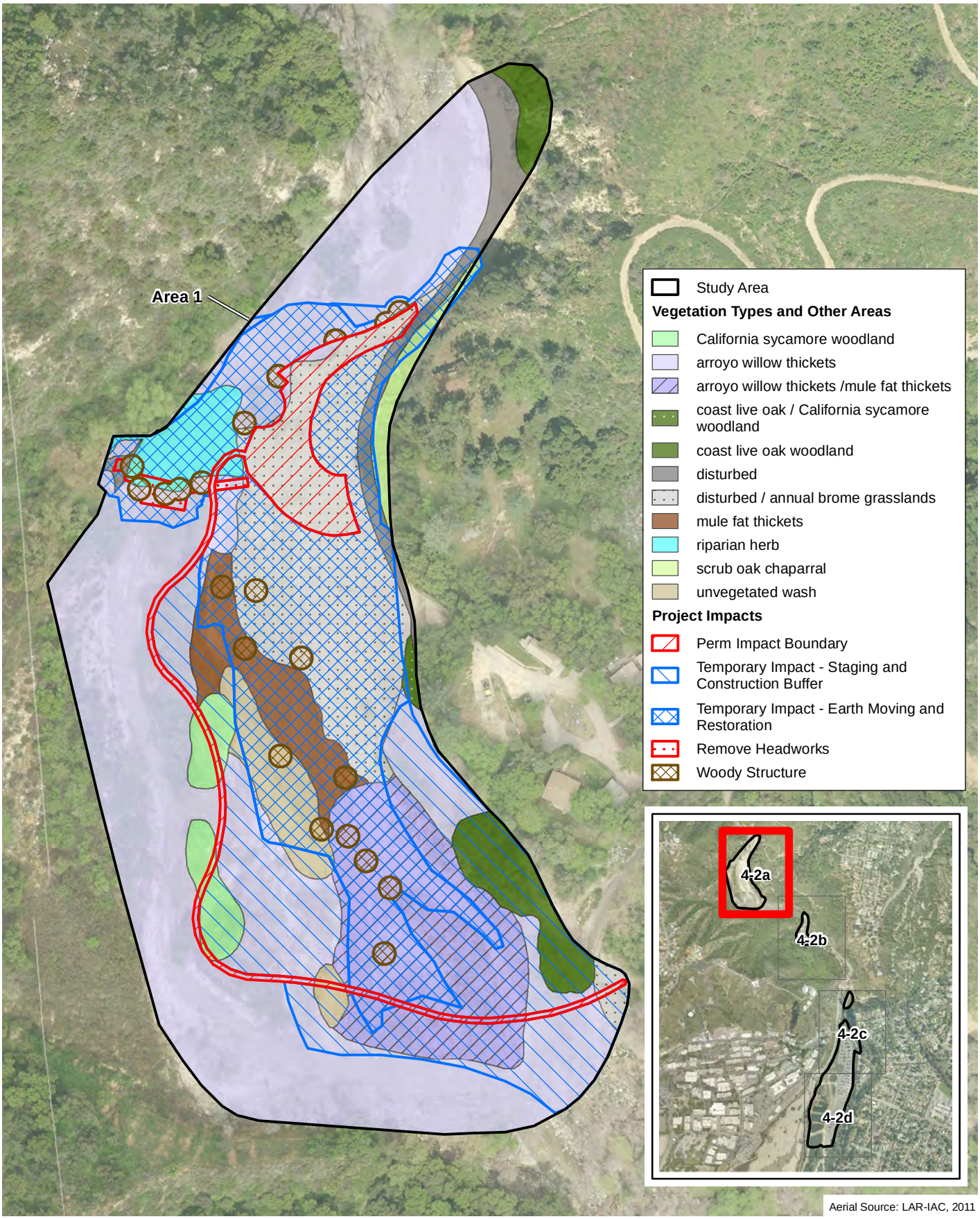
Areas 1, 2 and 3 Impacts. Project implementation would result in a total impact of 24.95 acres (permanent impact of 18.17 acres and temporary impact of 6.77 acres) of riparian habitat, as summarized in Table 4.4-2 below and shown in Exhibits 4-2a, 4-2b, 4-2c, and 4-2d. Riparian and other special status vegetation types are italicized in Table 4.4-2 and are discussed below.

TABLE 4.4-2
VEGETATION IMPACTS (ACRES)

Vegetation Type	Not Impacted	Impacted		Total Area
		Temp	Perm	
California sagebrush scrub / California buckwheat scrub	0.01	0.28	0.13	**0.43**
California sagebrush scrub / laurel sumac scrub	0.59	0.20	0.94	**1.73**
California buckwheat scrub	0.01	0.00	0.39	**0.40**
California buckwheat scrub / laurel sumac scrub	0.00	0.12	0.00	**0.12**
California buckwheat scrub / annual brome grasslands		0.00	0.18	**0.18**
laurel sumac scrub	0.42	0.03	0.11	**0.56**
scrub oak chaparral	0.07	0.04	0.00	**0.12**
California sycamore woodland	0.38	0.19	0.16	**0.73**
white alder grove / California sycamore woodland	0.97	0.11	0.08	**1.17**
coast live oak / California sycamore woodland	0.02	0.00	0.00	**0.02**
mule fat thickets		0.39	0.76	**1.15**
arroyo willow thickets	2.97	1.60	0.13	**4.69**
arroyo willow thickets/mule fat thickets		1.18	0.03	**1.21**
riparian herb	0.04	0.25	0.02	**0.31**
coast live oak woodland	0.41	0.29	0.20	**0.90**
poison oak scrub	0.03	0.00	0.00	**0.03**
annual brome grasslands	0.01	0.01	0.00	**0.02**
disturbed / annual brome grasslands	0.02	1.13	6.41	**7.56**
unvegetated wash		0.31	0.00	**0.31**
disturbed	0.19	0.14	0.32	**0.65**
developed	0.75	0.48	8.32	**9.55**
Total	**6.89**	**6.77**	**18.17**	**31.83**

Notes: ***Italicized and bold text*** indicates special status vegetation types.

Source: BonTerra Psomas 2014d.



Aerial Source: LAR-IAC, 2011

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Vegetation Impacts

Exhibit 4-2a

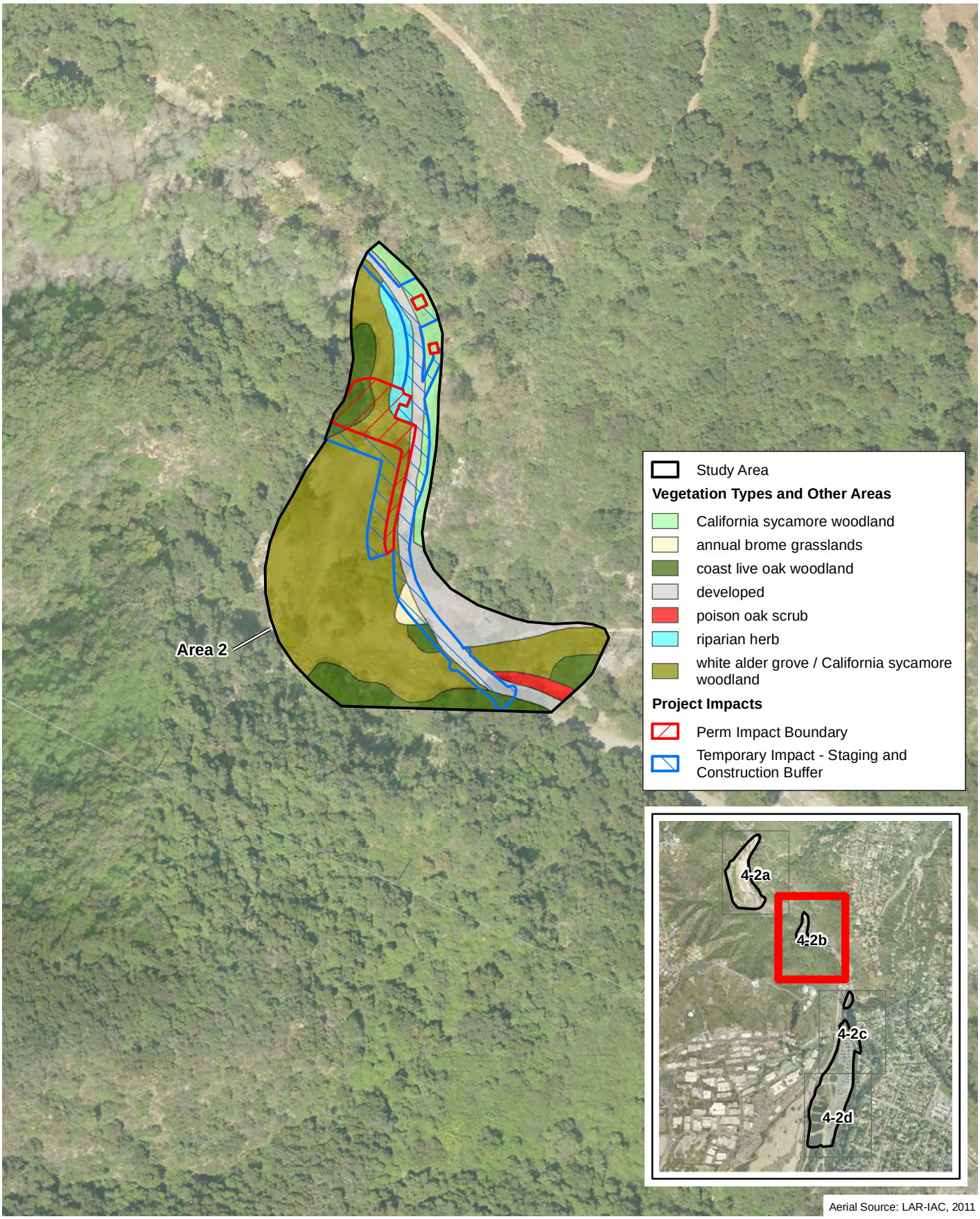
Arroyo Seco Canyon Project

N W E S

150 75 0 150 Feet

Bonterra PSOMAS

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Aerial Source: LAR-IAC, 2011

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Vegetation Impacts

Exhibit 4-2b

Arroyo Seco Canyon Project

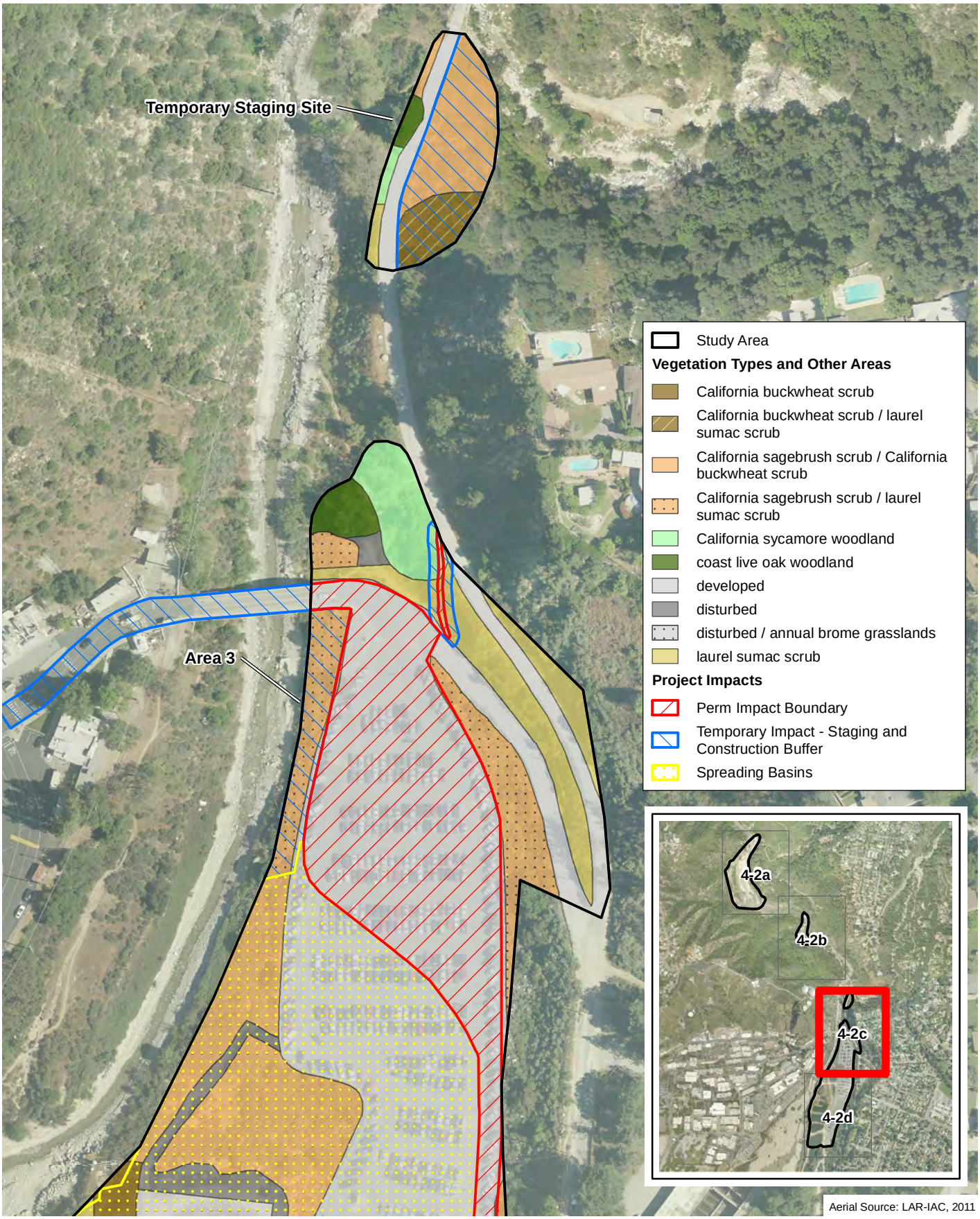
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Vegetation Impacts

Exhibit 4-2c

Arroyo Seco Canyon Project

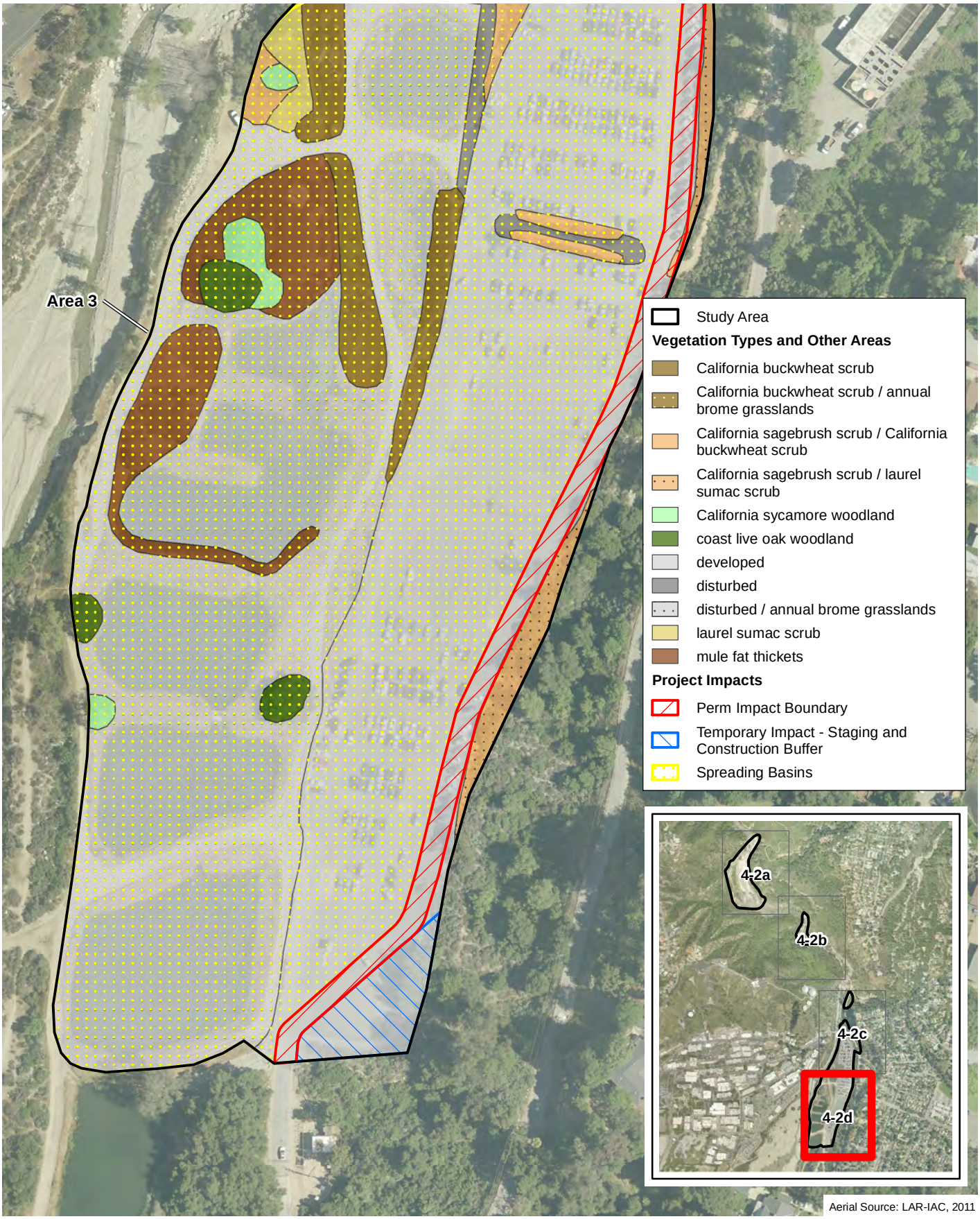
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Aerial Source: LAR-IAC, 2011

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Vegetation Impacts

Exhibit 4-2d

Arroyo Seco Canyon Project

N W E S

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Bonterra PSOMAS

(Rev: 8-19-2014 CJS) H:\PAS\Projects\Carollo\J041\Graphics\MND\Ex4-2_vegetation_impacts.pdf

The proposed Project would affect 6.37 acres (4.30 acres temporary; 2.07 acres permanent) of sensitive natural communities (or vegetation types) consisting of arroyo willow thickets, arroyo willow thickets/mule fat thickets, California sycamore woodland, coast live oak woodland, and white alder grove/California sycamore woodland. These vegetation types have been significantly reduced in acreage and are threatened by additional loss. Impacts on these vegetation types are considered potentially significant because of their high biological value. Impacts on these vegetation types would be reduced to less than significant levels with implementation of MM BIO-4, which requires restoration or replacement of sensitive natural communities.

Additionally, riparian vegetation may potentially be regulated as components of the streambed and riparian areas which are regulated by California Department of Fish and Wildlife (CDFW) per the *California Fish and Game Code* (§§1600–1616). Impacts to vegetation types in this regard are addressed under Threshold 4.3(c) below, which deals with impacts to federally protected wetlands.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potentially significant impacts to riparian habitats: southern willow scrub and mule fat scrub. Proposed restoration projects would mitigate impacts to southern sycamore riparian woodland and streambed riparian plant communities and would be beneficial to wildlife for food and shelter. The Master EIR included Measure Biological-2 to prevent significant impacts associated with the loss of wetlands and riparian habitats. As discussed above, a Jurisdictional Delineation has been completed to identify riparian habitats and wetlands that would be affected by the Project. Permits would be obtained from resource agencies and compensatory mitigation provided, as required under MM BIO-5, which is similar to Measure Biological-2.

c) Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

Less Than Significant With Mitigation.

Areas 1, 2 and 3 Impacts. Approximately 6.35 acres of non-wetland "waters of the U.S.", 10.22 acres of RWQCB jurisdictional "waters of the State", and 12.09 acres of CDFW jurisdictional waters exist on the Project site. As summarized in Table 4.4-3, the proposed Project would permanently impact a total of 0.48 acre of non-wetland "waters of the U.S.", (of which 0.02 acre is open water) as well as 0.60 acre of CDFW jurisdiction. In addition, the proposed Project would impact 3.87 acres of spreading basins that are considered "isolated waters", which are under the jurisdiction of the RWQCB but not the USACE.

Approximately 3.67 acres of non-wetland "waters of the U.S." would be temporarily impacted during construction activities associated with the removal of the Headworks structure, streambed restoration activities, and replacement of the diversion weir and inlet structure. Approximately 7.54 acres of RWQCB "waters of the State" and 7.88 acres of CDFW jurisdictional waters will be similarly impacted on a temporary basis during construction. Table 4.4-3 shows the amount of temporary and permanent impacts to jurisdictional resources that would occur with Project implementation.

TABLE 4.4-3
JURISDICTIONAL RESOURCES IMPACTED FOR EACH PROJECT IMPROVEMENT

	Jurisdictional Resources					
	USACE Jurisdiction					
	Open Water	Other Non-Wetland "Waters of the U.S."	Total	Isolated Waters	Total RWQCB Jurisdiction[a]	Total CDFW Jurisdiction
Existing Jurisdictional Resources (acres)						
Area 1	0.52	5.26	5.78	0.00	5.78	6.90
Area 2	0.17	0.40	0.57	0.00	0.57	1.32
Area 3	0.00	0.00	0.00	3.87	3.87	3.87
Total	*0.69*	*5.66*	**6.35**	**3.87**	**10.22**	**12.09**
Permanent Impacts (acres)						
Removal of headworks structure (Area 1)	–	0.02	0.02[b]	–	0.02[b]	0.02[b]
Bank stabilization for picnic area (Area 1)	–	0.04	0.04	–	0.04	0.11
Trail construction (Area 1)	–	0.15	0.15[b]	–	0.15[b]	0.16
Placement of woody structures (Area 1)	–	0.20	0.20[b]	–	0.20[b]	0.20[b]
Construction of new diversion weir/inlet structure (Area 2)	0.02	0.05	0.07	–	0.07	0.08
Construction of rip-rap bank stabilization (Area 2)	–	–	–	–	–	0.03
Total Permanent Impacts	**0.02**	**0.46**	**0.48**	**0.00**	**0.48**	**0.60**
Temporary Impacts (acres)						
Streambed restoration (Area 1)	–	1.52	1.52	–	1.52	1.52
Construction buffer for headworks removal, streambed restoration, bank stabilization (Area 1)	0.07	2.05	2.12	–	2.12	2.40
Place sand bags for streambed diversion (Areas 1 and 2)	0.01	–	0.01	–	0.01	0.01
Construction buffer for new diversion weir/inlet structure and bank stabilization (Area 2)	0.01	0.01	0.02	–	0.02	0.08
Expansion of Spreading Basins (Area 3)	–	–	–	3.87	3.87	3.87
Total Temporary Impacts	**0.09**	**3.58**	**3.67**	**3.87**	**7.54**	**7.88**

USACE: U.S. Army Corps of Engineers; RWQCB: Regional Water Quality Control Board; CDFW: California Department of Fish and Wildlife.

[a] RWQCB jurisdiction generally matches that of the USACE, but also includes "isolated waters".

[b] These impacts should not result in a loss of ecological/hydrological functioning of the streambed and should not require compensatory mitigation.

Source: BonTerra Psomas 2014a

It is worthwhile to note that three of the proposed activities (removal of the Headworks structure, placement of woody structures, and trail construction) are considered permanent impacts but are self-mitigating aspects of the Project. This is because the jurisdictional areas will benefit from these proposed activities and compensatory mitigation is not required. The establishment of an at-grade pedestrian trail within Area 1 also does not require compensatory mitigation because it is not expected to affect the ecological or hydrological functioning of the area. Similarly, the temporary impact areas will be restored to their original condition at the conclusion of the Project and will not require compensatory mitigation.

Therefore, the permanent impacts to "waters of the U.S." that will negatively affect these resources is confined to the bank stabilization for the establishment of the picnic area in Area 1 and the construction of a new diversion weir and inlet structure in Area 2. These permanent impacts total 0.11 acre of USACE/RWQCB jurisdiction.

Aspects of the Project that will permanently impact CDFW jurisdiction and will require compensatory mitigation include the picnic area bank stabilization in Area 1 and the diversion weir/inlet structure and roadway/stream embankment construction in Area 2. Additionally, the proposed trail in Area 1 will be maintained free of vegetation on an ongoing basis. Therefore, this is considered to be a permanent impact on the riparian vegetation in the area. In all, a total of 0.38 acre of impacts to CDFW jurisdiction will likely require mitigation.

Compliance with RR BIO-1 requires obtaining the necessary permits for impacts to jurisdictional resources. Implementation of MM BIO-5—which requires obtaining regulatory permits from agencies, including a Section 404 Permit from the USACE, a Section 401 Permit from the Los Angeles RWQCB, and a Section 1600 Streambed Alteration Agreement from the CDFW and complying with the permits requirements for mitigating for the loss of jurisdictional resources—would reduce impacts to wetlands to less than significant levels.

As part of the Project, the PWP proposes to create an additional low-flow channel and restore riparian habitat in Area 1. As described in Section 3.1.1, this aspect of the Project will restore approximately 0.98 acre of riparian habitat and is expected to fully mitigate Project impacts to jurisdictional waters.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potentially significant impacts to wetlands. The Master EIR included Measure Biological-2 to prevent significant impacts associated with the loss of wetlands and riparian habitats. As discussed above, permits would be obtained from resource agencies and compensatory mitigation provided, as required under MM BIO-5, which is similar to Measure Biological-2.

d) Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. The Project site is located just south of the southern edge of the Angeles National Forest. Development is located to the east, west, and south. Therefore wildlife is expected to move relatively freely between the Project site and open space areas to the north, but are not expected to move regularly into the developed areas west, east, or south of the Project site (with the exception of urban-tolerant species such as coyotes and striped skunks). For species that travel along riparian corridors, development to the south (JPL campus, Devil's Gate Dam, and the I-210) is a barrier to movement between the Upper Arroyo Seco and the Lower

Arroyo Seco. As a result, the Project site is not expected to serve as a regional corridor link between regional open space areas. It is expected, however, to support a relatively large amount of the local wildlife movement due to the existing topography, including the presence of a perennial creek.

Arroyo Seco Canyon is naturally very steep sided and restricts many species to traveling either up the canyon bottom or along the ridgelines. Local movement on the Project site is expected to include wildlife species with low mobility (e.g., amphibians, reptiles) and those with high mobility (e.g., birds, large mammals). Project implementation may affect movement of these wildlife species differently. The more mobile species would be expected to move through upland areas or along the periphery of the Project site through habitats not impacted by Project activities. Most mammalian wildlife movement occurs at night when construction would not be active; therefore, these species would still be expected to use the Gabrielino Trail for movement at night, and they would still able to use the ridgelines that would not be affected by the Project. Species with lower mobility may be adversely affected by Project implementation. These impacts, however, are expected to be short-term and not significant. Therefore, no mitigation would be required. Furthermore, Project implementation will restore native riparian habitat in the upstream portion of the Project area (PDF BIO-1), which is expected to have a beneficial effect on wildlife by creating an increase in native vegetation cover and habitats. Therefore, any adverse impacts on local wildlife movement would be further reduced by this PDF. Impacts on wildlife movement are considered less than significant and no mitigation is required.

In addition, the new diversion weir would be operated such that the pool level at the intake would be at a constant level of approximately 4 ft in depth, except during flooding conditions. This higher pool level would provide cover and refuge areas for existing fish populations and for potential re-established native fish populations. The deeper pool would also reduce water temperatures and increase the diversity of food supply. The upper end of the pool may also create a modest increase in spawning habitat as the stream changes from high gradient to low gradient over a short reach. The new weir design would also allow for a more gradual change in stream depth, which would be less harmful to fish when water is available.

The existing intake is protected by a trash rack that withstands approach velocities of approximately 2.1 ft/sec and has openings of approximately 2 inches. This current arrangement does little to protect fish. The improved intake would have an approach velocity of 1.4 ft/sec and fine screens with openings of 3/32-inches. In addition, the new screen consists of two screens – an outer and inner whereby the inner is smaller openings to avoid smaller fishes from becoming trapped. This proposed arrangement is expected to reduce the potential for fish to enter the intake. Additionally, the new intake is designed to be easily cleaned, which prevents regions of high velocity on portions of the intake associated with debris build-up. Lastly, the removal of the headworks in Area 1 would eliminate an impediment to fish movement and would re-establish the feasibility of fish passage through this area. As a result, project effects on fish species are expected to be potentially beneficial and no mitigation would be required.

The federal MBTA protects the nests of all native bird species, including common species such as mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), and house finch (*Carpodacus mexicanus*). Nesting birds and raptors have the potential to occur in vegetation throughout the Project area. Besides the MBTA, Sections 3503 and 3503.5 of the *California Fish and Game Code* protect nesting migratory birds and raptors. As described by MM BIO-2—surveys for nesting birds—vegetation removal should be planned during the non-breeding season if possible. If vegetation removal would occur during the breeding season, a pre-construction nesting bird/raptor survey would be required prior to clearing to ensure compliance with the MBTA, in compliance with MM BIO-2.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan indicated that improvements proposed in the HWP would not impact the movement of native migratory fish and wildlife species and no significant impacts to known migratory wildlife corridors would occur. As discussed, Project impacts on wildlife movement would also be less than significant.

e) Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. A tree survey was conducted to identify trees within the project area that are potentially regulated by the City of Pasadena's City Trees and Tree Protection Ordinance (Chapter 8.52 of the Pasadena Municipal Code). Of the 147 trees included in this survey, 122 trees are "native" trees and 2 are categorized as "specimen" trees as described in the Ordinance (described above in Section 1.2). None of the trees in the survey area are "landmark" trees as described in the Ordinance. Of these 124 trees covered by the City Ordinance, a total of 17 are expected to be removed in order to construct the project. These consist of 13 white alders, 1 coast live oak, and 3 arroyo willows.

Of the 147 trees documented within the Project's study area, a total of 102 meet the requirements for protection by the CDFW. A total of 16 of these trees are expected to be removed to construct the project. These include 13 white alders and 3 arroyo willows.

In all, a total of 17 trees are expected to be removed. Of these 17 trees that are proposed for removal, 16 of them meet the requirements for protection under both the City Tree Ordinance and the *Fish and Game Code*. One coast live oak occurs in the middle of the parking lot in Area 3 that qualifies for protection under the City Tree Ordinance but not the *Fish and Game Code*. A summary of trees included in the survey that are regulated by the City Tree Ordinance and the *Fish and Game Code* is provided in Tables 4.4-4 and 4.4-5. The quantity of trees within each survey area is shown with the number of expected removals represented in parentheses.

TABLE 4.4-4
TREES WITHIN SURVEY AREA REGULATED UNDER PASADENA TREE ORDINANCE

Species	Quantity of Trees (Expected Removals)				
	Area 1	Area 2	Area 3	Temp Staging Area	Total
Native Trees					
*Alnus rhombi*folia white alder	5 (5)	30 (8)	–	5 (0)	**40 (13)**
Juglans californica southern California black walnut	–	–	1 (0)	–	**1 (0)**
Platanus racemosa western sycamore	18 (0)	5 (0)	6 (0)	3 (0)	**32 (0)**
Populus trichocarpa black cottonwood	6 (0)	–	–	–	**6 (0)**
Quercus agrifolia coast live oak	16 (0)	3 (0)	8 (1)	4 (0)	**31 (1)**
Quercus berberidifolia scrub oak	1 (0)	–	–	–	**1 (0)**
Quercus chrysolepis canyon live oak	–	1 (0)	–	–	**1 (0)**
Salix lasiolepis arroyo willow	8 (3)	1 (0)	–	–	**9 (3)**
Umbellularia californica California bay laurel	–	–	–	1 (0)	**1 (0)**
Specimen Trees					
Pinus sp. pine	2 (0)	–	–	–	**2 (0)**
Total	**56 (8)**	**40 (8)**	**15 (1)**	**13 (0)**	**124 (17)**

Source: BonTerra Psomas 2014a.

TABLE 4.4-5
TREES WITHIN SURVEY AREA REGULATED BY CDFW

Species	Quantity of Trees (Expected Removals)				
	Area 1	Area 2	Area 3	Temp Staging Area	Total
Alnus rhombifolia white alder	5 (5)	37 (8)	–	5 (0)	**47 (13)**
Platanus racemosa western sycamore	19 (0)	5 (0)	1 (0)	3 (0)	**28 (0)**
Populus trichocarpa black cottonwood	2 (0)	–	–	–	**2 (0)**
Quercus agrifolia coast live oak	8 (0)	2 (0)	1 (0)	–	**11 (0)**
Quercus chrysolepis canyon live oak	–	1 (0)	–	–	**1 (0)**
Salix gooddingii black willow	1 (0)	–	–		**1 (0)**
Salix lasiolepis arroyo willow	10 (3)	1 (0)	–	–	**11 (3)**
Umbellularia californica California bay laurel	–	–	–	1 (0)	**1 (0)**
Total	**45 (8)**	**46 (8)**	**2 (0)**	**9 (0)**	**102 (16)**

Source: BonTerra Psomas 2014a.

As a result of Project construction, it is anticipated that a total of 17 trees would be removed. All of these trees are regulated by the City Tree Ordinance and 16 are regulated under Section 1602 of the *California Fish and Game Code.* It is possible that construction activity may be able to avoid a portion of these trees, thus lowering the overall impacts. However, because the removal of these trees is a clear possibility, they should be included in all tree removal permits that are acquired. If project construction is able to avoid some of these trees, project approvals and regulatory permits could later be amended and the overall mitigation/replacement requirements would be reduced accordingly.

According to guidelines adopted by the City of Pasadena in January 2010 (Pasadena 2010), tree replacement ratios are determined based on the size of the tree to be removed (i.e., larger trees require a higher replacement ratio). However use of larger sized replacement trees will, in turn, reduce the required number of replacement trees.

Removal of public trees require review and advice by the Urban Forestry Advisory Committee. Compliance with RR BIO-2 requires tree pruning, removal, relocation, and replacement to be made in compliance with the City of Pasadena "City Trees and Tree Protection Ordinance" (Section 8.52 of the Pasadena Municipal Code), which requires that mature, public, landmark, landmark-eligible, native and specimen trees be protected and preserved. Work on protected trees must be approved by the City Manager or his/her designated personnel.

A total of 13 trees were documented in the vicinity of the temporary staging site though none are located within the boundaries of that area. Because none of these trees are located within the boundaries of the temporary staging site, no impacts to these trees are anticipated. Additionally, there are several trees that appear to be located within or immediately adjacent to impact areas that are not included in the impact assessment. Such trees include those located adjacent to features whose footprint that can be adjusted shortly before and during construction in order to

avoid these trees. Impacts to trees that are not considered in accordance with RR BIO-2 and/or CDFW permit requirements, would be significant. In order to protect trees that are not anticipated to be impacted, MM BIO-7 requires that protective fencing be erected outside of the outer canopy of any tree whose root zone may be indirectly affected by construction activities, including soil stockpiles or equipment storage. Additionally, during Project construction, a biological monitor will be periodically present to record the number of trees actually impacted. If project construction can avoid impacting oak trees, the number of replacement trees will be reduced accordingly. Compliance with MM BIO-7, which requires tree protection during construction, would ensure that impacts to trees would be less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan indicated that projects that incorporate tree replacements are considered to be mitigated below the threshold of significance. The Project would comply with the City Trees and Tree Protection Ordinance, as RR BIO-2.

f) Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact.

Areas 1, 2 and 3 Impacts. There is no adopted Habitat Conservation Plan (HCP); Natural Community Conservation Plan (NCCP); or other approved local, regional, or State habitat conservation plan in the City of Pasadena.

There are two NCCPs in Los Angeles County. The Palos Verdes Peninsula NCCP covers 8,661 acres and provides a reserve system of 1,428 acres at the southwestern end of the County (nearly 30 miles southwest of Area 3) (CDFW 2013b). The West Mojave Plan covers 9.3 million acres of the western portion of the Mojave Desert, which includes the Antelope Valley area of Los Angeles County (northeastern section of Los Angeles County and nearly 20 miles northeast of Area 1) (BLM 2012). There are several HCPs in Los Angeles County but the HCP that is located nearest the HWP is the Newhall HCP along the Santa Clara River, west of I-5 (San Marino Environmental Associates 2004). Area 1 is located over 30 miles southeast of the Newhall HCP area.

The Project would not affect these conservation plans. Therefore, the Project would not conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or State habitat conservation plan. No impact would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that the Arroyo Seco Master Plan would not conflict with any habitat conservation plan, natural community conservation plan, or other local or regional habitat conservation plan; that the HWP is not included in any habitat conservation plan; and the HWP is not located in a designated sensitive ecological area.

4.4.3 MITIGATION MEASURES

MM BIO-1 A Biological Monitor shall be on site during vegetation clearing activities in Project work areas (i.e., areas of disturbance). Prior to the start of activities, the Biological Monitor shall confirm that the limits of Project work areas are clearly marked. In addition, the Biological Monitor shall conduct a pre-clearing sweep of the Project work area and shall flush and/or move common and unlisted special status wildlife to nearby suitable habitat outside the Project work area to the extent practicable.

The Biological Monitor shall also be familiar with least Bell's vireo and shall conduct pre-clearing non-protocol surveys for this species while onsite. If a least Bell's vireo or other State of federally listed species is detected, work activity within 200 feet of the detected occupied habitat will be temporarily halted and the City will consult with the USFWS and CDFW. With authorization from these agencies, which may include a 'take' permit, the project will proceed in accordance with conditions developed in the consultation. Conditions will include avoidance and minimization measures to prevent or minimize impacts on the listed species(s) occurring on or adjacent to the site.

MM BIO-2 Project construction shall be conducted in compliance with the conditions set forth in the Migratory Bird Treaty Act (MBTA) and *California Fish and Game Code* with methods approved by the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) to protect active bird/raptor nests. To the maximum extent feasible, vegetation removal shall occur during the non-breeding season for nesting birds (generally late September to early March) and nesting raptors (generally early July to late January) to avoid impacts to nesting birds and raptors. If the Project requires that work be initiated during the breeding season for nesting birds (March 1–September 30) and nesting raptors (February 1–June 30), in order to avoid direct impacts on active nests, a pre-construction survey shall be conducted by a qualified Biologist for nesting birds and/or raptors within 3 days prior to clearing of any vegetation and/or any work near existing structures (i.e., within 300 feet for nesting birds and within 500 feet for nesting raptors). If the Biologist does not find any active nests within or immediately adjacent to the impact areas, the vegetation clearing/construction work shall be allowed to proceed.

If the Biologist finds an active nest within or immediately adjacent to the construction area and determines that the nest may be impacted or breeding activities substantially disrupted, the Biologist shall delineate an appropriate buffer zone around the nest depending on the sensitivity of the species and the nature of the construction activity. Any nest found during survey efforts shall be mapped on the construction plans. The active nest shall be protected until nesting activity has ended. To protect any nest site, the following restrictions to construction activities shall be required until nests are no longer active, as determined by a qualified Biologist: (1) clearing limits shall be established within a buffer around any occupied nest (the buffer shall be 100–300 feet for nesting birds and 300–500 feet for nesting raptors), unless otherwise determined by a qualified Biologist and (2) access and surveying shall be restricted within the buffer of any occupied nest, unless otherwise determined by a qualified Biologist. Encroachment into the buffer area around a known nest shall only be allowed if the Biologist determines that the proposed activity would not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest or the nest has failed.

MM BIO-3 A Biological Monitor shall conduct a pre-construction bat habitat assessment of buildings and~~the~~ trees marked for potential removal. Potential for roosting shall be categorized by 1) potential for solitary roost sites 2) potential for colonial roost sites (10 bats or more). If the potential for colonial roosting is determined, those trees shall not be removed during the bat maternity roost season (March 1 – July 31). Trees potentially supporting colonial roosts outside of maternity roost season, and trees potentially supporting solitary roosts may be removed via a two-step removal process, whereby some level of disturbance (such as trimming of lower branches)

(at the direction of the Biological Monitor) is applied to the tree on day one to allow bats to escape during the darker hours, and the roost tree shall be removed two days later~~the following day~~ (i.e., there shall be no less or more than two~~one~~ nights between initial disturbance and the grading or tree removal). When feasible, trees will be dropped slowly and a Biological Monitor will monitor the activity. If buildings are determined to be occupied, one-way exclusionary devices will be placed over bat access points and left in place for two nights prior to building removal.

MM BIO-4 Prior to habitat disturbing activities of any Project component, a detailed restoration program shall be developed and implemented for any special status vegetation type identified within the Project disturbance limits that is removed. These special status vegetation types shall be restored within the project disturbance limits at a ratio of not less than 1:1, or as agreed to by the City of Pasadena in consultation with the CDFW. If the 1:1 ratio cannot be achieved within the project disturbance limits, then the balance shall be achieved by identifying additional areas for restoration or conservation within the Arroyo Seco or adjacent watersheds. Restoration shall consist of seeding and container plantings of appropriate species. A Restoration Program shall be submitted to the City of Pasadena for review by a qualified Biologist and approval by the resource agencies (USACE, RWQCB, CDFW) prior to issuance of grading permits. The Restoration Program shall include, at a minimum, the following elements:

a. **Responsibilities and qualifications of the personnel to implement and supervise the plan.** The responsibilities of the landowner, specialists, and maintenance personnel that will supervise and implement the plan shall be specified.

b. **Site selection.** The site(s) for mitigation shall be determined in coordination with the City of Pasadena and the resource agencies. Restoration required outside the Project disturbance limits shall be located in dedicated open space areas (i.e. preserved in perpetuity as open space) and shall be contiguous with other natural open space areas.

c. **Site preparation and planting implementation.** The site preparation shall include (1) protection of existing native species; (2) trash and invasive non-natives removal; (3) native species salvage and reuse (i.e., duff); (4) soil treatments (i.e., imprinting, decompacting); (5) erosion-control measures (i.e., rice or willow wattles); and (6) native seed mix application and plantings.

d. **Schedule.** Establishment of restoration/revegetation sites shall be conducted between October 1 and January 30. Seeding and planting of container plants shall take place immediately after preparation of the restoration sites.

e. **Maintenance plan/guidelines.** The maintenance plan shall include (1) invasive non-natives control, (2) herbivory control, (3) trash removal, (4) irrigation system maintenance, (5) maintenance training, and (6) replacement seeding and/or planting.

f. **Monitoring Plan.** The monitoring plan shall include (1) site preparation and implementation activities; (2) performance criteria as approved by the City of Pasadena and resource agencies; (3) long-term monitoring requirements and methods to determine compliance with performance criteria; (4) goals and methods of site maintenance (e.g., weed removal, erosion control); (5) preparation of regular progress reports to document site progress; and (6) preparation of annual reports which shall be submitted to the City of

Pasadena and resources agencies for three to five years. The monitoring shall be conducted for three to five years, depending upon the performance standard requirements for the vegetation type at the mitigation site.

g. **Long-term preservation.** Long-term preservation of the restoration site shall be outlined in the conceptual mitigation plan to ensure the mitigation site is not impacted by future development.

h. **Performance standards will be identified and will apply for each special status vegetation type.** Revegetation shall be considered successful at three years if the percent cover and species diversity of the restored and/or created habitat areas are similar to percent cover and species diversity of adjacent existing habitats, as determined by quantitative testing of existing, restored, and created habitat areas.

In addition, earth-moving equipment shall avoid maneuvering in areas outside the construction limits in order to avoid disturbing adjacent habitats. Prior to grading, the construction limits shall be identified on the grading plan and established at the Project site with appropriate staking and flagging materials. The Contractor shall submit a letter to the City of Pasadena verifying that the construction limits have been staked and flagged at the Project site.

MM BIO-5 Mitigation for the loss of jurisdictional resources shall be negotiated with the resource agencies during the regulatory permitting process (see RR BIO-1) and shall ensure that mitigation to compensate for permanent impacts on jurisdictional resources is equivalent or superior to biological functions and values impacted by the Project. Potential mitigation options may include: (1) removal of exotic species from the Arroyo Seco Canyon or Hahamongna Watershed Park; (2) payment to a mitigation bank or regional riparian enhancement program (e.g., invasive plant or wildlife species removal); and/or (3) restoration of riparian habitat either on site or off site at a ratio of no less than 1:1, determined through consultation with the USACE, the RWQCB, and the CDFW. The restoration plan shall detail the methodology and performance standards, which shall be prepared in accordance with requirements specified in permits/agreements issued by the USACE, the RWQCB, and the CDFW.

MM BIO-6 A team of qualified specialists in hydrology and plant and wildlife biology will monitor the Arroyo Seco stream and associated riparian habitat from the intake structure (i.e. diversion point) downstream to Devil's Gate Dam. The extent of the riparian habitat, including aquatic habitat, will be defined based on field observations during the initial site visit. Monitoring will begin with an initial baseline assessment to be conducted within six months prior to start of increased diversions. Thereafter, monitoring shall continue quarterly for a duration of five years. Data will be gathered at fixed points along the stream, and general descriptive notes and photos will be taken of the entire stretch. Data will include surface flow measurements; subsurface hydrology; surface water extent mapping; vegetation mapping; a vegetation health assessment; active channel location mapping; and a plant and wildlife habitat suitability assessment (including protocol surveys if warranted and necessary to determine presence or absence of species). Data from four quarterly visits will be compiled in an annual report. The initial report will include a summary of available biological and hydrological historic data for the site. Annual reports will also include U.S. Geological Survey (USGS) stream gauge data from the Arroyo Seco (upstream of the Project site) and City of Pasadena data on diversion amounts within the year. These reports will consider all potential

contributing factors, including precipitation and hydrologic conditions, flows from other managed tributaries, as well as potential maintenance and sediment removal activities behind the Devil's Gate Dam, and focus the reports on that which is attributable to the Project to the maximum extent feasible. Annual reports will conclude with an assessment on the effects of increased diversion and will provide recommendations for corrective actions, if deemed necessary to avoid or reduce downstream impacts attributable to the Project. Reports will be submitted to the City of Pasadena for review and approval of recommended corrective measures, if any.

Alternatively, if the City chooses not to take corrective measures, the City may mitigate for any loss of vegetation at a minimum 1:1 replacement ratio. The City shall only be required to mitigate for those impacts attributable to the City's increased diversions. Replacement vegetation shall be in kind; shall be equal to or greater than biological value prior to diversion; and shall be located within the Arroyo Seco watershed. Vegetation replacement shall mitigate for plant and wildlife impacts of the impacted community. Re-vegetated riparian communities within Area 1 established as part of the Project may potentially qualify towards credit for reduced flow impacts, if credit is available.

MM BIO-7 Prior to commencement of construction activities, trees not expected to be impacted by construction shall be enclosed by barriers such as chain-link fencing or orange snow fencing. At a minimum, the barriers will be placed at the outer canopy of each tree to be protected in place, and no grade changes will be made within the barriers without prior approval by the City. During Project construction, a biological monitor will be periodically present to record the number of trees actually impacted. If project construction can avoid impacting oak trees, the number of replacement trees will be reduced accordingly.

4.5 CULTURAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	☐	☒	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

A Phase I Cultural Resources Assessment was prepared for the Project, which is summarized below and provided in its entirety in Appendix C.

4.5.1 EXISTING CONDITIONS

Prehistory

At the time of Spanish contact, the Arroyo Seco Canyon area is believed to have been inhabited by the Gabrielino, or *Tongva*. The name "Gabrielino" identifies those people who came under the control of Mission San Gabriel Arcángel and included the inhabitants of most of current-day Los Angeles and Orange counties and portions of Riverside and San Bernardino counties. McCawley reports that the Arroyo Seco was known to the Gabrielino as *M'kat*. The name means "rocky or something like that". According to McCawley, no people lived in Pasadena during late Prehistoric times, as the area was prairie (BonTerra Psomas 2014b).

History

Over 20 years before a group of settlers met at Reservoir Hill near the Arroyo Seco to create the Pasadena colony north of the Los Angeles settlement, gold miners had searched the headwaters of that seasonal creek in the San Gabriel Mountains. In 1853, gold was found in the placer diggings of miners exploring the Arroyo Seco Canyon, and quartz mines in the San Gabriel Mountains continued to be mined up to 1883.

El Prieto Canyon, which feeds into the Arroyo Seco Canyon in Section 32 of Township 2 North, Range 12 West, had originally been known as Negro Canyon or Negro Creek, so named after an African-American freeman by the name of Robert Owen, who sold firewood harvested off the hillsides of the lands held by the U.S. Government in the 1850s and 1860s to residents of the Los Angeles settlement.

Millard Canyon had originally been known by the Mexican residents of the area as Blanco Canyon because of the geology of the canyon walls in some places. Millard, whose first name is unknown, established a homesite at the mouth of the canyon in 1862. He was an illegal squatter on the land in Section 5 of Township 1 North, Range 12 West, who is said to have made his income by raising bees and hauling wood to Los Angeles. Millard lived in the canyon until 1872 when he moved to the Downey settlement after his wife and a child died.

In the 1880s, the U.S. Government opened up a limited amount of land in Sections 31 and 32 of Township 2 North, Range 12 West of the San Gabriel Mountain foothills for private ownership. John Hartwell, Eugene and Clara Giddings, and Jason and Owen Brown all received patents for acreage in Section 32 wherein lay Fern Canyon, El Prieto Canyon, and Millard Canyon, from 1883 to 1891. The eastern half of the southeast quarter of Section 31 was owned primarily by Will D. and Mary L. Gould, a lawyer and his wife from Los Angeles.

The Giddings settled into a residence at the mouth of Millard Canyon and reported to local historian Hiram Reid, that they would find evidence of pre-historic peoples in the canyon when they worked the land with plows and hoes. The Giddings had constructed a wagon toll-road up to the falls on Millard Creek, creating a destination for persons seeking out-of-doors entertainment by hiking and picnicking. Owen and Jason Brown, descendants of the Kansas abolitionist John Brown, constructed a homestead in a canyon named after them located just south of El Prieto Canyon in 1886.

The most ambitious operation on the Arroyo Seco in the San Gabriel Mountains was that of C. Perry Switzer. The "Commodore", as he was known, built a tourist-resort camp far into the mountains that was accessible from a trail that followed the Arroyo Seco. An improved road ran up the canyon from Millard Creek to a halfway house, and then the remaining six miles to Switzer's Camp would be reached by riding burros.

The location of Commodore Switzer's camp is still accessible on the Gabrielino Trail. Some of the cabins were destroyed in a fire in the late 1890s, and the great flood of 1938 removed over a mile of the road that connected the camp to the Angeles Crest Highway. The owner of the camp in the 1950s was not able to keep the camp operating, and the site fell into ruins. The USFS removed the stone chapel that had been designed by the architect Arthur Benton due to its deteriorating condition.

The Altadena topographic map of the area in 1924 shows that a large number of buildings, most probably small, recreational cabins, were situated along the Arroyo road north of where Millard Creek joins the Arroyo Seco. By 1939, there were still scattered buildings situated along the Arroyo Road to Oak Wilde, where the road connected by dirt road with the Angeles Crest Highway. With the completion of the Angeles Crest Highway in 1956, the Arroyo Boulevard (Highway) became obsolete and fell into disrepair.

Archaeological Resources

A cultural resources survey was conducted by Patrick O. Maxon, M.A., RPA and Mark A. Roeder on May 1, 2013, and completed by Mr. Maxon alone on November 21, 2013. The survey did not identify any archaeological resources on the Project site. While it is likely that native populations used the Arroyo Seco Canyon area in prehistoric times; previous disturbance of the ground surface and the creek's dynamic, fluvial environment have resulted in much of the area being disturbed. Any archaeological resources that may have been present have likely been washed away or buried by alluvial processes.

Eighteen cultural resources studies have been conducted within a one-mile radius of the Project site, with two of the studies including a portion of the Project site. These studies did not identify any resources on the Project site. However, eight previously recorded resources are located within one mile of the Project site. Table 4.5-1 lists these known cultural resources.

TABLE 4.5-1
CULTURAL RESOURCES WITHIN
ONE MILE OF THE PROJECT SITE

Site Number	Recorder (Year)	Comment
19-342	Cowper (1965)	Cogstone and millingstones
19-2189	McKenna (1993)	Jet Propulsion Laboratory
19-3086	Romani (2002)	Teddy's Outpost Picnic Area
19-3090	McIntyre (1998)	Lower Sam Merrill Trail
19-186870	Schmidt and Schmidt (2003)	Southern California Edison Eagle Rock-Laguna Bell Transmission Line Corridor
19-189942	McKenna (2012)	Hahamongna Watershed Park
19-150023	Stone (1992)	Arroyo Seco Ranger Station No. 1
19-150024	Stone (1992)	Arroyo Seco Ranger Station No. 2
Source: BonTerra Psomas 2014b.		

Paleontological Resources

The Project area is underlain by several geological rock units with varying paleontological sensitivity. Quartz Diorite (qd), found in the eastern edge of Area 1 and between Areas 2 and 3, has no potential to yield paleontological resources. Leucocratic Granitic Rocks (gr) that are present west of Area 1 and west and east of Area 2 have no potential to yield paleontological resources. Quaternary Older Alluvium Fan Deposits (Qoa) east of Area 1 and south of Area 2 have moderate potential to yield paleontological resources. Quaternary Older Alluvial Fan Sediments (Qof) east of Area 3 have low potential to yield paleontological resources. Quaternary Stream Deposits (Qg) in the stream course of the Arroyo Seco in Areas 1 and 2 and found in Area 3 have low potential to yield paleontological resources.

Native American Sacred Lands File Review

On March 20, 2013, an inquiry was made of the Native American Heritage Commission (NAHC) in Sacramento to request a review of the Sacred Lands File database regarding the possibility of Native American cultural resources and/or sacred places in the Project vicinity that are not documented on other databases. The NAHC responded on March 21, 2013, with its Sacred Lands File Search and contacts list of Native American groups and individuals who may have knowledge regarding Native American cultural resources not formally listed on any database. Each of these groups and individuals were mailed an informational letter March 21, 2013, describing the Project and requesting any information regarding resources that may exist on or near the Project site.

One response has been received to date. Robert Dorame, Tribal Chair/Cultural Resources for the Gabrielino Tongva Indians of California Tribal Council, replied via email that (1) several Indian villages were present along the Arroyo Seco in 1769, when Spanish occupation of California began; (2) the Sheldon Reservoir site, located south of Devil's Gate Dam on the east side of Arroyo Seco, contained 53 sets of human remains associated with a prehistoric village site; (3) the ethnohistoric village of *Hahamongna* is located one mile due north of JPL; and (4) Mr. Dorame's grandmother and great-grandmother lived in the San Pasqual Rancho beginning in the late 19th Century. The Rancho is located adjacent to the site (BonTerra Psomas 2014b).

Historical Resources

There are no structures on the Project site that are currently listed, individually or collectively, in either the National Register of Historic Places (NRHP) or the California Register of Historical Resources (CRHR). In assessing the historical significance of built-environment structures located in Areas 1, 2, and 3, as evaluated in the Historic Resources Assessment Report prepared by Daly & Associates (see Appendix C), federal, State, and local significance criteria were applied.

The PWP had water rights to the Arroyo Seco prior to 1914. Water diversion and control structures (e.g., the Headworks, water diversion structure, intake system, debris basins) began to be constructed in the canyon in 1914. Bridges No. 1 and 2 appear to date from the 1920s when Arroyo Boulevard was paved for use as a county highway, while Bridge No. 3 was constructed in 1939 by the Civilian Conservation Corps (CCC) to replace an earlier bridge destroyed in the flood of 1938. Over the years, floods and other high water events have caused permanent damage to water diversion structures in the canyon, and some were replaced as needed. Resources in and near the Project site include:

Area 1. The configuration of the Headworks in Area 1 has been in use for many years. The fact that this headwork has been manually operated for over 50 years points to its design longevity and ease of operation. The headworks facility is not a significant engineering or technological structure.

Area 2. Due to the extensive damage suffered by the diversion dam and intake system, the water diversion and control structures in Area 2 have lost their physical integrity of design, workmanship, and materials. Water diversion systems such as these have been in use for many years and usually do not present significant engineering or technological innovation.

Bridge No. 3. This bridge was constructed in 1939 by the CCC Company 903 assigned to the USFS, a team from the local CCC that had been working on various projects in the Arroyo Seco Canyon and San Gabriel Mountains since 1933. Besides this bridge, the Arroyo Seco through this section and south to Bridge No. 2 is lined with river rock masonry walls, which were most probably constructed by the CCC at the same time as Bridge No 3. Bridge No. 3 was designed using one of the oldest truss-bridge forms; is constructed of wood timbers; and was constructed by a group that is associated with events that made a significant contribution to the history of the United States and California. Bridge No. 3 appears to be a property that meets the criterion to be listed in the NRHP and in the CRHR.

Bridge No. 2. This bridge is situated on the Gabrielino Trail/Arroyo Boulevard, between Areas 2 and 3. This reinforced, poured-concrete arch bridge may have been constructed in the 1920s when Arroyo Boulevard was paved for use as a county highway. It has distinctive decorative elements (e.g., the urn-shaped cast concrete balustrade railings, bas-relief panels below the balusters on the stream sides of the bridge, and the arched support structure) that would not be found on a utility road for service vehicles. The bridge appears to have been constructed to provide a formal entrance to the Upper Arroyo Seco Forest and Arroyo Boulevard. Stone masonry walls that line the east side of the creek at Bridge No. 3 continue downstream and are present at Bridge No. 2. Bridge No. 2 appears to be a property that meets the criterion to be listed as a historical resource in the CRHR and in the City of Pasadena as a landmark.

Bridge No. 1. This bridge is situated on the Gabrielino Trail/Arroyo Boulevard, between Areas 2 and 3. Bridge No. 1 was constructed in 1939 to carry Arroyo Boulevard over the runoff from Millard Canyon Creek, before the creek intersects with the Arroyo Seco creek. The bridge slab was replaced in 1979 with a similar reinforced concrete span. Bridge No. 1 does not appear eligible for listing in the NRHP, CRHR, or as a City of Pasadena landmark.

Area 3. The sludge and spreading basins, water diversion structures, and water conduits situated in Area 3 were all designed using common engineering techniques for moving, diverting, and controlling water. In an effort to protect lives and property and to capture runoff from the western slopes of the San Gabriel Mountains, many water diversion structures are located not only in the Upper Arroyo Seco, but throughout the canyons in Los Angeles County. The spreading basins, sludge basins, and water diversion structures in Area 3 are not significant engineering or technically innovative structures.

4.5.2 IMPACT ANALYSIS

Project Design Features

PDF CUL-1 A temporary bridge will be constructed over Bridge No. 3 prior to the start of construction activities in Areas 1 and 2. The temporary bridge will be used for all construction vehicles and equipment and will be removed after construction activities are completed.

Regulatory Requirements

RR CUL-1 If human remains are encountered during excavation activities, all work is required to halt in the immediate vicinity of the discovery and the County Coroner must be notified (*California Public Resources Code* §5097.98). The Coroner is required to determine whether the remains are of forensic interest. If the Coroner, with the aid of an Archaeologist, determines that the remains are prehistoric, s/he is required to contact the Native American Heritage Commission (NAHC). The NAHC is responsible for designating the most likely descendant (MLD), who is responsible for the ultimate disposition of the remains, as required by Section 7050.5 of the *California Health and Safety Code.* The MLD is required to make his/her recommendation within 48 hours of being granted access to the site. The MLD's recommendation is required to be followed if feasible, and may include scientific removal and non-destructive analysis of the human remains and any items associated with Native American burials (*California Health and Safety Code* §7050.5). If the landowner rejects the MLD's recommendations, the landowner is required to rebury the remains with appropriate dignity on the property in a location that will not be subject to further subsurface disturbance (*California Public Resources Code* §5097.98).

Impact Discussion

a) Would the project cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?

Less Than Significant Impact with Mitigation.

Areas 1, 2, and 3 Impacts. There are no historic resources in the Areas 1 or 3 that will be substantially changed as a result of the Project. Bridge No. 3 is situated within the boundary of Area 2, and Bridge No. 2 is located on the Gabrielino Trail (Arroyo Boulevard) between Areas 2 and 3. Project construction vehicles would cross/utilize Bridge No. 2 and have the potential to damage the structure and result in substantial changes/alterations of historic character-defining features that are components of Bridge No. 2. Additionally, the proposed Project has the potential to substantially change/alter a historic resource with the construction of a temporary bridge to

protect Bridge No. 3 and its associated features such as concrete abutments, railings, and stone walls.

PDF CUL-1 proposes a temporary bridge over Bridge No. 3 for use during construction. This will avoid use of the existing bridge and prevent damage from construction vehicles, equipment, and haul trucks. However, construction of the temporary bridge may affect the concrete abutments, railings, and stone walls. The design and construction (and eventual removal) of the temporary bridge will need to be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (MM CUL-1) so that the character defining features of any affected portions of the bridge remain intact after construction.

In addition, potential damage to the baluster railing of Bridge No. 2 could occur from construction equipment and trucks passing on the bridge. Each baluster railing, from the bridge deck to the top of the railing, will be protected by solid plywood panels secured without damaging the balusters or railing (MM CUL-2). The design and construction of the protective barriers will be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (MM CUL-2). Accordingly, the railings would not be adversely affected by construction traffic.

Impacts on historical resources would be less than significant after implementation of MM CUL-1 and MM CUL-2.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential impacts to historic resources and their settings and included mitigation measures to reduce significant impacts to historical resources. Measure Cultural-6 for impacts to Devil's Gate Dam, Measure Cultural-7 for impacts to features in the Central Arroyo Seco, and Measure Cultural-8 for impacts to the casting pond in the Lower Arroyo Seco are not applicable to the Project.

b) Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?

Less Than Significant Impact with Mitigation.

Areas 1, 2, and 3 Impacts. Several cultural resources have been recorded near the Project site. Teddy's Outpost picnic area (LAN-3086) is located just north of the Headworks near Area 1. Buildings 1015 and 1016 of the Arroyo Seco Ranger Station (19-150023 and 19-150024) are located just east of Area 1. JPL (LAN-2189) is located west of the Arroyo Seco and Area 3. The Hahamongna Watershed Park (19-189942) lies south of JPL and north of the I-210 Freeway on both sides of the Arroyo Seco. Area 3 is located within this park. A significant prehistoric site (LAN-342) was recorded at Millard Canyon, in the neighborhood north and east of the site, but was likely destroyed by development. No disturbance is proposed by the Project at these recorded resources.

It is likely that native populations used the Arroyo Seco Canyon area in prehistoric times. However, the dynamic, fluvial nature of the creek and surrounding floodplain have likely washed away archaeological resources or buried them by alluvial and colluvial processes. Previous disturbance during construction activities of existing facilities (e.g., Headworks, diversion and intake structures, Gabrielino Trail/access road, bridges, parking lot, and spreading basins) makes it unlikely that significant cultural resources are present in these areas. While unlikely, buried resources could exist in the Project site and be damaged by excavation and grading activities for Project construction, which would be a significant impact. As stated under MM CUL-3, a qualified Archaeologist must be retained to monitor earthmoving activities and to evaluate and develop a

mitigation plan for any discovered unique archaeological resource or historical resource. Impacts on archaeological resources would be less than significant with implementation of MM CUL-3.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potentially significant impacts to known and unknown archaeological resources and included mitigation measures (Measure Cultural-2 and Measure Cultural-3) to reduce significant impacts to these resources. Measure Cultural-2 calls for monitoring around CA-LAN-26, which is located in the Central Arroyo Seco, and thus, this measure would not be applicable to the Project. Measure Cultural-3 requires archaeological monitoring during grading of native soils during construction of the surface parking areas, restrooms, Johnson Field expansion, and new trails in the HWP. Since the parking lot in Area 3 would have been removed before construction of the new parking lot occurs, no monitoring is proposed. However, MM CUL-3 will be implemented for improvements in Area 3 and this MM is similar to and therefore replaces Measure Cultural-3.

The Master EIR for the Arroyo Seco Master Plan also identified potential impacts to unknown Native American resources from grading activities associated with construction of the surface parking areas, restrooms, and Johnson Field expansion in the HWP. The Master EIR included Measure Cultural-4 for a Native American Monitor to observe grading activities. The Phase I Cultural Resources Assessment for this Project indicates that the Project site is highly disturbed due to continuous flows in the Arroyo Seco and past disturbance of adjacent areas; the field survey did not uncover archaeological resources; but due to cultural sensitivity within the area, archeological monitoring is recommended. Consultation with Native American tribes was conducted as part of the Phase I Cultural Resources Assessment and the response from the Gabrielino Tongva Indians of California Tribal Council did not express the need for a Native American Monitor. However, MM CUL-3 is recommended and requires monitoring of earthmoving activities for archaeological resources. The City has the option to have a Native American Monitor observe grading and excavation activities in Area 3, if local tribes express a need or deem it appropriate.

c) Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Less Than Significant Impact with Mitigation.

Areas 1, 2 and 3 Impacts. Ground disturbance would occur at the stream bottom, which is overlain by recent alluvial material deposited by stream flows and generally does not contain fossil resources. The areas underlain by granitic bedrock also have no paleontological sensitivity. At the edges of the stream is older alluvium that may have limited potential for paleontological resources.

While no paleontological resources were observed on the surface of the Project site, underlying older Quaternary fluvial deposits may well contain significant vertebrate fossils. Thus, while excavation less than five feet in depth is not likely to disturb paleontological resources, deeper excavations (over five feet in depth), which are associated with excavation of the spreading basins, could expose paleontological resources that have the potential to be damaged by heavy equipment, which would be a significant impact. In order to avoid impacts to paleontological resources, MM CUL-4 requires that a qualified Paleontologist (one with training in the recognition of paleontological resources) shall be retained to observe grading activities in paleontologically sensitive sediments and conduct salvage excavation of paleontological resources as necessary. Any discovered resources would be evaluated for significance and appropriate exploration, salvage, and curation. Impacts on paleontological resources would be less than significant after mitigation.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potentially significant impacts to cultural resources and included Measure Cultural-1 to reduce significant impacts to paleontological resources from construction of the Flint Wash Bridge, the north bridge, and public restrooms in the HWP. While the Project does not propose Flint Wash bridge or the north bridge, it includes construction of a restroom in Area 3. MM CUL-4 will be implemented during construction activities and includes the same requirements outlined in Measure Cultural-1.

d) Would the project disturb any human remains, including those interred outside of formal cemeteries?

Less Than Significant Impact.

Areas 1, 2, and 3 Impacts. While human remains have been found in the Project area, the records search and field survey indicate no evidence of human remains on or near the Arroyo Seco. In the unlikely event of an unanticipated encounter with human remains, the *California Health and Safety Code* and the *California Public Resources Code* require that any activity in the area of a potential find be halted and the Los Angeles County Coroner be notified, as described in RR CUL-1. There would be less than significant adverse impacts to human remains with compliance with RR CUL-1. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential impacts to human remains during construction activities for surface parking areas, public restrooms, and Johnson Field expansion in the HWP. The Master EIR included Measure Cultural-5 for the construction briefing of the foreman and all personnel regarding the need to notify the County Coroner and stop excavation and disturbance of the site in accordance with Section 5097.98 of the *California Public Resources Code.* As discussed above, the Project would comply with RR CUL-1, which is equivalent to Measure Cultural-5.

4.5.3 MITIGATION MEASURES

MM CUL-1 Prior to the start of construction activities in Areas 1 and 2, the cast concrete baluster railing of Bridge No. 2 shall be protected from construction activities that include the movement of heavy and large motor vehicles and machinery over it to gain access to Areas 1 and 2. Each baluster railing, from the bridge deck to the top of the railing, shall be clad with solid plywood panels, with a minimum thickness of ¾ inches (or equally effective measures shall be installed) to protect against unintentional impacts from passing over the bridge. The plywood barriers shall be secured without damaging the balusters or railing.

The design and construction (and eventual removal) of the protective barriers at Bridge No. 2 shall be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The plans for the temporary barriers shall be reviewed by an architectural historian, historic architect, and structural or civil engineer who has experience with the physical components of historic bridges. A qualified architectural historian (who meets the Secretary of Interior's Professional Qualification Standards) shall be retained to monitor the proposed installation and removal of the protective barriers on Bridge No. 2, prior to construction. An installation/construction/repair methodology to protect the historic resources shall be developed prior to construction activities to ensure that the protective measures adequately safeguard Bridge No. 2.

A pre-construction and a post-construction survey shall be prepared to ensure that adverse effects or significant impacts have not occurred to the bridge. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning – Historic Preservation.

MM CUL-2 Prior to commencement of construction activities within Areas 1 and 2, the design and construction (and eventual removal) of the temporary bridge over Bridge No. 3 shall be prepared in accordance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. The plans for temporary bridge shall be reviewed by an architectural historian, historic architect, and structural or civil engineer who has experience with the physical components of historic bridges and stone walls. A qualified architectural historian (who meets the Secretary of Interior's Professional Qualification Standards) shall be retained to monitor the proposed installation/construction and removal plan documents for the temporary bridge on Bridge No. 3, prior to the start of construction activities.

A pre-construction and a post-construction survey shall be prepared to ensure that adverse effects or significant impacts have not occurred to the bridge. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning and Community Development, Design and Historic Preservation.

MM CUL-3 Prior to commencement of earthmoving activities, the City shall retain a qualified Archaeologist to observe grading activities. The Archaeologist shall be present at the pre-grade conference; shall establish procedures for archaeological resource surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts, as appropriate. Should archaeological resources be found during ground-disturbing activities for the Project, the Archaeologist shall first determine whether it is a "unique archaeological resource" pursuant to the California Environmental Quality Act (CEQA, i.e., Section 21083.2[g] of the *California Public Resources Code*) or a "historical resource" pursuant to Section 15064.5(a) of the State CEQA Guidelines. If the archaeological resource is determined to be a "unique archaeological resource" or a "historical resource", the Archaeologist shall formulate a mitigation plan in consultation with the City of Pasadena that satisfies the requirements of the above-referenced sections. The Archaeologist shall prepare a report of the results of any study prepared as part of a testing or mitigation plan, following guidelines of the California Office of Historic Preservation, and s/he shall record the site and submit the recordation form to the City of Pasadena and the California Historic Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton. Work may proceed in other areas of the site, subject to the direction of the Archaeologist.

MM CUL-4 Prior to commencement of earthmoving activities, a qualified Paleontologist shall be retained to observe grading activities in native soils that are 5 feet below the ground surface or deeper, in paleontologically sensitive sediments, and to conduct salvage excavation of paleontological resources, as necessary. The Paleontologist shall be present at the pre-grading conference; shall establish procedures for paleontological resources surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of any fossils discovered, as appropriate. If paleontological resources are discovered, the Paleontologist shall report such

findings to the City of Pasadena. If paleontological resources are found to be significant, the Paleontologist shall determine appropriate actions, in cooperation with the City, for exploration and/or salvage. These actions, as well as final mitigation and disposition of the resources, shall be subject to the approval of the City. All recovered fossils shall be deposited in an accredited institution or museum, such as the Natural History Museum of Los Angeles County.

4.6 ENERGY	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Conflict with adopted energy conservation plans	☐	☐	☐	☒
b) Use non-renewable resources in a wasteful and inefficient manner?	☐	☐	☐	☒

4.6.1 EXISTING CONDITIONS

The Project site currently uses minimal energy, with no energy use in Areas 1 and 2. Area 3 is developed with the JPL East Parking Lot and lights at the parking lot utilize electrical energy when in use during the nighttime hours. There is also an electrical charging station in Area 3 for electric vehicles. However, JPL will be removing these lights and all on-site improvements as part of their lease termination, except for the asphalt on a temporary access road through Area 3. Electrical energy is also used for the basin metering in the spreading basins.

4.6.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project conflict with adopted energy conservation plans?

No Impact.

Areas 1, 2 and 3 Impacts. The Project would have minimal demand for electrical energy. Sources of new energy demands resulting from Project implementation include the proposed control equipment enclosure and weir in Area 2 and the proposed restroom, guard station, irrigation system for planters within the parking lot, and basin metering in Area 3. Electricity would be provided to Area 2 via an existing electrical connection at an existing equipment building, so no new infrastructure is required. Electricity would be provided to Area 3 via the existing electrical infrastructure formerly used to power the parking lot lighting, and no new infrastructure is required. The temporary irrigation system in Area 1 would utilize a battery system. No demand for natural gas would be created by the Project. The elimination of the existing JPL East Parking Lot lighting and reductions in demand for State Water Project water deliveries due to increased groundwater recharge would help partially off-set new Project-related electrical demand. Therefore, although the Project would result in a slight increase in overall electrical usage, no new infrastructure would be required and any new electrical connections would be constructed in accordance with the City's Building Code (RR GEO-1). There would be no conflict with an adopted energy conservation plan would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts related to Energy.

b) Would the project use non-renewable resources in a wasteful and inefficient manner?

No Impact.

Areas 1, 2 and 3 Impacts. Energy use during construction would include the use of fossil fuels for construction equipment, material deliveries, demolition waste disposal, and construction crew travel. Also, maintenance and inspection activities will generate vehicle trips that would utilize fossil fuels. This would be minimal when compared to fossil fuel use from total vehicle miles travelled in the City on a daily basis and would be short-term for construction activities and intermittent for maintenance activities. Also, this energy use would not be considered wasteful or inefficient.

Energy use in Area 1 for the temporary irrigation system would be provided by a battery system. Electrical energy would be needed in Area 2 for the proposed control equipment enclosure and weir. Electrical energy use in Area 3 would be needed for the proposed guard station, restroom, and irrigation system and the basin metering. The proposed Project will not create a high enough demand for energy to require development of new energy sources. With the relatively small sizes of the proposed facilities, energy needs would also be limited and would not be considered wasteful or inefficient. The Project would utilize surface water resources in the Arroyo Seco to increase groundwater recharge and, in turn, would have beneficial impacts on the PWP's water supply, including decreased demand for State Water Project water deliveries. The increase in groundwater recharge due to the Project will require an incremental increase in energy use for groundwater well pumping. However, with decreased reliance upon imported water sources, the net effect would be a reduction in boosting and conveying imported water to the City's water system. No adverse impact on non-renewable resources would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts related to Energy.

4.6.3 MITIGATION MEASURES

There would be no significant adverse impacts on energy; therefore, no mitigation measures are required.

4.7 GEOLOGY AND SOILS	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

A Geotechnical Feasibility Study Report was prepared for the Project in August 2013 by Converse Consultants. The findings of this report are summarized below, with the report provided in Appendix D.

4.7.1 EXISTING CONDITIONS

The Arroyo Seco Canyon is located on the south-facing slopes of the San Gabriel Mountains. The San Gabriel Mountains are part of the Transverse Ranges physiographic province of Southern California. After the Devil's Gate Dam was constructed in 1920, sediments from the canyon accumulated behind the dam and raised the ground surface between the canyon walls. The areas around the dam and reservoir are relatively flat, but areas to the north feature moderately steep foothills. The lower hills north of the JPL campus rise to 1,560 feet above mean sea level (msl), but the San Gabriel Mountains rise up to heights of 6,200 to 8,400 feet above msl.

The Sierra Madre Fault is a 47-mile zone of deformation close to the base of the San Gabriel Mountains; it extends from the San Fernando Pass to the San Antonio Canyon in the eastern San Gabriel Mountains. Trenching at a site in Altadena indicated that the most recent earthquake on the fault segment near the Arroyo Seco occurred in the past 10,000 years. Peak ground

accelerations of between 0.47 gravity (g) and 0.75g are estimated in the City as a result of a magnitude 7.0 earthquake along the Sierra Madre Fault.

Ground elevations in Area 1 range from 1,210 to 1,260 feet above msl. The Headworks structure crosses where the stream elevation is approximately 1,222 feet above msl in Area 1, with slopes to the east rising to 1,231 feet above msl. This area is overlain by stream deposits and older alluvium consisting of primarily light brown silty sand, underlain by cobbles and boulders. The stream deposits and older alluvium are generally moderately dense to very dense. Based on the large amount of cobbles and boulders encountered during exploratory borings, difficult drilling conditions are expected during construction. Water was not encountered at a depth of seven feet but seasonal high groundwater is anticipated to be shallow. Soils are not corrosive to metal or concrete.

Ground elevations in Area 2 range from 1,170 to 1,200 feet above msl. The diversion structure in Area 2 is located in the stream at an elevation of 1,176 feet above msl. The eroded scarp along the access road in Area 2 is approximately 12 feet higher and has exposed older alluvium consisting of brown silty sand with cobbles and boulders that is underlain by very hard, massive granitic rock. The older alluvial soil is three feet thick over granitic bedrock. The upper one foot of bedrock is highly weathered but, below one foot, the bedrock is very hard and massive. Water was not encountered at a depth of 3.5 feet but, with the roadway adjacent to the stream channel, seasonal high groundwater is anticipated to be shallow.

Ground elevations in Area 3 range from 1,100 feet above msl at the southern end to 1,130 feet above msl at the northern end. The former parking lot in Area 3 was overlain by four to five inches of asphalt over a seven- to eight-inch-thick base over stream deposits. The spreading basins are underlain by stream deposits and terrace deposits, both consisting of primarily light brown silty sand, underlain by numerous cobbles and boulders. The stream deposits and terrace deposits are both moderately dense to very dense. Groundwater was not encountered in exploratory borings to a maximum depth of 21 feet.

The California Geological Survey's (CGS's) Inventory of Landslide Areas shows that the HWP, Areas 1 and 2, and adjacent areas have not been subject to landslides (CGS 2007).

4.7.2 IMPACT ANALYSIS

Regulatory Requirements

RR GEO-1 Grading, excavation, and construction is required to comply with the City's Building Code (Title 14 of the Pasadena Municipal Code, which incorporates the 2010 California Building Code), as they relate to site preparation and construction; alteration; moving; demolition; repair; use and occupancy of buildings; structures and building service equipment within the City. The California Building Code requires the preparation of engineering geologic reports, supplemental ground-response reports, and/or geotechnical reports for all new construction; new structures on existing sites; and alterations to existing buildings. It also includes seismic design criteria and requirements for use in the structural design of buildings (i.e., based on seismic hazard maps and the seismic design category) and specifies building components that require special seismic certification.

RR GEO-2 Proposed improvements must be designed and constructed in accordance with the recommendations of the Geotechnical Feasibility Report that has been prepared for the Project, as required by the City's Building Code.

Impact Discussion

a) Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

ii) Strong seismic ground shaking?

iii) Seismic-related ground failure, including liquefaction?

iv) Landslides?

Less Than Significant Impact.

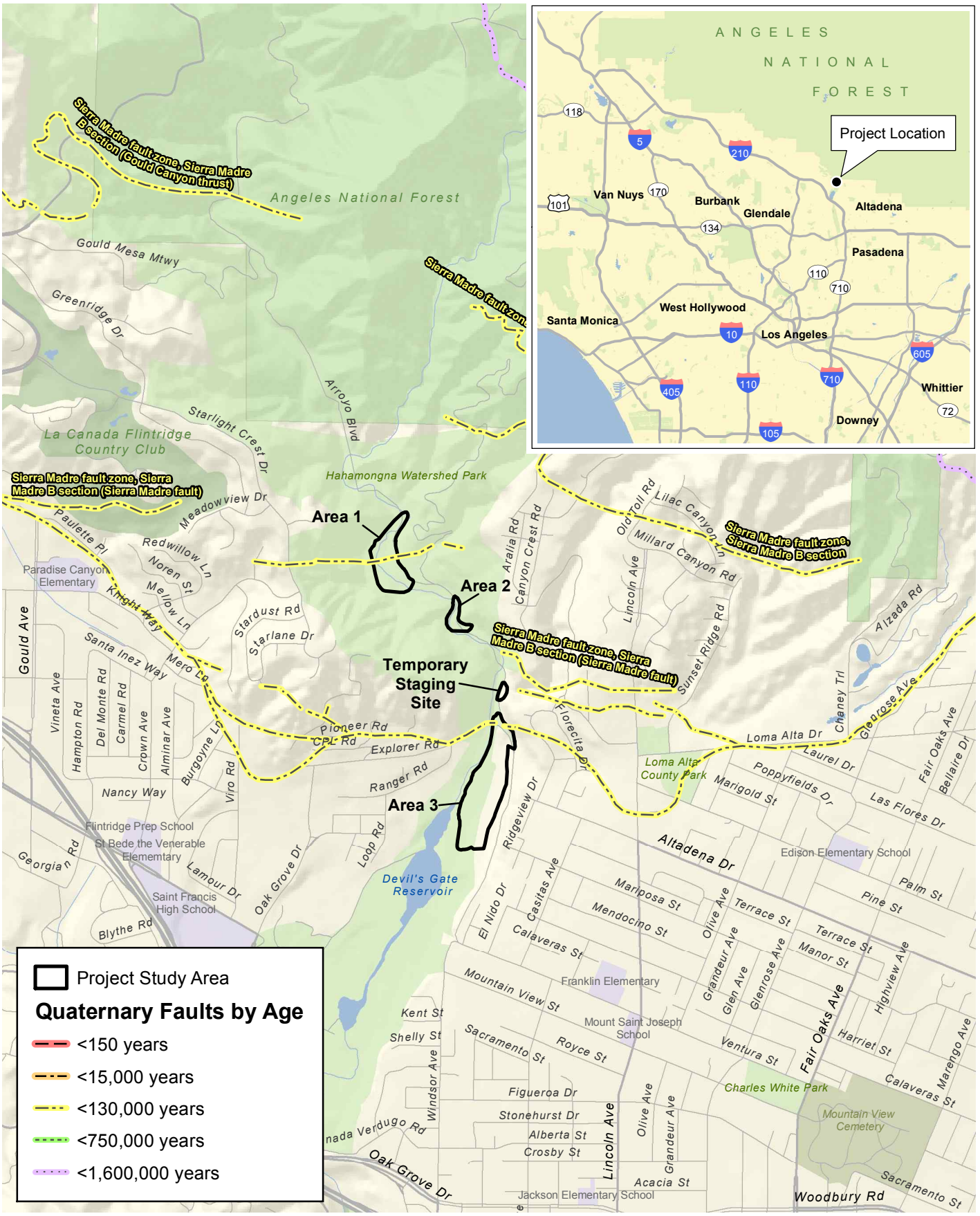
Areas 1, 2 and 3 Impacts. The Sierra Madre Fault (Tujunga segment) crosses the Arroyo Seco, north of the JPL Bridge. However, there is no designated Alquist-Priolo Special Studies Zone for the fault in the Upper Arroyo Seco.

Area 1 is not located within a designated Earthquake Fault Zone, but as shown in Exhibit 4-3, Faults, a splay of the Sierra Madre Fault runs through the center of Area 1. The stream is located within a Seismic Hazard Zone for liquefaction, with adjacent steep slopes susceptible to landslides. However, the Geotechnical Feasibility Study Report states that Area 1 has very dense gravelly sand with cobbles and boulders, and the site is not susceptible to liquefaction. Seismically induced settlement is also expected to be negligible.

Area 2 is not located within a designated Earthquake Fault Zone, but as shown in Exhibit 4-3, the traces of the Sierra Madre Fault are located approximately 1,000 feet south and approximately 1,000 feet north of Area 2. The stream is located within a Seismic Hazard Zone for liquefaction, with adjacent steep slopes susceptible to landslides. The Geotechnical Feasibility Study Report states that the presence of shallow granitic bedrock along the access road indicates that it is not susceptible to liquefaction hazards and seismically induced settlement would be negligible. While the slope just east of the access road is stable, small rock fall hazards are expected.

Area 3 is not located within a designated Earthquake Fault Zone, but as shown in Exhibit 4-3, a section of the Sierra Madre Fault runs though the northern portion of Area 3. Area 3 is located within a Seismic Hazard Zone for liquefaction.

Since portions of the Sierra Madre fault run through two of the three Project areas, the Project would be potentially exposed to fault rupture hazards. While structures sitting directly on top of the ruptured fault could be damaged in an earthquake event along the fault, the Project does not include any habitable structures or structures that are critical for public safety. Additionally, seismic shaking could be significant during an earthquake along other earthquake faults in the region. Ground shaking would not pose major safety hazards to the habitat restoration area and rest area/picnic area in Area 1. The new diversion and weir structures and the reconstructed access road in Area 2 could sustain damage during an earthquake event. Ground shaking would not pose major safety hazards to the spreading basins and parking lot in Area 3 but could damage the restroom, guardhouse, and pipelines proposed in this area. Design and construction in compliance with pertinent building code regulations (RR GEO-1) and in accordance with the recommendations of the Geotechnical Feasibility Report, including seismic design parameters (RR GEO-2), would ensure that the structural integrity of the proposed structures and improvements can withstand seismic shaking. The potential for liquefaction of bedrock is low, but



Faults

Exhibit 4-3

Arroyo Seco Canyon Project

N W E S

2,000 1,000 0 2,000 Feet

BonTerra PSOMAS

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liquefaction in the stream channel is expected to be high. The restored habitat area in Area 1 and the diversion structure in Area 2 would be located within the stream and may be exposed to liquefaction hazards. Slopes in Areas 1 and 2 have a potential for small rock fall hazards, and slopes that would be created could be unstable. The proposed parking lot, access road, restroom, guardhouse, and pipelines in Area 3 could also be exposed to liquefaction hazards that may lead to ground settlement and foundation cracks. Design and construction of the proposed improvements would have to address liquefaction and slope stability in accordance with the recommendations of the Geotechnical Feasibility Report (RR GEO-2).

The temporary bridges in and near Area 2 would also have to be designed and constructed in accordance with the City's Building Code and the recommendations of the geotechnical investigation that would be prepared for the bridges (RR GEO-1). This will prevent the creation of risks associated with seismic and geologic hazards in the area.

Through compliance with RR GEO-1 and RR GEO-2, impacts related to seismic hazards would be less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential impacts related to strong ground motion and liquefaction on the Flint Wash Bridge, the north bridge, Sunset Overlook, and embankments in the HWP. Measure Geology-1, Measure Geology-4, and Measure Geology-5 call for compliance with existing building codes and regulations by the Flint Wash Bridge, the north bridge, Sunset Overlook, and embankments. The Project does not propose the construction of these facilities and thus, these measures are not applicable.

Proposed improvements would be built in accordance with existing building codes and regulations (RR GEO-1), which would reduce seismic hazards.

b) Would the project result in substantial soil erosion or the loss of topsoil?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. Erosion within the Arroyo Seco has occurred due to loose soils in upstream areas, especially after the 2009 Station Fire. The proposed habitat restoration in Area 1 is expected to create a more natural riparian corridor that would reduce stream bank erosion through native planting, bank stabilization, woody debris clusters, and a meandering stream. The area around the diversion structure and the slopes along the access road in Area 2 would be stabilized with riprap protection. The new recreational parking lot in Area 3 would be covered in decomposed granite and the spreading basins would have compacted earth slope sides to reduce erosion. Therefore, the Project would reduce erosion in the long term.

During construction, erosion-control measures would be implemented as part of the Storm Water Pollution Prevention Plan (SWPPP) for the Project (RR HYD-1). Implementation of the erosion control best management practices (BMPs) in the SWPPP would reduce erosion, and impacts would be less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified the potential risk of damage from geologic hazards, including erosion. The Master EIR included mitigation measures to reduce geologic hazards to proposed improvements in the HWP. Measures Geology-1, Geology-4, and Geology-5 are for improvements that are not proposed by the Project and Measures Geology-6, Geology-7, and Geology-8 are for improvements in the Central or Lower Arroyo Seco; thus, these measures would not be applicable to the Project. The Master EIR stated that minor improvements (e.g., minor improvements to

existing structures, restrooms, surface parking areas, passive recreation facilities, and habitat restoration projects) would not expose people or property to significant risk for geologic hazards.

c) Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?

d) Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. The Project site may contain collapsible soils due to its location within and near the Arroyo Seco stream channel. Groundwater extraction wells in the general vicinity of Area 3 may also make this area susceptible to subsidence, although no significant regional subsidence has occurred in the City. The proposed spreading basins in Area 3 would increase recharge of the Monk Hill Subbasin of the Raymond Groundwater Basin. With only 60 percent of the recharge water pumped out, the Project would decrease the potential for subsidence.

To determine geologic hazards at the Project site, soil borings were made at the three areas to identify surface and subsurface soils and their characteristics. The Geotechnical Feasibility Study Report summarizes the findings of the soil analyses, which include geologic, seismic, and flood hazards, percolation testing, and slope stability. The report states that near surface soils in Areas 1 and 3 have a "Very Low" expansion potential (no soil expansion analysis was made for near surface soils in Area 2). The report includes seismic design parameters and recommendations for retaining walls, foundations, slabs-on-grade, soil corrosivity, site drainage, earthwork and site grading, pipeline backfill, temporary excavations, pavements, and other geotechnical considerations. Compliance with these recommendations (RR GEO-2) would address the geologic hazards that are present on the site.

The temporary bridges in and near Area 2 are required to be designed and constructed in accordance with the City's Building Code (RR GEO-1) and the recommendations of the geotechnical investigation that would be prepared for the bridges (RR GEO-2). This would avoid hazards associated with unstable soils, collapsible soils, expansive soils and/or other geologic hazards. Impacts would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified geologic hazards, including liquefaction, that may affect the water conservation pool, spreading basins, lakes, and utility line replacement and relocation proposed in the HWP. Measure Geology-2 called for the conservation pool, spreading basins, and lakes in the HWP to comply with all existing pertinent building codes and regulations; for geologic and geotechnical investigations for these improvements; and for remediation measures to minimize risks. Measure Geology-3 called for the replacement and relocation of utilities in the HWP to comply with all existing pertinent building codes and regulations; for geologic and geotechnical investigations for these improvements; and for remediation measures to minimize risks. RR GEO-1 and RR GEO-2 (similar to Measure Geology-2 and Measure Geology-3) would be implemented as part of the proposed spreading basins and utility improvements in Area 3.

e) Would the project have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No Impact.

Areas 1, 2 and 3 Impacts. The proposed restroom in Area 3 would not include the construction of septic tanks or seepage pits/fields. Instead, the restroom would be connected to an existing sewer line on the JPL campus. The construction crew would be served by portable toilets that would be brought to the site at the start of Project construction. These portable toilets would be regularly cleaned out and removed at the end of construction. Therefore, no impacts related to the use of septic tanks or alternative wastewater disposal systems would occur with the Project and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan included mitigation that called for the construction of a wastewater system to serve the HWP to be completed prior to the construction and renovation of restrooms. However, the Master EIR considered the connection of the new restroom in Area 3 to the sewer line at the JPL campus, which is being proposed by the Project.

4.7.3 MITIGATION MEASURES

There would be no significant adverse impacts related to geology and soils with compliance with RR GEO-1 and RR GEO-2; therefore, no mitigation measures are required.

4.8 GREENHOUSE GAS EMISSIONS	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

4.8.1 EXISTING CONDITIONS

Climate change refers to any significant change in temperature, precipitation, or wind patterns over a period of time. Climate change may result from natural factors, natural processes, and human activities that change the composition of the atmosphere and alter the surface and features of the land. Significant changes in global climate patterns have recently been associated with global warming, which is an average increase in the temperature of the atmosphere near the Earth's surface; this is attributed to an accumulation of greenhouse gas (GHG) emissions in the atmosphere. GHGs trap heat in the atmosphere which, in turn, increases the Earth's surface temperature. Some GHGs occur naturally and are emitted to the atmosphere through natural processes, while others are created and emitted solely through human activities. The emission of GHGs through fossil fuel combustion in conjunction with other human activities appears to be closely associated with global warming.

GHGs, as defined under California's Assembly Bill (AB) 32, include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). General discussions on climate change often include water vapor, ozone, and aerosols in the GHG category. Water vapor and atmospheric ozone are not gases that are formed directly in the construction or operation of development projects, nor can they be controlled in these projects. Aerosols are not gases. While these elements have a role in climate change, they are not considered by either regulatory bodies, such as CARB, or climate change groups, such as the Climate Registry, as gases to be reported or analyzed for control. Therefore, no further discussion of water vapor, ozone, or aerosols is provided.

GHGs vary widely in the power of their climatic effects; therefore, climate scientists have established a unit called global warming potential (GWP). The GWP of a gas is a measure of both potency and lifespan in the atmosphere as compared to CO_2. For example, since CH_4 and N_2O are approximately 25 and 298 times more powerful than CO_2, respectively, in their ability to trap heat in the atmosphere, they have GWPs of 25 and 298, respectively (CO_2 has a GWP of 1). Carbon dioxide equivalent (CO_2e) is a quantity that enables all GHG emissions to be considered as a group despite their varying GWPs. The GWP of each GHG is multiplied by the prevalence of that gas to produce CO_2e. The atmospheric lifetime and GWP of selected GHGs are summarized in Table 4.8-1, Global Warming Potentials and Atmospheric Lifetimes.

TABLE 4.8-1
GLOBAL WARMING POTENTIALS AND ATMOSPHERIC LIFETIMES

Greenhouse Gas	Atmospheric Lifetime (years)	Global Warming Potential (100-year time horizon)
Carbon Dioxide (CO_2)	50.0–200.0	1
Methane (CH_4)	12.0	25
Nitrous Oxide (N_2O)	114.0	298
HFC-134a	14	1,430
PFC: Tetrafluoromethane (CF_4)	50,000.0	7,390
PFC: Hexafluoroethane (C_2F_6)	10,000.0	12,200
Sulfur Hexafluoride (SF_6)	3,200.0	22,800
HFC: hydrofluorocarbons; PFC: perfluorocarbons Source: IPCC 2007.		

Assembly Bill 32 – the California Global Warming Solutions Act of 2006

AB 32, the California Global Warming Solutions Act of 2006, recognizes that California is the source of substantial amounts of GHG emissions. The statute states that:

> Global warming poses a serious threat to the economic well being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.

In order to avert these consequences, AB 32 establishes a State goal of reducing GHG emissions to 1990 levels by the year 2020, which is a reduction of approximately 16 percent from forecasted emission levels, with further reductions to follow (CARB 2011).

City of Pasadena General Plan

The City is in the process of updating its General Plan, and adopted the Open Space and Conservation Element in January 2012. The Open Space and Conservation Element summarizes greenhouse gas issues and outlines goals and policies that will reduce greenhouse gas emissions. It states, “In the City of Pasadena, the primary tool to address greenhouse gases is the Mobility Element of the General Plan. The City is in the midst of a major update to the Mobility Element. The updated plan will introduce sustainable transportation and circulation goals and policies to encourage non-automotive alternatives for residents and visitors to move about the City” (City of Pasadena 2012a).

4.8.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. In developing methods for GHG impact analysis, there have been suggestions of quantitative thresholds, often referred to as screening levels, which define an emissions level below which it may be presumed that climate change impacts would be less than significant. Neither the SCAQMD, the City of Pasadena, nor the County of Los Angeles has adopted a significance threshold for the GHG emissions from non-industrial development projects. Consequently, the City of Pasadena has determined, pursuant to the discretion afforded by Sections 15064.4(a) and 15064.4(b) of the State CEQA Guidelines, that the impact of the Project's GHG emissions be assessed based on the methodologies proposed by SCAQMD's GHG CEQA Significance Threshold Working Group.

On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal for a tiered threshold approach wherein Tier 1 determines if a project qualifies for an applicable CEQA exemption; Tier 2 determines consistency with GHG reduction plans; and Tier 3 proposes a numerical screening value as a threshold. At their September 28, 2010, meeting, the Working Group suggested a Tier 3 threshold of 3,000 metric tons of carbon dioxide equivalent ($MTCO_2e$) per year for all land use types. Although the Project is not a residential or commercial development, in the absence of adopted thresholds, the City of Pasadena has decided to assess the significance of the Project's GHG emissions using this SCAQMD proposed Tier 3 screening threshold (SCAQMD 2010). It is noted that the use of the Tier 3 threshold was selected for the proposed Project because it is located in the South Coast Air Basin and these thresholds are based on the best available information and data at the time of preparation of this document. The development of project-level thresholds in accordance with CEQA is an ongoing effort at the State, regional, and County levels, and significance thresholds may differ for future projects based on new or additional data and information that may be available at that time for consideration.

Construction

Construction GHG emissions are generated by vehicle engine exhaust from construction equipment, on-road hauling trucks, vendor trips, and worker commuting trips. Construction GHG emissions were calculated by using CalEEMod. The model and construction assumptions are described in Section 4.3, Air Quality, and are included in Appendix A. The results are output in $MTCO_2e$ for each year of construction. The estimated construction GHG emissions for the Project are shown in Table 4.8-2.

GHG emissions generated from construction activities are finite and occur for a relatively short-term period of time. Unlike the numerous opportunities available to reduce a project's long-term GHG emissions through design features, operational restrictions, use of green-building materials, or other methods, GHG-reduction measures for construction equipment are relatively limited. Therefore, SCAQMD staff recommends that construction emissions be amortized over a 30-year project lifetime so that GHG-reduction measures will address construction GHG emissions as part of the operational GHG-reduction strategies (SCAQMD 2008). As shown in Table 4.8-2, Estimated GHG Emissions From Construction, the 30-year amortized construction emissions of the Project would be 22 $MTCO_2e$/yr.

TABLE 4.8-2
ESTIMATED ANNUAL GHG EMISSIONS FROM CONSTRUCTION

Year	Emissions ($MTCO_2e$)
2015	587
2016	85
Total	**672**
Annual Emissions*	**22**

$MTCO_2e$: metric tons of carbon dioxide equivalent

* Combined total amortized over 30 years.

Operations

Operational GHG emissions for the proposed Project are estimated by including purchased electricity; the energy associated with solid waste disposal; and mobile source emissions. CalEEMod incorporates local energy emission factors and mitigation measures based on the California Air Pollution Control Officers Association's (CAPCOA's) publication *Quantifying Greenhouse Gas Mitigation Measures* (CAPCOA 2010) and the *California Climate Action Registry General Reporting Protocol* (CCAR 2009). Estimated annual CO_2e emissions are presented in Table 4.8-3.

TABLE 4.8-3
ESTIMATED ANNUAL GHG EMISSIONS

Year	Emissions $MTCO_2e$
Operational Emissions	
Area	<0.5
Energy	<0.5
Mobile	100
Waste	1
Water	3
Total	**104**
Amortized Construction Emissions (Table 4-13)	**22**
Annual Emissions	**126**

$MTCO_2e$: metric tons of carbon dioxide equivalent

Note: totals may not add due to rounding.

As shown in Table 4.8-3, the estimated increase in annual GHG emissions, including amortized construction emissions, would be 126 $MTCO_2e$/yr. This value may be compared with and is less than the proposed SCAQMD Tier 3 screening threshold of 3,000 $MTCO_2e$/yr for all land use types. It is very unlikely that any individual development project would have GHG emissions of a magnitude to directly impact global climate change; therefore, any impact would be considered on a cumulative basis. Because the proposed Project's GHG emissions would be less than 3,000 $MTCO_2e$/yr, the emissions would not be cumulatively considerable. This impact would be less than significant; no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address GHG emissions.

b) Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

No Impact.

Areas 1, 2 and 3 Impacts. As discussed above, the principal State plan and policy adopted for the purpose of reducing GHG emissions is AB 32. The quantitative goal of AB 32 is to reduce GHG emissions to 1990 levels by 2020. Plans and regulations (e.g., GHG emissions standards for vehicles and the Low Carbon Fuel Standard) are being implemented at the statewide level, and compliance at the project level is not addressed. The proposed Project does not conflict with these plans and regulations.

As previously discussed, the increase in GHG emissions would be much less than SCAQMD's recommended significance threshold for all land use projects. The Project would result in a slight increase in electrical use for increased groundwater well pumping to recover the water infiltrated through the spreading basins; however, this would be entirely offset by the corresponding reduced need for Colorado River Aqueduct (CRA) and State Water Project (SWP) water, which requires electricity for conveyance and boosting. Implementation of the proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. There would be no impact.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address GHG emissions.

4.8.3 MITIGATION MEASURES

There would be no significant adverse impacts related to GHG emissions; therefore, no mitigation measures are required.

4.9 HAZARDS/HAZARDOUS MATERIALS	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter-mile of an existing or proposed school?	☐	☐	☒	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☒	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☒	☐	☐
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☒	☐	☐

4.9.1 EXISTING CONDITIONS

The Project site includes Area 1 where the Headworks structure and sedimentation basins are located; Area 2 where the diversion and weir structures, intake structure, access road, and Bridge No. 3 are located; and Area 3 where the JPL East Parking Lot and spreading basins are located. No hazardous material use, storage, or generation occurs in these three areas.

The California Department of Toxic Substance Control (DTSC) maintains the EnviroStor Database, which compiles hazardous material sites and generators that have been identified for clean up or that are permitted to handle hazardous materials by various regulatory agencies. Hazardous material sites or generators in and near the HWP, as listed in the EnviroStor Database, include the JPL, Flintridge Riding Club, and Oak Grove Ranger Station (DTSC 2007). These facilities are located on the west side of the Arroyo Seco and would not be affected by the Project.

The USEPA maintains the Envirofacts Database, which compiles lists of facilities subject to permitting for their potential environmental hazards to air, water, waste, land, toxics, radiation, facility, regulatory compliance, and other. Facilities on the Envirofacts Database that are located in or near the HWP, include JPL, LA Steelcraft Products, Pacific Bell, Audubon Elementary School, Rite Cleaners, and several industrial and commercial uses south of Area 3 (USEPA 2013b).

The facility with the highest potential to affect the Project site is JPL, a 181.2-acre federally funded research and development center operated by the California Institute of Technology (Caltech) under a contract with NASA. JPL is involved in planning, advocacy, and execution of unmanned exploratory scientific flight through the solar system. The campus has 138 buildings and ancillary structures, including 19 underground storage tanks, immediately west of the Arroyo Seco in the City of La Cañada Flintridge. JPL generates laboratory chemical wastes that are brought to the Hazardous Waste Accumulation Facility (Building 305) for off-site disposal. Over 1,000 kilograms (kg, i.e., 2,204 pounds) of hazardous wastes are generated at JPL per year and this facility is considered a large quantity generator. Hazards material and waste handling at JPL is currently made in accordance with its Pollution Prevention Plan and applicable State and federal hazardous waste regulations (JPL 2012).

Past waste handling activities at JPL involved the disposal of waste solvents, solid rocket fuel propellants, cooling tower chemicals, sulfuric acid, freon, mercury, and chemical laboratory wastes into on-site seepage pits, settling chambers, and dumps. These waste-handling activities have led to soil and groundwater contamination, such that volatile organic compounds (VOCs) and perchlorate, which have been detected in local wells east and southeast of the JPL campus. The groundwater contamination is located beneath a portion of the JPL campus and has travelled east and southeast of the campus. This contamination has affected four water wells of the PWP in the Monk Hill Subbasin and two water wells of the Lincoln Avenue Water Company (LAWC) (USEPA 2013a). The nearest groundwater monitoring wells to Area 3 of the Project site include MW-3 (deep multi-port monitoring well) and MW-9 (shallow monitoring well). The depths to groundwater contamination at MW-3 are over 200 feet below the ground surface (NASA 2013a).

A number of studies and investigations under a Work Plan have been completed and a Removal Action Plan is being implemented that includes three water treatment facilities to remove perchlorate and VOCs from the groundwater. The Monk Hill Treatment System (located southeast of Area 3) removes VOCs and perchlorate from four City wells (Arroyo Well, Well 52, Ventura Well, and Windsor Well) located in and near Area 3 (JPL 2011).

The Arroyo Seco Canyon and adjacent areas are designated as a Very High Fire Hazard Severity Zone by the California Department of Forestry and Fire Protection (CalFire 2011). In August 2009, the Station Fire burned nearly 252 square miles in the ANF. This included a fire station, administration buildings, lookout tower, campgrounds, picnic areas, water systems, communication sites, roads, and trails. Subsequent to the fire, the USFS has implemented a restoration strategy that includes tree planting, invasive species removal, trail repair, and recreation sites clean up (USFS 2011).

Several Southern California Edison (SCE) and PWP power lines run through the HWP. However, there are no gas transmission pipelines or hazardous liquid pipelines running in or near the HWP, as mapped by the National Pipeline Mapping System (PHMSA 2012).

4.9.2 IMPACT ANALYSIS

Regulatory Requirements

RR HAZ-1 Construction activities are required to comply with existing federal, State, and local regulations regarding hazardous material use, storage, disposal, and transport to prevent risks to public health and safety. Construction wastes that meet hazardous waste criteria must be stored, manifested, transported, and disposed of in accordance with the *California Code of Regulations* (Title 22) and to the satisfaction of the Los Angeles County Fire Department, which serves as the local Certified Unified Program Agency (CUPA).

RR HAZ-2 The City shall continue to implement its Emergency Operations Plan, which outlines the City's responses to emergencies associated with natural disasters, technological incidents, and national security emergencies.

Impact Discussion

a) Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. No manufacturing or industrial activities are proposed by the Project and no aboveground storage tanks, underground storage tanks, natural gas transmission lines, or other hazardous material storage facilities/conduits would be built as part of the Project. No hazardous materials use, storage, waste generation, or disposal would occur during long-term use and operation of the proposed improvements.

Construction activities would utilize hazardous materials on a short-term basis, and compliance with RR HAZ-1 would prevent the creation of significant hazards to the public or the environment. Impacts would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential hazards associated with the release of hazardous materials (e.g., asbestos-containing materials and lead-based paint) into the environment. RR HAZ-1 (similar to Measure Hazards-1 and Measure Hazards-2) would be implemented for the proper handling and disposal of hazardous materials and wastes as part of construction activities for the Project.

b) Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Less than Significant With Mitigation.

Areas 1, 2 and 3 Impacts. JPL currently utilizes hazardous materials and generates hazardous wastes, but its compliance with existing regulations would prevent the creation of hazards to adjacent land uses, including Area 3.

No long-term hazardous materials use or generation would occur with the Project, as discussed above. During construction, hazardous materials that would be in use would include oil and grease, solvents, diesel gasoline, and other chemicals in vehicles, trucks, and heavy equipment. These hazardous materials could pose risks to construction workers or lead to soil and water

contamination, if not properly stored, used, or disposed. Due to the presence of surface water in construction sites on the Arroyo Seco, the potential for water contamination and the likelihood that accidentally contaminated soils would enter the Arroyo Seco may create a public health and safety hazard. This would be considered a significant adverse impact.

To prevent environmental hazards, the handling of hazardous materials used in equipment would have to be made in accordance with existing regulations (RR HAZ-1) with regard to the transport of hazardous materials; on-site storage and use of hazardous materials; and procedures to implement in the event of a spill. In addition, under RR HYD-1, the Project would implement a SWPPP, as discussed in Section 4.9, Hydrology and Water Quality, which would include hazardous waste management BMPs and a sampling and analysis plan, which require the contractor to report and mitigate any hazardous material discharges that may contaminate the soil, surface water, and/or groundwater.

In addition, MM HAZ-1 includes specific measures to avoid impacts associated with hazardous material spills and accidents in and near the Arroyo Seco. These include inspecting trucks for oil, gasoline, or other vehicle fluid leaks; locating fueling areas and storage of hazardous materials away from water bodies and drainages; creating a plan for refueling; removing hazardous material spills and contaminated soils; controlling and containing hazardous materials spills; and ensuring cleanup kits are available. Implementation of MM HAZ-1 would reduce potential impacts associated with the use and reasonably foreseeable upset of hazardous materials to a less than significant level.

There is groundwater contamination beneath Area 3. Construction activities within Area 3 would involve excavations into native soils to create the spreading basins. However, construction activities are not anticipated to encounter any contaminated groundwater due to the depths of the contamination, which is over 200 feet below the ground surface. Dewatering of any groundwater within the construction areas may be required and would result in the need to discharge and dispose of the recovered water. RR HYD-3 requires compliance with Los Angeles RWQCB Order No. R4-2013-0095 for discharges of treated or untreated groundwater into surface waters. The order requires dischargers to file a Notice of Intent with the Los Angeles RWQCB prior to discharging into surface waters; to complete water sampling and analysis; to implement BMPs to prevent water quality degradation; and/or to treat groundwater prior to discharge. Coverage under the permit requires compliance with effluent limitations, discharge prohibitions, receiving water limitations, and other conditions/provisions in the permit, along with implementation of a monitoring and reporting program.

Due to the presence of contaminated groundwater in the Project area, there is the potential for earthmoving activities to disturb contaminated soils. Should discolored or odorous soils be encountered, MM HAZ-2 requires the soils be sampled and analyzed for contamination and remediated and/or disposed of in accordance with existing regulations, as necessary.

Compliance with applicable regulations (RR HAZ-1, RR HAZ-2, RR HYD-1, and RR HYD-3) and implementation of MM HAZ-1 and MM HAZ-2 would ensure that the use, storage, transport, and disposal of hazardous materials would not create hazards to public health and safety. Impacts would be less than significant after mitigation.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential hazards associated with the release of hazardous materials into the environment and discussed hazards associated with contaminated soils and groundwater from historic uses at the JPL campus. MM HAZ-2 (which is similar to Measure Hazards-3) would be implemented during excavation activities in Area 3. The Master EIR stated that construction activities would not require grading below 1,040.5 feet above msl (e.g., the east side park access,

east side parking area, sunset overlook, trails, bicycle routes and fencing) and would not expose people to contaminated soil or groundwater.

c) Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter-mile of an existing or proposed school?

Less than Significant Impact.

Areas 1 and 2 Impacts There are no schools within 0.25 mile of Areas 1 and 2. The proposed rest area/picnic area and restored habitat in Area 1 and the new diversion and weir structures and improved access road in Area 2 would not generate toxic emissions that may affect nearby trail users and residents. Construction activities would utilize hazardous materials in the short-term, but these would be handled in accordance with existing regulations (RR HAZ-1).

Area 3 Impacts. Sycamores School, located at 2933 El Nido Drive, is located approximately 600 feet southeast of Area 3. Odyssey Charter School, located at 725 Altadena Drive, is located 0.25 mile east of Area 3. Franklin Elementary School, located at 527 West Ventura Street, is located 0.5 mile southeast of Area 3. A number of other schools are located in Altadena east of the Arroyo Seco and in La Cañada Flintridge west of the Arroyo Seco.

The proposed spreading basins and the recreational parking lot in Area 3 would not generate toxic emissions that may affect students at nearby schools. Construction equipment and trucks coming to and from the Project site would utilize Windsor Avenue and I-210, and would not pass along area schools. Construction activities would utilize hazardous materials, but these would be handled in accordance with existing regulations (RR HAZ-1). No hazards to the construction crew or to nearby residents, students, or employees would occur from hazardous materials use on the site. Section 4.3, Air Quality, also discusses toxic air contaminants and determined that the Project would not expose any nearby sensitive receptors to substantial pollutant concentrations.

Impacts would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified schools as sensitive receptors that may be exposed to air contaminants, but no specific discussion of hazards to schools is provided in the Master EIR.

d) Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Less than Significant With Mitigation.

Areas 1 and 2 Impacts Areas 1 and 2 are not located on or near a site included in the list of hazardous material sites. Land uses utilizing hazardous materials are located downstream of Areas 1 and 2. The proposed rest area/picnic area and restored habitat in Area 1 would not pose hazards to adjacent land uses. Similarly, the new diversion and weir structures in Area 2 would not pose hazards.

Area 3 Impacts. The JPL campus, west of Area 3 and the Arroyo Seco, has been designated as a Superfund site pursuant to the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and has been listed on the National Priority List (NPL) (USEPA 2013a). While the HWP is not a source of hazardous material contamination, past waste

handling activities at the JPL campus has led to groundwater contamination that has migrated to the east and southeast beneath the HWP, including Area 3.

The spreading basins and recreational parking lot proposed in Area 3 would not utilize hazardous materials or pose hazards to adjacent land uses. These improvements would not add to the underlying groundwater contamination. Also, contaminated groundwater has been found more than 200 to 300 feet beneath Area 3 (JPL 2013a) and, thus, would not be disturbed by excavation activities associated with construction of the sedimentation basins and expansion of the spreading basins. Impacts would be less than significant.

The increase in spreading area would increase percolation by as much as 1,100 afy of water into the ground, increasing the groundwater resources beneath Area 3. Modeling simulations conducted in 2005 using the NASA JPL's groundwater flow model for the Monk Hill Subarea were conducted to assess the potential impacts on existing groundwater contamination from increased groundwater recharge from the spreading basins anticipated in the Arroyo Seco Master Plan. The analysis assumed an increase in the spreading area from 13.1 acres to 21 acres; increasing recharge by 2,443 afy; and pumping from local production wells and JPL's extraction and injection wells. The simulations suggest that increased spreading would have the most significant effect on the uppermost aquifer layer, where an additional 5 to 10 feet of mounding could occur beneath the new spreading area. No significant change in flow patterns would occur. Also, only a minor change would occur in the capture zone of the deeper aquifer layers, where existing groundwater contamination is present. The modeling indicated that groundwater cleanup would not be significantly impacted by the expanded spreading grounds. With less groundwater recharge proposed by the Project (1,100 afy), impacts on the contaminated groundwater would likely be less than the 2005 modeling results.

As discussed above, compliance with RR HYD-3 would require implementation of water sampling and analysis; implementation of BMPs to prevent water quality degradation; and/or treatment of groundwater prior to discharge. A monitoring and reporting program would also have to be implemented to ensure that dewatering activities do not affect water quality in surface waters. In addition, compliance with MM HAZ-2 would ensure that encounters with potentially contaminated soils are remediated and/or disposed of in accordance with existing regulations.

Compliance with applicable regulations (RR HAZ-2 and RR HYD-1) and implementation of MM HAZ-2 would ensure that existing groundwater contamination in Area 3 does not pose hazards to public health and safety. Impacts would be less than significant after mitigation.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan discussed hazards associated with contaminated soils and groundwater from historic uses at the JPL campus, located west of Area 3. It indicated that water conservation and flood management activities, proposed lakes, Gabrielino Trail area, habitat conservation, and relocation/replacement of utilities that involve grading below 1040.5 feet above msl may expose contaminated soils and require mitigation. MM HAZ-2 (which is similar to Measure Hazards-3) would be implemented during excavation activities in Area 3.

The Master EIR stated that construction activities that would not require grading below 1,040.5 feet above msl (e.g., the east side park access, east side parking area, sunset overlook, trails, bicycle routes and fencing) would not expose people to contaminated soil or groundwater.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact.

Areas 1, 2 and 3 Impacts. There are no airports or airstrips within two miles of the Arroyo Seco Canyon. The nearest airports are the Burbank Bob Hope Airport and the El Monte Airport, which are both approximately 11 miles from the site. There is a heliport and a helipad near the Arroyo Seco. The Project would not involve the construction of high-rise structures or involve activities that could pose a safety hazard to helicopter or aircraft operations or airport activities, nor would it conflict with an airport land use plan. There would be no impact to airports or airstrips from the Project.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that the HWP is not located within an airport land use plan or within two miles of a public airport or private airstrip. Therefore, no hazards related to airport or aircraft operations would occur and no mitigation is required.

g) Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Less than Significant With Mitigation.

Areas 1 and 2 Impacts. No improvements are proposed on the Gabrielino Trail/access road in Area 1, except for removal of a section of the chain-link fencing along its western edge. Improvement of the Gabrielino Trail/access road in Area 2 would result in a temporary partial obstruction of this road, which may affect emergency response and evacuation of the USFS Ranger Station and other areas in the ANF farther north. Compliance with the Standard Specifications for Public Works Construction (Greenbook) and the City's Supplements and Modifications to the Greenbook (RR TRA-1 in Section 4.16, Transportation/Traffic) regarding maintenance of access at all times would mean closure of only half of the access road; the use of a flagperson to direct traffic, as necessary; and allowing for the public use of the Gabrielino Trail/access road at times when construction is not ongoing. This RR also requires that the Gabrielino Trail/access road be made passable at the end of each workday. Thus, access to Areas 1 and 2 (including the USFS Ranger Station) would be made available during construction activities, but short-term closures may occur.

The process of assembling the temporary bridges over Bridge No. 1 near Area 1 and over Bridge No. 3 in Area 2 would block access across the bridges and areas farther north when the access road is connected to temporary bridges. Similarly, RR TRA-1 would ensure that access would be available to the USFS Ranger Station and the ANF during bridge construction, as required by the Greenbook.

Access would be maintained for vehicles coming to and from the USFS Ranger Station in accordance with the Greenbook (as discussed above); however, there would be short time periods during the day when both the temporary bridge and Bridge No. 1 or the other temporary bridge and Bridge No. 3 are closed. There would also be times when construction equipment and vehicles would be on the access road and would slow down other vehicles that need to pass through the area. While the bridges and access road do not provide access to a hospital, fire or police station, emergency operations center, communications center, emergency shelter or other critical or essential facilities, they do serve as the only access to the USFS Ranger Station and the ANF to the north. Temporary bridge closure would be considered a significant adverse impact on emergency access and evacuation.

MM HAZ-3 requires the Contractor to shorten the closures of the access road and bridges to the extent feasible and to inform the PWP, Pasadena Fire Department, Pasadena Police Department, Los Angeles County Fire Department, and the USFS at least one week prior to the start of construction of the times when work on the access road is planned; and when both Bridge No. 1 and the temporary bridge or Bridge No. 3 and the temporary bridge would be closed off. This will facilitate emergency response and evacuation that may be necessary when the bridges are not accessible or when the access road is partially blocked.

Compliance with RR TRA-1 and implementation of MM HAZ-3 would reduce impacts to emergency access and evacuation to less than significant levels after mitigation.

Area 3 Impacts. A temporary access road would be retained through Area 3 while construction of the new access road is ongoing. Also, the Gabrielino Trail to the east of Area 3 may serve as an additional emergency access road during construction activities. Thus, emergency access through Area 3 would be maintained at all times. Continued implementation of the City's Emergency Operations Plan (RR HAZ-2) would provide emergency access and evacuation in the HWP, as necessary. Impacts would be less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated no changes to the existing fire camp operated by the Los Angeles County Fire Department (located west of the Arroyo Seco) and the helicopter landing area operated by the Pasadena Police Department (south of Oak Grove Avenue and west of Windsor Avenue) would occur. Also, no encroachment into support areas for emergency evacuation plans was anticipated. Therefore, no increase in exposure to hazards related to emergency evacuation and air support operations and no impacts to emergency access would occur.

h) Would the project expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

Less than Significant with Mitigation.

Areas 1, 2 and 3 Impacts. The Arroyo Seco Canyon is located in an area designated as a Very High Fire Hazard Severity Zone, which includes Areas 1 and 2 (CalFire 2011). The proposed habitat restoration and increased water diversion would not increase fire hazards in the Arroyo Seco Canyon and surrounding areas. The proposed recreational amenities would encourage the increase in trail users and visitors, who may accidentally cause fires in the canyon. While native plants would be combustible, they would not present fire hazards.

The proposed restroom would have fire-retardant shingles. The guard station, picnic table, benches, pet waste stations, trash receptacles, fencing, and signs would not utilize explosive or flammable materials; however, woody debris clusters, picnic tables and benches, and other improvements that utilize wood would be combustible. In the absence of a fire source, these improvements would not increase the potential for wildfire in the area.

The proposed control equipment enclosure, guard station and restroom would have electrical systems that may lead to fire. However, compliance with the City's Fire Prevention Code (RR PS-1 from Section 4.14, Public Services) would prevent the creation of a fire hazard. Also, the Project would not involve construction or operation of habitable structures that may expose people to wildfire hazards in the area. Users of the recreational facilities and maintenance workers that would come to the area would be in the area for limited time periods (from a few minutes to a few hours during each visit) and could readily avoid the area in the event of wildfires. Residents

of the USFS Ranger Station are exposed to wildfire hazards due to their employment, but this exposure would not increase with the Project.

Construction workers would be exposed to potential injury in the event of wildfire or an accidental fire at the construction sites. Potential sources of fire from the Project include sparks from construction equipment and vehicles and from electrical systems at the control equipment enclosure, guard station, and restroom. The City's Fire Prevention Code includes fire safety measures that need to be followed during construction and demolition. The use of various construction equipment with combustion engines could also increase the potential for fire at the Project sites. MM HAZ-4 requires the use of spark arrestors and other measures to prevent accidental fires. Compliance with MM HAZ-4 and RR PS-1 from Section 4.14, Public Services, would reduce the potential for fire. Therefore, wildfire hazards during construction would be less than significant.

With compliance with RR PS-1 from Section 4.14, Public Services, impacts related to wildfires would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan indicated that recreational improvements would not increase fire hazards or change the potential for fire hazard.

4.9.3 MITIGATION MEASURES

MM HAZ-1 The City shall require the Construction Contractors to implement the following measures:

- Trucks and equipment entering the site shall be inspected to be free from oil, gasoline, or other vehicle fluid leaks.
- Equipment fueling areas shall be located outside jurisdictional waters as identified by the USACE and CDFW.
- Hazardous materials shall not be stored within the 50-year floodplain for the Arroyo Seco. Instead, hazardous materials shall be stored within staging areas located away from the Arroyo Seco and shall be removed prior to the start of the storm season.
- All hazardous material spills and contaminated soils shall be excavated immediately upon discovery to minimize soil and water contamination and the potential of wildlife being poisoned or otherwise harmed.
- The Contractor shall maintain hazardous materials spill control, containment, and cleanup kits of adequate size and materials for potential accidental instream spills and releases.

MM HAZ-2 Should discolored or odorous soils be encountered during grading and excavation activities in Area 3, the Contractor shall have a sample of the soils analyzed for the presence of contamination. If the results of the testing show that chemical levels are present below regulatory levels, grading and excavation activities may proceed accordingly. Otherwise, remediation and/or removal of the contaminated soils shall be completed prior to continued ground disturbance if chemical levels are above regulatory standards. Remediation and/or disposal shall be conducted with the oversight of applicable regulatory agencies such as the Los Angeles County Fire Department [operating as the CUPA], the South Coast Air Quality Management District (SCAQMD), the California Department of Toxic Substances Control

(DTSC), and/or the U.S. Environmental Protection Agency in compliance with established maximum contaminant levels (MCLs).

MM HAZ-3 The Contractor shall schedule the temporary bridge construction and the access road reconstruction in Area 2 so as to shorten the necessary closures of the bridges and access road to the extent feasible. The Contractor shall also inform the Pasadena Department of Water and Power (PWP), the Pasadena Fire Department, the Pasadena Police Department, the Los Angeles County Fire Department, and the United States Forest Service (USFS) at least one week in advance of the start of construction of the times when work on Bridge No. 1/temporary bridge; Bridge No. 3/temporary bridge; and the Gabrielino Trail/access road are planned. Any major changes to the schedule shall be forwarded to these agencies at least one week prior to the bridge or trail closures.

MM HAZ-4 The Contractor shall not use, operate, or cause to be operated any internal combustion engine that uses hydrocarbon fuel, unless the engine is equipped with a spark arrestor and is maintained in effective working order, or the engine is constructed, equipped and maintained for the prevention of fire.

4.10 HYDROLOGY AND WATER QUALITY	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?	☐	☐	☒	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?	☐	☐	☒	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of pollutant runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

4.10.1 EXISTING CONDITIONS

The Upper Arroyo Seco is located on the south-facing slopes of the San Gabriel Mountains. The watershed for the Upper Arroyo Seco (north of the Devil's Gate Dam) covers 32 square miles of the San Gabriel Mountains and surrounding areas. Several drainage streams (flows from canyons) and storm drains convey runoff into the Arroyo Seco. Stream flows depend on rainfall in the mountains during the winter and spring seasons, with urban runoff from local storm drains contributing very limited flows.

Devil's Gate Dam is a flood control facility owned and operated by the Los Angeles County Department of Public Works on land owned by the City of Pasadena. The County has an easement for the area upstream of the dam to the 1,075-foot elevation. This facility was built in 1920 for flood control and water conservation purposes. In 1948, the County constructed the spreading basins, which were subsequently transferred to the City of Pasadena for operation.

The Raymond Basin underlies an alluvial valley that covers approximately 40 square miles and that is bordered by the San Gabriel Mountains on the north; the San Rafael Hills on the west; and the Raymond Fault on the south and east. The general east-west trend of the San Gabriel Mountains, the north-south trend of the San Rafael Hills, and northeast trend of the Raymond Fault result in the basin having a triangular form. The basin is divided into the Monk Hill Subbasin to the west, the Santa Anita Subbasin to the east, and the Pasadena Subbasin in the central portion; these designations are based on differences in elevation and groundwater flow. Groundwater elevation east of the Arroyo Seco was estimated at 1,000 feet above msl in 2005 (MWD 2007).

The California Department of Water Resources estimates the Raymond Basin's storage capacity at about 1,450,000 acre-feet (af), with about 1,000,000 af of water remaining in storage in 1970. The Raymond Basin is recharged by the Arroyo Seco, a tributary to the Los Angeles River, and by Eaton Wash, Santa Anita Wash, and other streams in the watershed (DWR 2004).

Pumping rights to the Raymond Basin are adjudicated and the Raymond Basin Management Board administers the provisions of the adjudication decree. The Board coordinates the pumping rights and the groundwater storage accounts of public and private water agencies, including the PWP.

The spreading basins in Area 3 overlie the Monk Hill Subbasin, which has a natural safe yield of 7,489 afy. The MWD estimates that 11 wells in this subbasin provided 17,500 afy of water in 2004/2005. Valley Water Company has two aquifer storage and recovery (ASR) wells and PWP has no ASR wells in the Monk Hill Subbasin. The wells injected 10,500 afy of water in 2005. The Arroyo Seco spreading basins cover approximately 24 acres, with 12 acres of wetted area and a recharge capacity of 18 cfs and 13,000 afy (MWD 2007 and PWP 2014).

Groundwater quality is hard (high levels of calcium bicarbonate) and fluoride levels are occasionally high. Nitrate, perchlorate, and VOCs have been detected in wells in the Monk Hill Subbasin and along the Arroyo Seco (MWD 2007). The Monk Hill Treatment System (located on Windsor Avenue southeast of Area 3) removes VOCs and perchlorate from four City wells (Arroyo Well, Well 52, Ventura Well, and Windsor Well) located in and near Area 3 (NASA JPL 2011).

The floodplains for the 50-, 100- and 500-year storm events are generally confined to the stream channel in Areas 1 and 2. While the floodplains include portions of the access road in Area 1, the USFS Ranger Station is outside the 500-year floodplain (Carollo 2013). The Flood Insurance Rate Maps of the Federal Emergency Management Agency (FEMA) show that Areas 1 and 2 are located in Zone D (areas in which flood hazards are undetermined, but possible) and Area 3 is located in Zone X (areas determined to be outside the 0.2 percent annual chance floodplain) (FEMA 2008).

The Upper Arroyo Seco is not listed as an impaired water body under Section 303(d) of the Clean Water Act (SWRCB 2012).

4.10.2 IMPACT ANALYSIS

Project Design Features

PDF HYD-1 Habitat restoration proposed in Area 1 will create a more natural riparian corridor for the Arroyo Seco and will include recontouring the stream channel; stabilizing the bank; revegetating with native plants; creating planting islands; and placing woody debris clusters at scattered locations.

PDF HYD-2 Replacement of the diversion and weir structures in Area 2 and additional spreading basins and expansion of the spreading basins in Area 3 will increase groundwater recharge using the City's surface water rights from the Arroyo Seco.

PDF HYD-3 The proposed restroom in Area 3 will be located outside the 50-year floodplain and would be connected to the public sewer system. In addition, trash cans and pet waste stations will be provided in Areas 1 and 3 to reduce pollutants that may enter the Arroyo Seco.

Regulatory Requirements

RR HYD-1 Prior to the start of construction activities, the Contractor is required to file a Permit Registration Document (PRD) with the State Water Resources Control Board (SWRCB) in order to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with the Construction and Land Disturbance Activities (Order No 2009-009-DWQ, NPDES No. CAS000002) or the latest approved general permit. This permit is required for construction activities (including demolition, clearing, grading, and excavation) and other land disturbance activities that result in the disturbance of one acre or more of total land area. The PRD consists of a Notice of Intent (NOI); a Risk Assessment; a Site Map; a Storm Water Pollution Prevention Program (SWPPP); an annual fee; and a signed certification statement. Pursuant to permit requirements, the Contractor must implement Best Management Practices (BMPs) in the SWPPP into the Project to reduce or eliminate construction-related pollutants in the runoff.

RR HYD -2 The Contractor is required to comply with SWRCB Order No. 2003-0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification", which requires compliance with all conditions of the Water Quality Certification issued by the Regional Water Quality Control Board (RWQCB). Compliance with the Water Quality Certification issued by the RWQCB would ensure that any discharge does not conflict with the applicable provisions of Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), or 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, or any other applicable requirements of State law.

RR HYD-3 Construction activities that will result in discharges of groundwater and dewatering that could result in discharges to surface waters are required to comply with the effluent limitations, discharge prohibitions, receiving water limitations, and other provisions outlined in the Los Angeles RWQCB Order No. R4-2013-0095. This Order requires that an NOI be filed with the Los Angeles RWQCB prior to dewatering activities and discharge into surface waters; water sampling and

analysis; implementation of BMPs to prevent water quality degradation; and/or treatment of groundwater prior to discharge. The Los Angeles RWQCB reviews the NOI and the proposed discharge; authorizes the discharge subject to the requirements in the Order; and prescribes an appropriate monitoring and reporting program.

RR HYD-4 The Contractor is required to comply with the City's Stormwater Management and Discharge Control Ordinance (Chapter 8.7 of the Pasadena Municipal Code), which prohibits illicit discharges and connections to the municipal storm water system; requires that storm water pollutants be reduced through litter control, natural water course protection, and containment of spills; and calls for the implementation of BMPs during construction through SWPPPs and standard urban storm water mitigation plans (SUSMPs) for new development and major redevelopment.

RR HYD-5 All new construction and improvements in flood-prone areas are required by the City's Floodplain Management Regulations Ordinance (Chapter 14.27 of the Pasadena Municipal Code) to be adequately anchored to prevent flotation, collapse, or lateral movement; to be constructed with materials and equipment resistant to flood damage; to have utility and service facilities designed and located to prevent water from entering; and to provide adequate drainage to reduce exposure to flood hazards.

Impact Discussion

a) Would the project violate any water quality standards or waste discharge requirements?

f) Would the project otherwise substantially degrade water quality?

Less than Significant with Mitigation.

Areas 1, 2 and 3 Impacts. The restoration of riparian habitat in Area 1 would reduce pollutants in the stream channel (PDF HYD-1) by diverting flows in the Arroyo Seco through a meandering high-flow channel featuring seasonal wetlands, planting islands, and sandbars that would allow for the settlement of soils and sediments. The improvements in Area 2 include a diversion structure and screens in the intake structure that would prevent sediments from entering into the diverted water. In addition, the sedimentation basins proposed in Area 3 (PDF HYD-2) would also allow for the settlement of silts and fine sediments, preventing these from entering the spreading basins. Since overflows from the high-flow channel and spreading basins would go back into the Arroyo Seco, these PDFs would have beneficial impacts on water quality in the Arroyo Seco.

Pollutants that may impact storm water quality and water quality in the Arroyo Seco would be reduced by the Project. The recreational parking lot in Area 3 would be constructed of decomposed granite and would not generate runoff pollutants that may enter the Arroyo Seco. Oil, grease, and other vehicle fluids that may leak from parked vehicles in the proposed recreational parking lot would be absorbed into the ground surface and would be in limited amounts. The proposed trash receptacles and pet waste stations (PDF HYD-3) would allow trail users and visitors to properly dispose of these wastes; this would discourage others from throwing wastes on the ground, thereby preventing their potential conveyance by runoff into the Arroyo Seco. The proposed restroom would also provide a convenience to trail users and visitors, thereby reducing the occurrence for human waste and contact in the streambed or canyon and improving the water quality in the Arroyo Seco. The restroom is estimated to generate 2,000 gallons of

wastewater per day that would be conveyed to an existing sewer line at the JPL campus (PDF HYD-3); this sewer line, in turn, would convey wastewater to the Los Angeles County Sanitation Districts' Whittier Narrows Water Reclamation Plant or the Joint Water Pollution Control Plant. No wastewater would be directed into the Arroyo Seco. Thus, the proposed restroom would reduce water pollutants in the Arroyo Seco. No long-term storm water pollutant generation would occur with the Project.

While the Upper Arroyo Seco is not an impaired water body, construction activities within and near the Arroyo Seco in Areas 1 and 2 would temporarily result in pollutants in the stream that may degrade water quality. Compliance with RR HYD-1 and RR HYD-4, which require implementation of BMPs during construction, would reduce the amount of these pollutants that enter the Arroyo Seco. In addition, the Project requires a Water Quality Certification from the Los Angeles RWQCB (MM BIO-5 from Section 4.4, Biological Resources), and implementation of the Waste Discharge Requirements (WDRs) and other conditions of the Water Quality Certification (RR HYD-2) would reduce pollutants in the stream.

Dewatering activities associated with excavation of the spreading basins in Area 3 may also lead to the temporary discharge of water into the Arroyo Seco that may affect water quality in the stream. Compliance with the provisions outlined in the Los Angeles RWQCB Order No. R4-2013-0095 relating to the discharge of groundwater into surface water (RR HYD-3) would reduce adverse impacts to water quality.

As discussed earlier, hazardous materials use, storage, and disposal (i.e., equipment and refueling activities) may lead to hazardous materials entering or being washed down into the Arroyo Seco. Compliance with MM HAZ-1 from Section 4.8, Hazards and Hazardous Materials, regarding hazardous materials handling at the construction sites would prevent these impacts.

Impacts on water quality would be less than significant during construction with compliance RR HYD-1, RR HYD-2, RR HYD-3, RR HYD-4, MM BIO-5 from Section 4.4, Biological Resources, and MM HAZ-1 from Section 4.8, Hazards and Hazardous Materials. No other mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential impacts to water quality from construction activities and increases in vehicles, horses, and park and trail users at the HWP. The Project would comply with RR HYD-1 and RR HYD-4 for the implementation of BMPs during construction as part of the SWPPP. These RRs are similar to the Master EIR's Measure Hydro-1. The Project's proposed trash cans and decomposed granite parking lot are comparable to BMPs called out in Measure Hydro-2.

The Master EIR also discussed potential microbial contamination of surface water from waterfowl and the use of wetlands for filtration. The Project does not propose habitat restoration in Area 3, which is located within the HWP and was analyzed in the Master EIR. However, the Project proposes wetland and habitat restoration in Area 1, which would provide filtration of water in the Arroyo Seco.

b) Would the project substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. The Project does not involve direct extraction of groundwater from the Raymond Groundwater Basin's underlying Monk Hill Subbasin. The PWP owns the rights to divert up to 25 cfs of stream flow from the Arroyo Seco, but currently only utilizes up to 18 cfs for spreading at existing basins. The LAWC has surface water rights to 6.59 cfs of surface water flows on Millard Creek.

The new diversion and weir structures in Area 2 and the expanded spreading basins in Area 3 (PDF HYD-2) would allow for the capture and recharge of as much as 25 cfs. With the increased ability to divert water during storm events and the larger recharge area provided by additional spreading basins, the Project would allow for the recharge of an additional 1,100 af of water annually, which would supplement the PWP's local water supplies. This is a beneficial impact on PWP's water resources.

With the improved diversion, less surface water would flow in the portion of the Arroyo Seco downstream of Area 2 and towards the Devil's Gate Reservoir and more surface water would be conveyed to the spreading basins for groundwater recharge. The Upper Arroyo Seco, Devil's Gate Reservoir, and the spreading basins are underlain by the same Monk Hill Subbasin of the Raymond Groundwater Basin. Where surface water now percolates in Devil's Gate Reservoir to reach the groundwater or is released through the dam by the County prior to storm events, the Project would divert an estimated 1,100 afy into spreading basins, allowing for a 60 percent extraction (i.e., 660 afy) of the amount of groundwater infiltrated. Depending on the amount of surface water currently percolating at Devil's Gate Reservoir, the Project could alter the amount of water percolating into the underlying groundwater subbasin, as well as the amount of groundwater extraction. The Raymond Basin Management Board adjudicates water resources in this groundwater basin by setting the pumping rights and managing the groundwater storage accounts of public and private water agencies, including the PWP. Continued management of the Raymond groundwater basin would prevent adverse impacts to underlying groundwater resources, and impacts would be less than significant.

Construction activities would require water for dust control, equipment cleaning, and incidental uses, but this water demand would be provided by water trucks and would not directly impact underlying groundwater supplies. While recharge at existing spreading basins may be temporarily disrupted during the construction phases of the diversion and weir structures, the intake structure, and the spreading basins, and the long-term increase in recharge brought on by the Project would have a beneficial impact on groundwater supplies. Impacts on the spreading basins would be short-term and less than significant; no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that the improvement of spreading basins would have positive impacts on the Raymond groundwater basin.

c) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. Recontouring of Area 1 would change stream flows in the Arroyo Seco; however, the proposed flow diversion, floodplain islands, riparian planting, and woody debris clusters in Area 1 would reduce flow velocities in the Upper Arroyo Seco, while the bank stabilization (e.g., rock revetment and coconut fiber bundles) would reduce erosion and scour.

The addition of woody structures and revetment would slightly alter the course of the Arroyo Seco within Area 1; however, this portion of the creek is subject to variations in flows through the braided stream area.

Flows over the ten-year base flow may go into the proposed rest area/picnic area. Improvements in this area would be bolted into concrete foundations to withstand flooding and erosion hazards. If the proposed nature trail is submerged in flows and wiped out, it is anticipated that trail users would create a new trail alignment. Erosion due to changes in stream flows would be less than significant.

Increases in surface water diversion at Area 2 would not change drainage patterns, but would redirect some of the surface water flows currently entering the Devil's Gate Reservoir to the new spreading basins in Area 3. The area around the diversion structure and the slopes along the access road in Area 2 would also be stabilized with riprap protection to reduce erosion. The new recreational parking lot in Area 3 would be covered in decomposed granite, and the maintenance roadway around the spreading basins would be compacted to reduce erosion. Therefore, the Project would reduce erosion in the long term. No major change in drainage patterns or erosion and siltation would occur with the Project.

During construction, erosion control measures would be implemented as part of the Project's SWPPP (as RR HYD-1). BMPs proposed include cofferdams that would be placed at the upstream ends of Areas 1 and 2, with a sump pump to direct water through a pipeline to the downstream ends of the construction areas. This alteration of flows would be temporary, but would avoid construction materials and debris from entering the stream flow. A silt fence would also be installed around Area 1 to reduce erosion and sedimentation into the construction area. Compliance with the BMPs in the SWPPP would reduce erosion, and impacts would be less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that storm drain improvements, channel widening, and habitat establishment would reduce erosion along the Arroyo Seco. Erosion and sedimentation controls were called out for the water conservation pool, spreading basins, lakes, bridges, and utility relocation/replacement (Measures Geology-1 through Geology-5). Measures Geology-1, Geology-3, and Geology-4 are not applicable to the Project. The Project would comply with RR HYD-1, which includes implementation of erosion-control measures as part of the SWPPP for the Project. This is similar to Measures Geology-2 and Geology-5.

d) Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. The proposed improvements would not change drainage patterns in a way that could cause flooding. The Project does not involve the construction of new impervious cover that would impede storm water absorption into soils, or cause new sheetflow runoff. In Area 1, the footings and legs for the proposed picnic tables, benches, horse water trough, pet waste stations, trash cans, and signs would be relatively small and scattered, and would have no impact on floodwater flows. These recreational and educational amenities in Area 1 will be placed outside the five-year floodplain to minimize the amount of maintenance or repair needed following storm events. Bank revetment and the addition of woody debris clusters and a high flow channel

would slightly alter the course of the Arroyo Seco within Area 1; however, they would not alter flows in such a way that could increase flooding.

The diversion and weir structures in Area 2 would be placed above the existing diversion sill, and no changes to existing drainage patterns would occur. Flooding in Area 2 would not change, although water impoundment during high flows would be greater.

The area near Area 3 that is most frequently inundated is located behind the Devil's Gate Dam, below the elevation of the spillway (at 1,040.5 feet above msl). When the water level reaches the top of the dam at an elevation 1,075 feet above msl, water flows downstream and does not rise further. Since Area 3 is above this downstream elevation (at 1,100 to 1,130 feet above msl), it is not subject to flooding. Flooding of the proposed spreading basins, which may be excavated below 1,100 feet above msl, would not present an adverse impact. Since the proposed recreational parking lot and restroom would be at an elevation near 1,130 feet above msl and above the height of the dam, these facilities would not be subject to flooding.

Changes in drainage patterns due to Project implementation would be confined to small areas and would not cause flooding. Impacts would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that floodplain features and flood water elevations would not be impacted significantly since no significant fill or dredging activities are planned and no major structures that may affect flow resistance and conveyance are proposed. Minor encroachments would not cause significant changes to flood water stages or erosion/sedimentation trends.

e) Would the project create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of pollutant runoff?

No Impact.

Areas 1, 2 and 3 Impacts. There are no storm drain systems that receive storm water flows from Areas 1 and 2. All storm water flows enter the Arroyo Seco. In Area 3, storm water flows will be reduced when compared to the existing condition due to the elimination of the JPL East Parking Lot and the expansion of the spreading basins. There would be no impact to storm water drainage systems. No long-term storm water pollutants would be generated by the Project, as previously discussed under Thresholds a) and f).

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential impacts to water quality from construction activities and increases in vehicles, horses, and park and trail users at the HWP. The Project would comply with RR HYD-1 and RR HYD-4 for the implementation of BMPs during construction as part of the SWPPP. These RRs are similar to the Master EIR's Measure Hydro-1. The Project's proposed trash cans and decomposed granite parking lot are comparable to BMPs called out in Measure Hydro-2.

g) Would the project place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

h) Would the project place within a 100-year flood hazard area structures which would impede or redirect flood flows?

No Impact.

Areas 1, 2 and 3 Impacts. The proposed Project would not involve the construction of any permanent housing that may be exposed to flood hazards. The improvements in Area 1 (e.g., habitat restoration, nature trail, and rest area/picnic area) would be located within the 100-year floodplain for the Arroyo Seco, but would be built to withstand flooding (RR HYD-5). Their small and scattered locations would not impede flood flows.

The proposed diversion and weir structures in Area 2 would impede low flows for diversion into the spreading basins in Area 3, but this is not considered an adverse impact. During extremely high-flow rain events, the proposed diversion and weir structures may be partially or fully bypassed, depending on streamflow turbidity or the potential for large debris damaging the weir, thus allowing flows to continue downstream. Area 3 is located outside the floodplain, and improvements in Area 3 would not impede flood flows.

An increase in the number of trail users in the Arroyo Seco Canyon may occur but, as in the existing condition, signage would be posted regarding the hazards associated with stream flows. No impacts related to flooding would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that floodplain features and flood water elevations would not be impacted significantly since no significant fill or dredging activities are planned and no major structure that may affect flow resistance and conveyance is proposed. Minor encroachments would not cause significant changes to flood water stages or erosion/sedimentation trends.

i) Would the project expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?

No Impact.

Areas 1, 2 and 3 Impacts. The proposed improvements would be located upstream of Devil's Gate Dam. The top of this dam is at an elevation of 1,075 feet above msl. The lowest ground elevation is at Area 3 and is 1,100 feet above msl. Thus, when waters behind the dam reach 1,075 feet above msl, they will overtop the dam and would not affect areas at higher elevations, including Area 3. Also, failure of the dam will release waters downstream into the Central and Lower Arroyo Seco (Pasadena 2011) and would not affect the proposed improvements in Areas 1, 2, or 3.

There are reservoirs on the ridge north of JPL and failure of these reservoirs may release waters into Areas 2 and 3. The new diversion and weir structures, the improved access road in Area 2, and the proposed parking lot and spreading basins in Area 3 would not be damaged by waters from these reservoirs. Also, the proposed restroom and guard station in Area 3 are unlikely to sustain any significant damage from reservoir failure and are not habitable structures with a permanent population.

The proposed diversion structure would impound low flows, but would allow flows above 25 cfs to pass through; thus, it would not lead to flooding of Area 2. Overflows in the spreading basins in Area 3 would flow back into the Arroyo Seco. The Project would not expose people or structures to flooding due to levee failure or dam inundation. No impacts would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify inundation hazards in the HWP.

j) Would the project cause inundation by seiche, tsunami, or mudflow?

No Impact.

Areas 1, 2 and 3 Impacts. The City of Pasadena is located inland and is not subject to tsunami (sea waves) hazards. The Project would not expose people or structures to tsunami hazards due to distance from the Pacific Ocean. There is no large open water body near the Arroyo Seco that may pose seiche hazards. The existing and proposed spreading basins would not hold water for long periods, but would allow water to percolate into the ground within several hours. The basins would also have at least two feet of freeboard; spillways, pipes and outlets for water to flow into lower basins; and overflow pipes to direct water back into the Arroyo Seco. Thus, no seiche hazards would be created by the Project, and the Project would not be exposed to seiche hazards.

Mudflows in the Arroyo Seco Canyon occur during large storm events, with large amounts of debris and sediment deposited in the Devil's Gate Reservoir. The proposed flow diversion, floodplain islands, riparian planting, and woody debris clusters in Area 1 would reduce flow velocities in the Upper Arroyo Seco, while bank stabilization (e.g., rock revetment and coconut fiber bundles) would reduce erosion and scour. The diversion structure that would be rebuilt in Area 2 would allow large flows to pass through to prevent sediment build up behind the weir and intake structure; it would also slow down flow velocities and reduce downstream erosion and the potential for mudflows. In addition, stabilizing the roadway slope with riprap will reduce erosion that could add to sediment loads in the stream flow. The proposed sedimentation basins in Area 3 would remove fine sediments from the diverted water. Thus, the Project would reduce sediment loads and mudflow hazards in the Arroyo Seco. No adverse impacts related to tsunami, seiche, or mudflow would occur.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify hazards associated with tsunamis or mudflows. It did indicate that the Devil's Gate Reservoir poses seiche hazards, although no seiches have been reported and the dam does not impound water on a continuous basis.

4.10.3 MITIGATION MEASURES

Implementation of PDF HYD-1 and PDF HYD-2 and compliance with RRs HYD-1 to HYD-5 would reduce impacts to hydrology and water quality to less than significant levels; therefore, no mitigation measures are required.

4.11 LAND USE AND PLANNING	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

4.11.1 EXISTING CONDITIONS

The Arroyo Seco Canyon Project proposes improvements at three separate areas along the Upper Arroyo Seco. Existing improvements in each area are discussed in Section 2.2 of this IS/MND.

The Upper Arroyo Seco and adjacent lands are designated and zoned as Open Space and Planned Development in the City of Pasadena's Land Use Plan and Zoning Map (Pasadena 2009, 2012b). The Open Space designation and zone applies to City-owned land with active and passive public recreational facilities and natural open spaces and the Planned Development zone applies to sites developed with a particular mix of uses, appearance, land use compatibility, or special sensitivity to neighborhood character (Pasadena 2004). The area north and east of Area 1, within the unincorporated community of Altadena, is designated as Low Density Residential and Open Space-National Forest (LACDRP 2009).

As discussed in Section 2.2, the Hahamongna Watershed Park Master Plan (HWMP) is a land use plan for approximately 330 acres of Hahamongna Watershed Park (HWP), which extends northward from the Devil's Gate Dam to the mouth of the Arroyo Seco Canyon. A number of improvements proposed for Area 3 are in the HWMP.

The ANF is managed by the USFS for the protection of open space and natural resources within the San Gabriel Mountains. Area 1 is located within the boundaries of the ANF and is designated in the USFS Land Management Plan as Non-Forest System Land (USFS 2005a) and is located on land owned by the City. Land farther north of Area 1 is designated as Back Country, Motorized Use Restricted (BCMUR). The BCMUR zone considers the restoration of vegetation condition as a suitable activity or use and supports non-motorized dispersed recreational opportunities, including camping, hiking, biking, hunting, and fishing (USFS 2005b).

4.11.2 IMPACT ANALYSIS

Regulatory Requirements

RR LU-1 The proposed improvements in Area 3 must be designed and constructed in compliance with the *Hahamongna Watershed Park Master Plan* (HWMP) and the proposed restroom building will require Design Review Approval.

RR LU-2 The proposed Project will require a Conditional Use Permit (CUP) for developing/improving recreational facilities in the Open Space zone.

Impact Discussion

a) Would the project physically divide an established community?

No Impact.

Areas 1, 2 and 3 Impacts. The proposed Arroyo Seco Canyon Project does not involve the displacement of existing residences or the construction of barriers through the developed areas located east and west of the Arroyo Seco. Therefore, the Project would not divide an established community. No impacts would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts on land use and planning since the Initial Study for the Arroyo Seco Master Plan had determined earlier that no division or disruption of an established community would occur.

b) Would the project conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. The Project would not conflict with the City's Open Space designation and zone for the area since the restored habitat areas, improved water diversion facilities, expanded spreading basins, and new recreational amenities would be consistent with the Open Space designation. However, recreational elements in the Open Space zone require a conditional use permit (CUP) from the City. Therefore, the Project includes obtaining a CUP for developing/improving recreational facilities in the Open Space zone. The proposed recharge basins in Area 3 would not conflict with the Planned Development zone.

Chapter 3.32 of the City's Municipal Code is the Arroyo Seco Public Lands Ordinance, which outlines the City's regulations for publicly owned lands within the Arroyo Seco. This ordinance only applies to the Central and Lower Arroyo Seco and does not pertain to the Upper Arroyo Seco. The Project would not conflict with the Arroyo Seco Public Lands Ordinance, as the proposed improvements would be located north of the Devil's Gate Dam as defined in the ordinance.

The proposed improvements include the recreational parking lot at the northern end of Area 3; construction of spreading basins; expansion of the spreading basins; and the provision of a restroom, interpretive signs, and potential future trail connection at the north end of Area 3. These are consistent with the HWMP, which proposes the spreading basin expansion and a new trailhead north of the JPL East Parking Lot. The HWMP proposes other facilities in or near Area 3 (e.g., a sunset overlook, bridge for North Perimeter Trail, East park entrance, East Rim Trail, Johnson Field improvements, pumpback system, storm drain improvements, utility line relocation and undergrounding) that would not be implemented by the Project but, at the same time, would not be precluded from future implementation. No conflict with the HWMP would occur. Thus, the Project would comply with RR LU-1.

The habitat restoration, water diversion, and recreational amenities that would be provided by the Project in Area 1 would not conflict with the goals of the USFS for the protection of open space and natural resources within the San Gabriel Mountains. The Project would also not conflict with the BCMUR zone to the north, which considers the restoration of vegetation condition as a suitable activity or use and supports non-motorized dispersed recreational opportunities, including camping, hiking, biking, hunting and fishing.

Since no urban development is proposed and no change to the open space use of the land would occur with the Project, no conflict or inconsistency with regional plans (i.e., SCAG's Regional Comprehensive Plan, Regional Housing Needs Assessment, Regional Transportation Plan/Sustainable Communities Strategy, and Compass Blueprint) or with the growth forecasts used in the development of these regional plans would occur. Impacts would be less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts on land use and planning since the Initial Study for the Arroyo Seco Master Plan had determined earlier that no significant impact on applicable land use plan or policies would occur and no significant impacts to land use and planning are anticipated.

c) Would the project conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact.

Areas 1, 2 and 3 Impacts. As discussed under Section 4.4, Biological Resources, there is no adopted habitat conservation plan or natural community conservation plan in the City of Pasadena or near the City and the Arroyo Seco. The Arroyo Seco Canyon is located in the Altadena Foothills and Arroyos Significant Ecological Area (SEA) under the County's SEA program (LACDRP 2011). The Project site is not subject to the SEA Program because it is not located within an unincorporated County area. Still, the Project consists of habitat restoration, water diversion, and recreational amenities that would not conflict with the objectives of the SEA for species conservation, biotic diversity, or habitat linkages. Impacts on biological resources are discussed in Section 4.4 above. No impacts related to habitat conservation plans or natural community conservation plans would occur with the Project. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts on land use and planning since the Initial Study for the Arroyo Seco Master Plan had determined earlier that no habitat conservation plans or natural community conservation plans are applicable to the Arroyo Seco Master Plan since no such plans exist in the area.

4.11.3 MITIGATION MEASURES

There would be no significant adverse impacts related to land use and planning with compliance with RR LU-1 and RR LU-2; therefore, no mitigation measures are required.

4.12 MINERAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☒	☐
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

4.12.1 EXISTING CONDITIONS

Mineral resources are naturally occurring chemicals, elements, or compounds such as bituminous rock, gold, sand, gravel, clay, crushed stone, limestone, diatomite, salt, borate, potash, geothermal, petroleum, and natural gas resources. Construction aggregate refers to sand and gravel (natural aggregates) and crushed stone (rock) that are used as Portland-cement-concrete aggregate, asphaltic-concrete aggregate, road base, railroad ballast, riprap, fill, and the production of other construction materials.

The California Geological Survey (CGS) has identified deposits of regionally significant aggregate resources in the State in accordance with the Surface Mining and Reclamation Act (SMARA). Clusters or belts of mineral deposits are designated as Mineral Resources Zone 2 (MRZ-2), which include areas that require special management due to the presence of mineral resources important to the State. The Devil's Gate Reservoir is designated as an MRZ-2 zone. The reservoir was mined by eight operators and by the County for channel maintenance until 1994. The MRZ-2 zone in the reservoir covers 204 acres and contains sand and gravel deposits up to 100 feet below the ground surface. This zone encompasses Area 3. However, there is no active mining operation in this MRZ-2 zone (CDOC 2010).

Review of maps prepared by the California Department of Conservation shows that there are no oil, gas or geothermal fields in or near the Upper Arroyo Seco (CDOC 2001). Additionally, there are no active or idle oil wells in or near the canyon. The nearest well is a plugged and inactive well located approximately six miles southwest of Area 3 (DOGGR 2013).

4.12.2 IMPACT ANALYSIS

Project Design Features

PDF MIN-1 Large cobbles and boulders exposed in Area 2 will be collected and stockpiled at a designated area for future use as trail markers, signs, and other decorative purposes.

Regulatory Requirements

RR MIN-1 Excavation activities in Area 3 is required to include the collection of arroyo stone for use in structures, signs, walls, and other improvements in accordance with the Arroyo Seco Design Guidelines, subject to design review and approval by the City's Planning Division.

Impact Discussion

a) Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. The sand and gravel resources within Devil's Gate Reservoir, as identified by CGS (CDOC 2010), would not be affected by the Project, since no excavation, grading, or paving is proposed within the reservoir.

The proposed improvements in Areas 1 and 2, upstream of the reservoir, would restore habitat and increase water diversion, but would not affect the availability of sand and gravel resources in the reservoir. However, there are large cobbles and boulders in these areas that would be disturbed by the Project. Improvements in Area 1 would place these boulders along the edges of the stream and the nature trail, and in the proposed rest area/picnic area. Improvements in Area 2 may use boulders depending on integrity, shapes, and sizes for the rock wall and riprap protection. Improvements in Area 3 may also utilize cobbles and boulders (e.g., structure facades, walkway/trail edges, signs, etc.). In addition, as stated in PDF MIN-1, large cobbles and boulders in Area 2 would be moved away from active construction areas and stockpiled for future decorative uses, to conserve these resources.

The CGS has identified sand and gravel resources in Area 3 (CDOC 2010). The improvements in Area 3 would not extract the underlying sand, gravel, or arroyo stone resources, but may expose these resources during utility line excavation and as part of grading activities for the sedimentation basins and expansion of the spreading basins. The amount of excavated soils requiring off-site disposal would be minimized by creating shallow embankments around the proposed basins and raising the elevation of the access road and the new parking lot. Still, approximately 2,000 cubic yards of excess soils would be disposed of offsite. The HWMP and Arroyo Seco Design Guidelines call for the use of local arroyo stone in structures, walls, fences, signs, entries, and along trails to reflect the culture and style that is present along the Arroyo Seco. In compliance with the HWMP and Arroyo Seco Design Guidelines, RR MIN-1 requires the collection of arroyo stones during excavation activities in Area 3. This would allow for the reuse of the stones for the restroom, trail, drinking fountain, signs, or other site improvements, as well as to reduce the off-site disposal of excavated soils and materials.

The improvements for Area 3 would include some impervious surfaces (e.g., foundations for restroom, access road, and guard station), but the majority of the area would remain pervious as a decomposed granite parking lot and open sedimentation and spreading basins. Thus, the Project would maintain the availability of these mineral resources and would not preclude future mining operations in this area.

Impacts on regionally important mineral resources would be less than significant, and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan acknowledged the presence of mineral resources, such as arroyo stone, behind Devil's Gate Dam and includes a mitigation measure for the collection of the arroyo stone for use in other areas of the HWP. To allow for continued collection and reuse of the arroyo stone in the HWP, RR MIN-1 (similar to Measure Minerals-1) would be implemented in Area 3.

b) Would the project result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

No Impact.

Areas 1, 2 and 3 Impacts. There are no identified oil, gas, or geothermal resources or ongoing mining/extraction activities in the Upper Arroyo Seco. The City of Pasadena Comprehensive General Plan does not identify any mineral resources in the City (Pasadena 2004). The HWMP talks about the removal of sand and gravel from the Devil's Gate Reservoir in the past but does not identify aggregate or other mineral resources in and around the reservoir that should be protected or preserved (Pasadena 2003a).

The Project would not require mineral resources, nor would it change the availability of resources within Devil's Gate Reservoir. The diversion of water into the spreading basins would not affect sand and gravel resources in the reservoir. Additionally, no new structures or facilities would be constructed as part of the Project that could potentially restrict or obstruct future mineral resource recovery activities within Devil's Gate Reservoir. As discussed above, construction activities in Areas 2 and 3 would include collection of arroyo stones (PDF MIN-1 and RR MIN-1). Long-term recreational activities in the Arroyo Seco Canyon and operation and maintenance activities on the PWP facilities would not require mineral resources. Thus, there would be no impacts to locally important mineral resources. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan acknowledged the presence of mineral resources, such as arroyo stone, behind Devil's Gate Dam and includes a mitigation measure for the collection of the arroyo stone for use in structures, walls, fences, signs, entries, and along trails. The Project would implement RR MIN-1 in Area 3, which is similar to Measure Minerals-1 in the Master EIR.

4.12.3 MITIGATION MEASURES

There would be no significant adverse impacts related to mineral resources, with implementation of PDF MIN-1 and RR MIN-1. No mitigation is required.

4.13 NOISE	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

4.13.1 EXISTING CONDITIONS

Noise-Sensitive Receptors

Noise-sensitive receptors include land uses where an excessive amount of noise would interfere with normal operations or activities and where a high degree of noise control may be necessary. Examples include schools, hospitals, and residential areas. Recreational areas may be considered noise-sensitive where quiet and solitude may be an important aspect of the specific recreational experience (Pasadena 2004).

Area 1. The USFS Ranger Station, which includes three dwelling units providing housing for USFS Rangers, is located just east of the trail in Area 1 (See aerial photograph of Area 1 in Exhibit 2-3a). The USFS Ranger Station is located in the City of Pasadena. The closest residences to the west in La Cañada Flintridge are on Gleneagles Place, approximately 0.2 mile west of Area 1. Residential neighborhoods to the east in Altadena are approximately 0.25 mile from Area 1.

Area 2. The closest homes to Area 2 are approximately 0.15 mile to the east on Canyon Dell Drive in Altadena. Residential neighborhoods to the west in La Cañada Flintridge are more than 0.25 mile from Area 2.

Area 3. There are single-family residential neighborhoods to the east of Area 3. Some homes are in the City of Pasadena and others are in Altadena. The closest homes to Area 3 are on Ridgeview Drive in Altadena, approximately 225 feet from the eastern edge of the JPL parking lot, and are approximately 100 feet higher in elevation than the parking lot.

North Windsor Avenue, between I-210 and Explorer Drive, would be used by traffic generated by the proposed Project. There are homes adjacent to North Windsor Avenue in the City of Pasadena and in the community of Altadena.

Passive and active recreational areas, including the Gabrielino Trail, are near all Project areas and are described in Section 4.15, Recreation.

Existing Noise Levels

Areas 1 and 2 are located in rural settings approximately 0.25 mile from suburban development. Local noise sources include occasional vehicles, recreational visitors, wind, and other natural sounds. Average hourly daytime noise levels (L_{eq}) are estimated to be 40 to 45 A-weighted decibels (dBA) L_{eq}.

Area 3 is located within a developed area and includes the JPL East Parking Lot. The principal local noise sources in the surrounding area are (1) industrial activities, including material handling equipment at the JPL campus to the west and (2) vehicles coming to, using, and leaving the parking lot. Average hourly daytime noise levels are estimated to be 50 to 55 dBA L_{eq}.

Ambient noise level measurements were taken near the residential receptors east of Area 3 on November 14, 2013, using a Larson Davis Laboratories Model 831 integrating sound level meter (LD 831). The LD 831 sound level meter and microphone was mounted on a tripod four to five feet above the ground and equipped with a windscreen during all measurements. The LD 831 was calibrated before and after use. Four short-term noise level measurements were made. The monitoring locations are shown in Exhibit 4-4, Noise Monitoring Locations. Each short-term measurement was taken for a period of 20 minutes to provide representative average daytime noise levels. The average, maximum, and minimum (L_{eq}, L_{max}, and L_{min}) values taken at each noise measurement location are shown in Table 4.13-1, Ambient Noise Level Measurements. The complete noise monitoring results are included in Appendix E.



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Noise Monitoring Locations

Exhibit 4-4

Arroyo Seco Canyon Project

N
W E
S

600 300 0 600

Feet

Bonterra PSOMAS

(Rev: 5-19-2014 CJS) R:\Projects\Carollo\J041\Graphics\MND\Ex_NoiseMonitoring.pdf

TABLE 4.13-1
AMBIENT NOISE LEVEL MEASUREMENTS

Location No.	Location	Start Time (Duration)	Noise Levels (dBA)			Primary Noise Source(s)	Notes
			L_{eq}	L_{max}	L_{min}		
1	West end of Altadena Dr	12:01 PM (20 min)	46	55	41	Hum and material handling equipment at JPL. Occasional traffic.	Occasional hikers and their dogs.
2	West end of Mariposa St	12:32 PM (20 min)	45	60	40	Hum and material handling equipment at JPL.	One helicopter pass. Occasional dog bark.
3	Intersection of N Windsor Ave and Ventura St	1:07 PM (20 min)	53	65	44	Traffic on Windsor Ave and Ventura St	JPL noise; 105 cars on Windsor Ave and Ventura St; 35 cars on JPL access road.
4	West end of Kent St	1:59 PM (20 min)	47	56	42	Residential sounds. Traffic on Windsor Ave.	I-210 traffic noise audible.

dBA: A-weighted decibel; L_{eq}: average noise level over a period of minutes or hours expressed as the equivalent noise level for that time period; L_{max} and L_{min}: the highest and lowest (respectively) A-weighted sound level that occurs during that noise event; min: minutes; JPL-Jet Propulsion Laboratory; I: Interstate

As shown in Table 4.13-1, the daytime noise levels in the residential area east of Area 3 ranged from an average noise level of 45 to 53 dBA. The existing background noise environment (i.e., ambient noise) in the Project area is primarily influenced by occasional vehicle traffic on the roads adjacent to the Project site.

The area in the City of La Cañada Flintridge west of Areas 1 and 2 includes developed residential areas, but no major roadways. Average hourly daytime noise levels are estimated to be 45 to 50 dBA L_{eq}.

Applicable Noise Standards

While the Project would be located in the City of Pasadena, there are nearby noise-sensitive receptors in Cities of Pasadena and La Cañada Flintridge and the unincorporated community of Altadena. The applicable noise standards of all three jurisdictions are provided below.

City of Pasadena

The City of Pasadena has established guidelines and standards in its General Plan and Municipal Code. The Noise Element recognizes that construction activity is a source of occasional temporary nuisance noise throughout the City and that these and other such nuisance noises are common to cities and, because of their unpredictable nature, must be addressed on a case-by-case basis.

The following policies are applicable to the Project:

Policy 7b: The City will encourage limitations on construction activities adjacent to sensitive noise receptors.

Policy 7c: The City will encourage construction and landscaping activities that employ techniques to minimize noise.

The City Municipal Code (Title 9, article IV, Chapter 9.36, Noise Restrictions) is the City's Noise Ordinance. It is the City's policy ". . . to prohibit unnecessary, excessive and annoying noises from all sources . . . Noise at certain levels is detrimental to the health and welfare of the general public". The following sections of the Noise Ordinance are applicable to the Project:

Section 9.36.050 – General Noise Sources

This is applicable for long-term, operational noise and states "It is unlawful for any person to create, cause, make or continue to make or permit to be made or continued any noise or sound which exceeds the ambient noise level at the property line of any property by more than 5 decibels". In accordance with Section 9.36.040, adjustments are made to the allowable noise level for steady audible tones, repeated impulsive noise, and noise occurring for limited time periods.

Section 9.36.070 – Construction Projects

This section is applicable for Construction Projects and states:

A. No person shall operate any pile driver, power shovel, pneumatic hammer, derrick power hoist, forklift, cement mixer or any other similar construction equipment within a residential district or within a radius of 500 feet therefrom at any time other than as listed below:

    1. From 7:00 AM to 7:00 PM Monday through Friday;
    2. From 8:00 AM to 5:00 PM on Saturday; and
    3. Operation of any of the listed construction equipment is prohibited on Sundays and holidays.

B. No person shall perform any construction or repair work on buildings, structures or projects within a residential district or within a radius of 500 feet there from in such a manner that a reasonable person of normal sensitiveness residing in the area is caused discomfort or annoyance at any time other than as listed below:

    1. From 7:00 AM to 7:00 PM Monday through Friday;
    2. From 8:00 AM to 5:00 PM on Saturday; and
    3. Performance of construction or repair work is prohibited on Sundays and holidays.

C. For purposes of this section, holidays are New Year's Day, Martin Luther King Jr. Day, Lincoln's Birthday, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Day after Thanksgiving, and Christmas.

Section 9.36.080 – Construction Equipment.

This section states that "It is unlawful for any person to operate any powered construction equipment if the operation of such equipment emits noise at a level in excess of 85 dBA when measured within a radius of 100 feet from such equipment".

Los Angeles County

The Los Angeles County noise restrictions are applicable to the properties within the Altadena community. Section 12.08 of the County of Los Angeles Code (County Code) contains the County Noise Ordinance. The County sets maximum construction noise levels "at residential structures." As shown in Table 4.13-2 below, the daytime noise level limit at single-family residences for mobile construction equipment is 75 dBA.

TABLE 4.13-2
COUNTY OF LOS ANGELES CONSTRUCTION EQUIPMENT NOISE LIMITS

Time Interval	Single-Family Residential (dBA)	Multi-Family Residential (dBA)	Semi-Residential or Commercial (dBA)
Mobile Equipment			
Daily, except Sundays and legal holidays, 7:00 AM to 8:00 PM	75	80	85
Daily, 8:00 PM to 7:00 AM, and all day Sunday and legal holidays	60	64	70
Stationary Equipment			
Daily, except Sundays and legal holidays, 7:00 AM to 8:00 PM	60	65	70
Daily, 8:00 PM to 7:00 AM, and all day Sunday and legal holidays	50	55	60
dBA: A-weighted decibels Source: Los Angeles County 2013b.			

The County's Noise Ordinance requirements are not applicable to mobile noise sources such as automobiles or heavy trucks when traveling in a legal manner on public roadways or on private property. Mobile noise source control is preempted by federal and State laws.

City of La Cañada Flintridge

The City of La Cañada Flintridge does not have quantitative standards for construction noise.

Applicable Vibration Standards

Neither the City of Pasadena nor the City of La Cañada Flintridge has vibration standards. Section 12.08.560 of the Los Angeles County Code states, "Operating or permitting the operation of any device that creates vibration which is above the vibration perception threshold of any individual at or beyond the property boundary of the source if on private property, or at 150 feet (46 meters) from the source if on a public space or public right-of-way is prohibited. The perception threshold shall be a motion velocity of 0.01 in/sec over the range of 1 to 100 Hertz".

4.13.2 IMPACT ANALYSIS

Regulatory Requirements

RR NOI-1 In accordance with Section 9.36.070 of the City of Pasadena Municipal Code, the Contractor is required to limit noise-generating construction activities to between the hours of 7:00 AM and 7:00 PM Monday through Friday and between the hours of 8:00 AM and 5:00 PM Saturday in or within 500 feet of a residential district. No noise-generating construction activities shall be conducted on Sundays and federal holidays.

Impact Discussion

a) Would the project result in exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

d) Would the project result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Less than Significant Impact.

Noise impacts associated with the proposed Project would be largely limited to the construction phase. The primary noise sources during construction of a project are the diesel engines of construction equipment and noise from operations such as pile driving, blasting, and jackhammering. No pile driving or blasting activities are proposed; jackhammering, hoe-rams, and concrete saws may be used for some demolition work.

Construction noise is related primarily to the use of heavy equipment. Construction equipment can be considered to operate in two modes: stationary and mobile. Stationary equipment operates in one location for one or more days at a time, with either a fixed-power operation (such as pumps, generators and compressors) or a variable noise operation (such as rock drills and pavement breakers). Mobile equipment moves around the construction site with power applied in cyclic fashion, such as bulldozers, graders, and loaders. Noise impacts from stationary equipment are assessed from the location of the specific equipment, while noise impacts from mobile construction equipment are assessed from the center of the equipment activity or construction site. The noise level at a receptor is dependent on the distance from the source to the receptor and the intervening topography and groundcover.

Variation in power is also a factor in characterizing the noise source levels from construction equipment. Power variation is accounted for by describing the noise at a reference distance from equipment operating at full power and adjusting it based on the duty cycle of the activity to determine the L_{eq} of the operation.[6] Typical duty cycles and noise levels generated by representative pieces of equipment are listed in Table 4.13-3, Typical Maximum Construction Equipment Noise Levels.

[6] The duty cycle is the percentage of time that the equipment is typically at full power.

TABLE 4.13-3
TYPICAL MAXIMUM CONSTRUCTION
EQUIPMENT NOISE LEVELS

Equipment	Noise Level (dBA) at 50 ft	Typical Duty Cycle
Auger Drill Rig	85	20%
Backhoe	80	40%
Blasting	94	1%
Chain Saw	85	20%
Clam Shovel	93	20%
Compactor (ground)	80	20%
Compressor (air)	80	40%
Concrete Mixer Truck	85	40%
Concrete Pump	82	20%
Concrete Saw	90	20%
Crane (mobile or stationary)	85	20%
Dozer	85	40%
Dump Truck	84	40%
Excavator	85	40%
Front End Loader	80	40%
Generator (25 KVA or less)	70	50%
Generator (more than 25 KVA)	82	50%
Grader	85	40%
Hydra Break Ram	90	10%
In situ Soil Sampling Rig	84	20%
Jackhammer	85	20%
Mounted Impact Hammer (hoe ram)	90	20%
Paver	85	50%
Pile Driver, Impact (diesel or pneumatic)	95	20%
Pile Driver, Vibratory	95	20%
Pneumatic Tools	85	50%
Pumps	77	50%
Rock Drill	85	20%
Scraper	85	40%
Tractor	84	40%
Vacuum Excavator (vac-truck)	85	40%
Vibratory Concrete Mixer	80	20%
dBA: A-weighted decibels; ft: feet; KVA: kilovolt amps Source: Thalheimer 2000.		

Each phase of construction has a specific equipment mix, depending on the work to be accomplished during that phase. Each phase also has its own noise characteristics; some would have higher continuous noise levels than others, and some have high-impact noise levels. The L_{eq} of each phase is determined by combining the Leq contributions from each piece of equipment used in that phase. Construction of the Project is anticipated to start in Summer 2015.

Typical heavy construction equipment would include bulldozers, excavators, dump trucks, front-end loaders, graders, and industrial/concrete saws. Because of the effects of noise attenuation, the distance from the noise source to a receptor is a primary consideration in determining the noise level experienced at the receptor. Because different construction stages involve different pieces of equipment and may involve only localized portions of a site, each construction stage can result in different noise levels being generated depending on the distance to sensitive receptors.

Area 1 Impacts. The noisiest construction work in Area 1 would be the demolition of the Headworks structure, which is located at the north end of Area 1, approximately 500 feet from the nearest Ranger Station residence. Assuming that a concrete saw or a hoe-ram has a maximum noise level of 90 dBA at 50 feet and a 20 percent duty cycle (as shown in Table 4.13-3), the maximum noise level at the Ranger Station more than 500 feet, which would occur intermittently, would be approximately 65 dBA. The average noise level would be less than 60 dBA L_{eq}. Grading in Area 1 would occur at distances of approximately 100 to 500 feet from the closest Ranger Station residence. Because equipment would move around the site, average noise levels are calculated for the average distance of 250 feet. Assuming the simultaneous operation of two pieces of equipment (e.g., an excavator and dump truck), average noise levels at the nearest receptor would be approximately 67 dBA L_{eq}. The noise would be audible at the Ranger Station and could occasionally interfere with normal speech of persons outside and close to the construction work. The duration of the demolition and grading phases would be relatively short at approximately four months; noise levels would vary throughout the day and from day to day. The Contractor shall also comply with construction time limits in the City's Noise Ordinance (RR NOI-1). This impact would be less than significant.

Residential neighborhoods to the east in Altadena and to the west in La Cañada Flintridge would experience noise levels at 51 dBA L_{eq} because of distance; there likely would also be additional noise reduction because of topographical features. The noise may be heard occasionally, but would not be substantial or significant. The City of Pasadena's Noise Ordinance is also more restrictive than the County's noise regulations and the City of La Canada Flintridge has no standards for construction noise. Thus, Project construction will comply with the City's Noise Ordinance (RR NOI-1).

Although no mitigation is required, MM NOI-1 would be incorporated into the Project to minimize noise impacts and to support Policies 7b and 7c of the Pasadena Comprehensive General Plan's Noise Element. MM NOI-1 specifies noise-control measures to minimize noise effects upon sensitive receptors.

Area 2 Impacts. The noisiest construction work in Area 2 would be the demolition of a portion of the diversion weir. Assuming that a concrete saw or a hoe-ram has a maximum noise level of 90 dBA at 50 feet and a 20 percent duty cycle (as shown in Table 4.13-3), the maximum noise level at the closest homes on Canyon Dell Drive in Altadena (approximately 800 feet to the east), which would occur intermittently, would be approximately 60 dBA; this is less than the County standard of 75 dBA. The average noise level would be less than 60 dBA L_{eq}. During grading in Area 2, assuming the simultaneous operation of two pieces of equipment, such as an excavator and dump truck, average noise levels at the nearest receptor in Altadena would be approximately 54 dBA L_{eq}. The noise may be occasionally audible, but would not interfere with normal speech of persons outside. This impact would be less than significant.

Construction noise from Area 2 to residential neighborhoods to the west in La Cañada Flintridge would be reduced to less than 55 dBA L_{eq} because of distance, with additional noise reduction likely occurring because of topographical features. The noise may be heard occasionally but

would not be substantial or significant; no mitigation is required. However, RR NOI-1 and MM NOI-1 would be implemented during construction activities.

Area 3 Impacts. The noisiest construction work in Area 3 would be the demolition of paved areas, concrete vaults, and other structures. Assuming that a concrete saw or a hoe-ram has a maximum noise level of 90 dBA at 50 feet and a 20 percent duty cycle (as shown in Table 4.13-3), the maximum noise level at the closest homes on Ridgeview Drive in Altadena, which would occur intermittently, would be approximately 73 dBA, which is less than the County standard of 75 dBA. The closest homes to Area 3 are located on a bluff approximately 100 feet above the elevation of Area 3. The noise from Area 3 to the closest homes would be reduced by distance and by the bluff edge, which would break the line of sight between the noise sources and the receptors. The average noise level would be approximately 65 dBA L_{eq}. During grading in Area 3, assuming the simultaneous operation of two pieces of equipment, such as an excavator and dump truck, average noise levels at the nearest Altadena receptors would be approximately 67 dBA L_{eq}. The noise would be audible and could occasionally interfere with normal speech of persons outside.

Project construction would not require pile driving or blasting. All equipment planned for use on the Project site would be anticipated to have noise levels not exceeding 90 dBA at a distance of 50 feet, which would be 84 dBA at a distance of 100 feet. This noise level would be less than the limit of 85 dBA at 100 feet stated in Section 9.36.080 of the City of Pasadena Noise Ordinance. All construction activities would also be limited to between the hours of 7:00 AM and 7:00 PM Monday through Friday and between 8:00 AM and 5:00 PM on Saturday, as required by the City's Noise Ordinance (RR NOI-1). As stated above, MM NOI-1 would also be implemented by the Contractor.

Roadway Noise

The Project would generate construction traffic on North Windsor Avenue. Traffic would include workers commuting to and from Areas 1, 2, and 3; vendors bringing materials; and haul trucks removing demolished structural and vegetative materials from the three site areas. The existing average daily weekday traffic volumes (ADT) in 2011 on North Windsor Avenue ranged from 6,361 to 10,097 ADT between Ventura Street and Figueroa Drive and from 10,258 to 13,928 south of Figueroa Drive to Oak Grove Avenue (Los Angeles County 2013a). CalEEMod assumptions for the mix of construction equipment assumed during construction activities result in an estimated maximum number of daily workers during Project construction of 366 ADT. Since a doubling of traffic volume is needed to increase noise levels by 3 dBA and since it takes a 5-dBA increase for noise level changes to become discernible, the increase in roadway noise would not be discernible and would be considered less than significant.

Truck passbys would be heard at residences adjacent to the roads used; the noise would be similar to the occasional noise of waste collection trucks, which would be approximately 73 to 77 dBA at a distance of 50 feet from the road centerline, depending on the speed of the truck. The maximum number of heavy truck trips would occur during demolition activities in Area 3. There would be approximately 52 passbys (26 round trips per day), which is fewer than 7 passbys per hour. During this period, the hourly average noise increase would be less than 2 dBA. During other Project phases, the number of heavy truck trips would be considerably less. This noise impact would not be substantial and impacts would be less than significant.

Hikers, bicyclists, and equestrians could come near construction activities in Areas 1, 2, and 3 while using the Gabrielino Trail. However, these recreational users would have the option of modifying their activities to avoid exposure to undesirable noise levels. Impacts on trail users and visitors would be less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that noise from operational and construction activities at the HWP would not create significant noise impacts. The Master EIR identified potential noise impacts from short-term construction activities in the Central Arroyo Seco and Lower Arroyo Seco and included mitigation measures to reduce construction noise. The Project would comply with RR NOI-1 for the scheduling of construction activities in accordance with City regulations. This RR is similar to Measure Noise-1. Although Measure Noise-2 and Measure Noise-3 are not applicable to the Project, these mitigation measures call for similar noise-control measures as those outlined in MM NOI-1.

b) Would the project result in exposure of persons to or generate excessive groundborne vibration or groundborne noise levels?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. Vibration affects structures and persons located relatively close to the source of the vibration. For heavy construction equipment operations, vibration would not be perceptible and would be less than the 0.1 inch per second (in/sec) threshold of perception defined by Los Angeles County at distances of 200 feet and greater. There are no residential neighborhoods in Altadena/Los Angeles County within 200 feet of construction areas. At Area 1, heavy equipment may occasionally work at distances within 100 to 200 feet of a USFS Ranger Station residence, and vibration may be perceptible. However, neither the frequency, the duration of vibration, nor the magnitude of vibration would be substantial. The impact would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify any vibration impacts from proposed improvements or facilities in the HWP.

c) Would the project result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. Permanent increases in noise associated with operations and maintenance of the proposed improvements would come from new vehicles trips from trail users and visitors and from maintenance crews.

Visitors. Existing maximum visitor use is estimated at 125 persons on weekdays and 800 persons on holiday weekend days, with fewer visitors on non-holiday weekend days. The proposed Project could increase visitor use by 25 persons on weekdays and 200 persons on holiday weekend days. A very conservative analysis assumes each visitor drives separately, resulting in an additional 50 one-way trips (25 round trips) on weekdays and 400 one-way trips (200 round trips) on holiday weekend days. As discussed previously, weekday traffic volumes on North Windsor Avenue north of Oak Grove Avenue ranged from 6,361 to 13,928 ADT. Weekend volumes are less, ranging from 4,680 to 9,044 ADT (Los Angeles County 2013a). The increase in weekday traffic would increase traffic noise levels by less than 0.1 dBA; the increase in weekend traffic would increase traffic noise levels by less than 0.5 dBA. These increases in noise levels would not be discernible; would be less than the City of Pasadena's 5-dBA standard; and would be less than significant. No mitigation is required.

Maintenance. There would be no substantial long-term changes to maintenance activities. Maintenance in Area 1 would be the same due to the elimination of maintenance for the Headworks and sedimentation basins but the need to maintain the proposed rest area/picnic area

and collect wastes from the pet waste station and trash cans. Maintenance in Area 2 would be reduced by automation of the diversion structure and the improved Gabrielino Trail/access road. Maintenance of the restroom, pet waste station, and trash can in Area 3 would require restroom cleaning twice per week and waste collection once a week. The reduced size of the parking lot would require less maintenance. The expanded spreading basins are expected to have the same maintenance needs due to the use of sedimentation basins, which would reduce the need for sediment removal in the spreading basins. Changes in noise resulting from maintenance activities would be negligible and less than significant; no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that operational components and recreational uses at the HWP would not create significant noise impacts.

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact.

Areas 1, 2 and 3 Impacts. There are no airports or airstrips within two miles of the Arroyo Seco Canyon. The nearest airports are the Burbank Bob Hope Airport and the El Monte Airport, which are both approximately 11 miles from the site. The Project would not subject persons in the area to noise from public or private airports, nor would the Project generate aircraft noise. There is a heliport and a helipad near the Arroyo Seco but no change in helicopter noise would occur with the Project. There would be no impact.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that the HWP is not located within two miles of a public airport or private airstrip. Therefore, users of the HWP are not exposed to noise from airport or aircraft operations.

4.13.3 MITIGATION MEASURES

There would be no significant adverse impacts related to noise with compliance with RR NOI-1. However, MM NOI-1 would be implemented to further minimize noise impacts on adjacent land uses.

MM NOI-1 The Contractor shall implement the following noise reduction measures during all construction activities:

- Equip all construction equipment (fixed or mobile) with properly operating and maintained mufflers, consistent with or exceeding manufacturers' standards.
- Ensure that construction equipment engine enclosures and covers as provided by manufacturers shall be in place during operation.
- Place all stationary construction equipment so that the equipment is as far as feasible from noise-sensitive receptors and so that the emitted noise is directed away from the noise-sensitive receptors.

- Locate equipment and materials staging in areas that will create the greatest distance between staging area noise sources and noise-sensitive receptors during Project construction.
- Ensure that construction equipment is shut down when not in use.
- Limit haul truck deliveries to the same hours specified for the operation of construction equipment.

4.14 POPULATION AND HOUSING	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through the extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

4.14.1 EXISTING CONDITIONS

The Arroyo Seco Canyon does not support a residential community nor contain residential land uses, except for the USFS Ranger Station near Area 1, which is developed with three dwelling units that are occupied by three households of USFS Rangers. There are nearby residential uses to the east of the Arroyo Seco, within the community of Altadena; to the east and southeast in the City of Pasadena; and to the west in the City of La Cañada Flintridge.

4.14.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through the extension of roads or other infrastructure)?

No Impact.

Areas 1, 2 and 3 Impacts. The Project does not propose the construction of new homes or businesses that may induce population growth in the area. Also, no extension of infrastructure to unserved areas is proposed. The presence of the construction crew would be temporary and would not generate a measurable demand for housing, goods, or services in the area.

No major change in the PWP's operational or maintenance activities would occur that would lead to new employees or which would induce growth and development in the area. The Project would improve the PWP's surface water diversion facilities and increase groundwater recharge. This would, in turn, reduce the PWP's reliance on imported water resources and would reduce its operating costs, but would not promote development in the City or the surrounding area.

The increase in the number of trail users/visitors due to the proposed recreational parking lot and the recreational and educational amenities that would be provided by the Project would not lead to a permanent population in the area. These trail users and visitors would be present in the Arroyo Seco Canyon for a few hours during each visit and would not create a permanent demand for housing, goods, or services in the area.

No growth-inducing impacts would occur and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts on population and housing since the Initial Study for the Arroyo Seco Master Plan had determined earlier that no new residential homes are planned and no significant impacts to population and housing are anticipated.

b) Would the project displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

c) Would the project displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No Impact.

Areas 1, 2 and 3 Impacts. Construction activities for the Project would be confined to the parcels owned by the City of Pasadena and located within the City. These activities would not affect the residences located within the USFS Ranger Station near Area 1 or the single-family residences to the east and west of the Arroyo Seco. No housing demolition or household displacement is proposed with the Project as the USFS Ranger Station near Area 1 would not be displaced, demolished, or rehabilitated. Long-term recreational activities in the Arroyo Seco Canyon and operation and maintenance activities on the PWP facilities would not displace existing housing or households. Thus, no displacement impacts would occur and no replacement housing is needed. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not address impacts on population and housing since the Initial Study for the Arroyo Seco Master Plan had determined earlier that no housing displacement or demand for additional housing would occur.

4.14.3 MITIGATION MEASURES

There would be no impacts related to population and housing; therefore, no mitigation measures are necessary.

4.15 PUBLIC SERVICES	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would the project:				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☒	☐

4.15.1 EXISTING CONDITIONS

Public services in the Upper Arroyo Seco area are provided by the Pasadena Fire Department, the Pasadena Police Department, the Pasadena Unified School District, the City of Pasadena Parks and Natural Resources Division, the Pasadena Library, and other City departments. The Los Angeles County Fire Department and the USFS also provide wildfire protection services, particularly related to the ANF.

Fire Protection Services

The Pasadena Fire Department provides fire protection services to the City and operates eight fire stations. Pasadena Fire Station 38 at 1150 Linda Vista is located 2.4 miles south of Area 3. However, the Los Angeles County Fire Station #12 at 2760 North Lincoln Avenue in Altadena is located only 0.6 mile east of Area 3. County Fire Camp #2 is located southwest of the JPL campus and is a helicopter standby location during the fire season, with a crew of ten firefighters. County Fire Station #82 is located one mile southwest of Area 3 but is on the west side of the Arroyo Seco.

The Los Angeles County Fire Department has automatic aid agreements with 33 cities in the County, including the City of Pasadena, to provide fire protection services during a fire or medical emergency regardless of territory. Thus, City and County firefighters would provide emergency response to the Upper Arroyo Seco in the event of a fire incident.

In the ANF, the USFS provides fire prevention and preparedness; hazardous fuels reduction; wildfire suppression; and emergency support. Under the California Fire Assistance Agreement, local fire departments provide fire protection and suppression services to State and federal agencies. Under the Cooperative Fire Protection Agreement, the California Department of Forestry and Fire Protection (CalFire) and federal agencies (e.g., the USFS, the National Parks Service) assist each other to suppress wildland fires on lands adjacent to each other (Firescope 2009).

Police Protection Services

The Pasadena Police Department provides police protection and law enforcement services in the City. The Police Department has a Park Safety Specialist Team that is assigned to patrol City parks, including Hahamongna Watershed Park. In addition, the Police Department has a Volunteer Mounted Unit that consists of volunteers on horses who provide patrol services in the remote park areas of the City, such as Hahamongna Watershed Park (Pasadena 2013b).

The Pasadena Police Department also participates in the California Law Enforcement Mutual Aid Plan and the California Disaster and Civil Defense Master Mutual Aid Agreement, which allow the City to request mutual aid from and to provide mutual aid to adjacent police protection and law enforcement agencies.

The USFS provides law enforcement of federal laws within the ANF. The Pasadena Police Department is responsible for the enforcement of State and local laws on City lands (within the ANF) and at PWP facilities.

School Services

The Pasadena Unified School District (PUSD) provides school services to the Upper Arroyo Seco area through Franklin Elementary School, Eliot Middle School, and Muir High School (PUSD 2005, 2006, 2010).

Parks

The Upper Arroyo Seco provides recreational opportunities for area residents and visitors. Area 1 is located within the ANF and the Gabrielino Trail runs along the east side of Areas 1 and 2. Area 3 is located within Hahamongna Watershed Park, which is developed with a variety of active and passive recreational facilities. This park is maintained by the Pasadena Parks and Natural Resources Division.

Other Public Facilities

There are ten City libraries, with the Linda Vista Branch Library located nearest the Upper Arroyo Seco at 1281 Bryant Street, approximately two miles south of Area 3.

The Headworks structure in Area 1, the diversion and intake structures in Area 2, and the spreading basins in Area 3 are subject to inspection and maintenance by PWP personnel.

4.15.2 IMPACT ANALYSIS

Regulatory Requirements

RR PS-1 Proposed improvements are required to be designed and constructed in accordance with the Pasadena Fire Prevention Code (Chapter 14.28 of the City's Municipal Code), which adopts the California Fire Code with changes and additions to the adopted code.

Impact Discussion

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered government facilities, need for new or physically altered government facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

- **Fire protection?**
- **Police protection?**
- **Schools?**
- **Parks?**
- **Other public facilities?**

Fire Protection

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. The proposed habitat restoration, increased water diversion, and new recreational and educational amenities would not introduce habitable structures, operational activities, or people into the area that could generate a long-term demand for fire protection services. Also, the Project does not propose any new land uses in or near the Arroyo Seco. Thus, the Project would not result in a need for new or physically altered fire protection facilities.

The restored habitat area, new diversion and intake structures, improved access road, new sedimentation/spreading basins, and new decomposed granite parking lot would not be susceptible to fire. The proposed restroom would have fire-retardant shingles. The woody structures proposed in Area 1 would be located along the water's edge and would be damp much of the time, substantially reducing any fire hazards. The proposed picnic tables and benches would be made of heavy duty wood with weatherproofing and would not be highly flammable. MM HAZ-4 would reduce the potential for fire from combustion engines used during construction. Project improvements would be constructed in accordance with the Pasadena Fire Prevention Code (Chapter 14.28 of the City's Municipal Code) as RR PS-1. The improved access road in Area 2 and the new access road in Area 3 would also be constructed in accordance with the emergency access requirements in the City's Fire Prevention Code (RR PS-1). Compliance with MM HAZ-4 and RR PS-1 will minimize the potential for fire and, therefore, the Project's demand for fire protection services.

Construction activities would temporarily create an increased demand for fire-protection services due to the use of equipment, electricity, fuels, and other fire sources that may ignite flammable and combustible materials. As discussed under Section 4.8, Hazards and Hazardous Materials, the Project has the potential to increase the risks associated with wildfires due to the presence of heavy construction equipment, including the use of flammable liquids and the presence of combustion engines, which could result in accidental fire.

During construction, emergency response by the Pasadena Fire Department to the HWP, the USFS Ranger Station, and the Upper Arroyo Seco may be affected while construction on or near the access road and at the Gabrielino Trail is ongoing. The existing trail/access road may be partially closed while improvements in Areas 1 and 2 are under construction. The existing bridges may also be closed while the temporary bridges over them are under construction. Since the Gabrielino Trail/access road to Areas 1 and 2 provide access to three households and a number

of hikers, bicyclists, equestrians and maintenance personnel, access would have to be maintained at all times in accordance with the Standard Specifications for Public Works Construction (Greenbook) (RR TRA-1 in Section 4.17, Transportation/Traffic). Also, MM HAZ-3 from Section 4.8, Hazards and Hazardous Materials, requires the contractor to inform public service agencies of the construction schedule and times when Bridge No. 3 and the access road would be closed. This will facilitate emergency response to the area in the event of a fire.

A temporary access road would be maintained in Area 3 while the new two-lane access road is under construction to provide continued access to the JPL campus through the JPL Bridge and to areas farther north (e.g., USFS Ranger Station). In addition, the Gabrielino Trail/North Arroyo Boulevard east of Area 3 may serve as an alternate emergency access to the JPL Bridge and ANF while improvements in Area 3 are under construction.

The City also implements an Emergency Operations Plan (RR HAZ-2 from Section 4.8, Hazards and Hazardous Materials) that outlines emergency procedures that would be followed in the event of a local, regional or national emergency.

Compliance with RR PS-1 and RR TRA-1 from Section 4.17, Transportation and Traffic, and RR HAZ-2 from Section 4.8, Hazards and Hazardous Materials would also facilitate fire protection services to the Project. No new or physically altered fire protection facilities would be needed to serve the Project and, thus, impacts on fire protection services would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified significant impacts on police, fire and emergency services during construction and operation of game fields, lakes, equestrian facilities, restrooms, and parking areas. Several mitigation measures were provided to reduce impacts on public services. The Arroyo Seco Canyon Project would comply with the City's Fire Prevention Code as RR PS-1, which is similar to Measure Public Services-3 and Measure Public Services-5. Implementation of MM HAZ-3, which is similar to Measure Public Services–1, would inform the Pasadena Fire Department of the construction schedule and the potential need to use alternative routes for emergency response.

Police Protection

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. The Project does not involve the development of habitable structures or operational activities that could increase demands for long-term police protection services. The restored habitat area, new diversion and intake structures, improved access road, new sedimentation basins, and expanded spreading basins are not new land uses that could attract criminal elements or criminal activities into the area. However, the new recreational parking lot, picnic tables, benches, signage and restroom may increase trail users/visitors and provide greater opportunities for vandalism, graffiti, littering, and theft.

The Park Safety Specialist Team and the Volunteer Mounted Unit of the Pasadena Police Department would continue to patrol the area and provide police protection services in the Upper Arroyo Seco, and PWP personnel would continue inspection and maintenance activities at the diversion structures and spreading basins. If any additional resources are required to patrol the area, the City of Pasadena can adjust staffing accordingly. Any increase in demand for police protection services would be less than significant and would not result in a need for new or physically altered police facilities.

Construction activities may provide opportunities for crime (e.g., theft and vandalism). However, construction areas and staging areas would be screened/fenced, which would prevent theft and vandalism during the construction phase. During construction, emergency response by the Pasadena Police Department to the HWP, USFS Ranger Station, and Upper Arroyo Seco may be affected when construction on or near the access road and at the Gabrielino Trail is ongoing. Similar to fire protection services, this impact would be temporary and less than significant since no new or physically altered police facilities would be needed or required. In addition, impacts on police services are further reduced with compliance with the Greenbook (see RR TRA-1 from Section 4.16, Transportation and Traffic) and advance notification of service providers under MM HAZ-3 (see Section 4.8, Hazards and Hazardous Materials).

Impacts on police protection services would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified significant impacts on police, fire and emergency services during construction and operation of various facilities in the HWP. The Arroyo Seco Canyon Project would implement MM HAZ-3, which is similar to Measure Public Services–1, to inform the Pasadena Police Department of the construction schedule and the potential need to use alternative routes for emergency response.

The Master EIR included Measure Public Services-2, which calls for additional sworn and non-sworn officers commensurate with the increase in park attendees. The majority of the anticipated increase in trail users (20 to 25 percent or as many as 200 additional trail users/visitors per day during a holiday weekend) would likely be using facilities in Areas 1 and 2 and would not be in Area 3 or the HWP. The improvements in Area 3 alone are not expected to require additional sworn and non-sworn officers.

Since the City regularly evaluates the need for police officers as part of its annual budgeting process, this mitigation is being implemented by the City. Also, emergency response and evacuation plans under Measure Public Services–4 have been established for the City for various types of emergencies and incidents (RR HAZ-2 from Section 4.8, Hazards and Hazardous Materials), and is implemented by the City and its various departments and personnel.

Schools

No Impact.

Areas 1, 2 and 3 Impacts. The Project would be located in areas designated as Open Space. The proposed habitat restoration, increased water diversion, and new recreational amenities would not induce residential development. Also, the Project would not generate a demand for school services because no residential land uses that may be occupied by households with school-aged children are proposed. Long-term recreational activities in the Arroyo Seco Canyon and operation and maintenance activities on the PWP facilities would not create a demand for school services. No impact on schools would occur with the Project and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that positive impacts on students would be provided by the HWP as an extended recreational, educational and cultural venue for area residents.

Parks

No Impact.

Areas 1, 2 and 3 Impacts. The Project would not generate a demand for parks or recreational facilities because the Project does not propose residential development that may be occupied by households that would utilize local parks and recreational areas. Rather, the Project includes the construction of recreational amenities along the Gabrielino Trail to serve the existing and future users of the HWP and the ANF. The Project would provide greater opportunities for recreation in Area 1 and would improve the recreational experience in the area with the rest area/picnic area, interpretive signage, trash can, horse water trough, and pet waste station. The proposed restroom, potential future trail connection, pet waste station, signage, and recreational parking lot in Area 3 would also improve the recreational experience. These amenities would not result in adverse impacts on parks and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that the expansion and improvement of existing active and passive recreational facilities in the HWP would accommodate additional visitors and would not have impacts on other parks in the area.

Other Public Facilities

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. The Project would not generate a demand for libraries because the Project does not propose residential development that may be occupied by households, nor would the Project bring in other land uses that may require library services or facilities. No impact on existing library services would occur with the Project.

Long-term operation and maintenance for the proposed recreational amenities and improved PWP facilities would be largely similar to existing services. Maintenance of the proposed restroom, trash cans, and pet waste stations would slightly increase over existing levels, but would be provided by the same City personnel. The improved surface water diversion and intake facilities would reduce maintenance activities from the PWP. The larger area for spreading basins may increase inspection and maintenance needs, but the proposed sedimentation basins would reduce the need for maintenance of the downstream spreading basins. The needed maintenance would not require new PWP personnel or new public facilities. Impacts related to park maintenance and groundwater recharge maintenance services would be less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that increases in public facility maintenance, landscape maintenance, public transportation, and park operation services to the HWP would be needed from the City Department of Public Works and Transportation. The Project would increase maintenance activities for the proposed recreational amenities but this impact is considered less than significant.

4.15.3 MITIGATION MEASURES

There would be no significant adverse impacts related to public services, with compliance with RR PS-1; therefore no mitigation measures are required.

4.16 RECREATION	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Would/does the project:				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☒	☐	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☒	☐

4.16.1 EXISTING CONDITIONS

The Hahamongna Watershed Park is developed with active and passive recreational areas on both sides of the Arroyo Seco, upstream of Devil's Gate Dam. East of the Arroyo Seco are several trails and Johnson Field (a softball field with picnic tables, a barbecue pit, and a restroom that have not been in use) that has been used by the County to temporarily stockpile sediments that were removed from the reservoir since 2011. The City's spreading basins and the JPL East Parking Lot in Area 3 are also located east of the Arroyo Seco. The parking lot was leased by the City to JPL until June 2013, with an extension until a new JPL On-Site Parking Structure is built on the JPL campus (expected to be completed in August 2014). West of the Arroyo Seco are multi-purpose play fields, picnic areas, an equestrian facility, an equestrian staging area, trails, trailheads, an overlook, a disc golf course, a fire camp, an amphitheater, a youth camp, restrooms, a maintenance yard, and parking lots.

The Arroyo Seco Trail runs along both sides of the Arroyo Seco and is part of the Rim of the Valley Trail Corridor that connects the Santa Monica Mountains and the San Gabriel Mountains through trails in the San Fernando and La Crescenta Valleys. This trail also continues south along the Central and Lower Arroyo Seco to connect with the Los Angeles River Trail. North of Devil's Gate Dam, there are several local trails on both sides of the Arroyo Seco, including the East Rim Trail, the West Rim Trail, the Mountain View Trail, the Flint Wash Trail, the Gould Canyon Trail, the Altadena Crest Trail, and the Gabrielino Trail.

North Arroyo Seco Road shares its alignment with the Gabrielino Trail, which is an easement from the City to the USFS that begins at the intersection Windsor Avenue and Ventura Street and extends 1.5 miles north along the eastern edge of the JPL parking lot toward the Arroyo Seco Canyon and the ANF. An existing dirt path runs east-west through the middle of the parking lot connecting the spreading basins on the west to the Gabrielino Trail on the east. This pathway is currently used by both pedestrians and equestrians.

4.16.2 IMPACT ANALYSIS

Impact Discussion

a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Less Than Significant With Mitigation.

Areas 1, 2 and 3 Impacts. The Project would not induce population growth directly or indirectly, which could generate a need for or increase the use of parks and recreational facilities. Rather, the Project includes a rest area/picnic area and nature trail in Area 1; an improved Gabrielino Trail/access road in Area 2; and a potential future trail connection and restroom in Area 3. These recreational amenities would add to existing recreational facilities at the HWP and in the ANF to serve existing and future trail users and recreational visitors. These amenities would improve the recreational experience of existing users (through the provision of a restroom, picnic tables, benches, trash cans, pet waste stations, potential future trail connection, a drinking fountain, and signage along the existing trail) and may increase use of the adjacent trails. This increase is not expected to be large enough to attract a large number of new users into the area. Rather, it is anticipated that a 20 to 25 percent increase in use may occur, such that approximately 150 people would use the trail and adjacent recreational facilities on the weekdays (or 25 people more than existing) and 500 to 1,000 trail users/visitors would use them on weekends (as many as 200 users more per day during a holiday weekend). This increase in use is not expected to result in the deterioration of existing and proposed recreational facilities.

However, during construction within Areas 1, 2, and 3, there may be times when portions of the Arroyo Seco Trail, Altacrest Trail and Gabrielino Trail/access road would be closed to the public. While the trails would be kept open during construction to the extent possible, there would be days when equipment and construction activities would be on and/or near the trails, making recreational trail use hazardous for the general public. During these times, the trails would be closed.

Without proper noticing, it is possible that trail users would go into the HWP or the canyon only to find that the trails are closed. They would then have to turn back and find a nearby trail or move to another location (e.g., west side of the Arroyo Seco), while others may forego their planned recreational activity. Since the Gabrielino Trail is heavily used (estimated at 125 current trail users per weekday; 400 trail users on weekends; and 800 trail users on holiday weekends), intermittent closure of this and other nearby trails during the construction period would inconvenience a number of trail users. This would be a potentially significant but mitigable impact on recreation, especially during holiday weekends when trail use is highest.

MM REC-1 requires advanced notification to trail users of closures dates and alternative trails prior to the closure of the trails in and near the Project site. Periods of closure would be restricted to no more than 5 consecutive days during non-emergency closures, and notices would be posted at the parking lots and trail entrance stating the closure times and dates. There are a number of other existing trails and recreation areas in the vicinity of the Project that could be used during any trail closures. The southern segments of the Arroyo Seco Trail that run through Hahamongna Watershed Park and the Central and Lower Arroyo Seco would not be affected by Project construction and would be available for recreational use. In addition, there are a number of other access points that provide connections to regional trailheads that run through the ANF, including the Gould Canyon, Cross Town Trail, and the Lukens Connection Trail, which have trailheads off the Angeles Crest Highway in the City of La Canada Flintridge, as well as nearby Eaton Canyon and Loma Alta trails.

Use of alternative nearby trails on the days when the Arroyo Seco Trail, Altacrest Trail and Gabrielino Trail/access road are closed would be temporary and would not lead to any significant deterioration of these other trails. Impacts on nearby trails associated with the partial and temporary closure of trails near Areas 1, 2 and 3 would be short-term and less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified significant impacts on existing recreational facilities during construction activities and provided several mitigation measures. The Arroyo Seco Canyon Project would not require the closure of existing recreational facilities, appurtenant facilities (such as restrooms), playfields, or parking spaces.[7] Thus, mitigation measures (Measure Recreation-1 through Recreation-4) for the temporary closure of these facilities are not applicable. However, the Arroyo Seco Canyon Project would require the temporary closure of trails, and thus, would implement MM REC-1, which is similar to Measure Recreation-5.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. The proposed recreational amenities in Areas 1 and 3 would add to existing recreational facilities in the Hahamongna Watershed Park to serve existing and future trail users and recreational visitors in the park but is not anticipated to increase the use of other recreational facilities in the City nor require the construction of other facilities. The proposed amenities include a new recreational parking lot, restroom, picnic tables, benches, trash cans, pet waste stations, and signage along an existing trail. These would improve the recreational experience of existing users and may increase the use of the adjacent trails although they are not expected to attract a large number of new users into the area. As discussed earlier, the Project is anticipated to lead to a 20 to 25 percent increase in use, such that 25 new trail users/visitors per weekday (over the current 125 trail users/visitors) and 100 to 200 new trail users/visitors on weekends (over the estimated 500 to 1,000 trail users/visitors) may be present per day. This increase in trail use is not expected to result in significant impacts on other recreational facilities in the HWP.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified significant impacts on trails during construction activities and provided several mitigation measures. The Arroyo Seco Canyon Project would require temporary closure of trails and would implement MM REC-1 (which is similar to Measure Recreation-5) to reduce impacts related to the unavailability of trails in the HWP. The Master EIR stated that play fields, new park entrances, lakes, security fencing and utility improvements would not affect recreation.

4.16.3 MITIGATION MEASURES

MM REC-1 Prior to the closure of recreational trails for public use, the Construction Contractor shall post signs at the parking lots and trail entrances providing at least one week of advanced notice of the dates and times of planned trail closures. The trails shall be closed no more than 5 consecutive days in non-emergency circumstances. In addition to the closure notice, the Contractor shall provide directions to the nearest trails in the surrounding areas that would be open for public use at the times when the trails are closed.

[7] It is anticipated that the new JPL parking structure would be in use by the time construction in Area 3 occurs.

4.17 TRANSPORTATION/TRAFFIC	Potentially Significant Impact	Less Than Significant With Mitigation	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system. Including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☒	☐	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☒	☐	☐
e) Result in inadequate emergency access?	☐	☒	☐	☐
f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☒	☐

4.17.1 EXISTING CONDITIONS

Regional Access

The Foothill Freeway (I-210) starts at the Golden State Freeway (I-5) in the northern portion of the San Fernando Valley, and generally runs in a southeasterly and easterly direction near the southern base of the San Gabriel and San Bernardino Mountains to the I-10 in Redlands. The I-210 has eight travel lanes as it passes along the southern edge of Devil's Gate Dam. Caltrans estimates the 2012 traffic volumes on the I-210 in this area (between Berkshire Place and Arroyo Boulevard) during the peak hour at 10,600 vehicles, with a peak month volume of 122,000 vehicles per day and an average daily traffic volume of 118,000 vehicles (Caltrans 2013b).

Local Roadway Network

Access to the Arroyo Seco Canyon is provided by the I-210's Arroyo Boulevard/Windsor Avenue off-ramp. Windsor Avenue is a two-lane road that runs north and ends at its intersection with Ventura Street and Explorer Road. Explorer Road continues northerly toward the JPL East Parking Lot and turns west across the Arroyo Seco (onto the JPL Bridge) and southwesterly onto the JPL campus. Oak Grove Drive is a four-lane road extending westerly from Windsor Avenue,

just north of the I-210, and passing along Devil's Gate Dam and the southwest edge of the reservoir before turning north toward the JPL campus.

In 2011, the average daily traffic (ADT) volumes on North Windsor Avenue from Ventura Street to Figueroa Drive ranged from 6,361 to 10,097 ADT on weekdays and from 4,680 to 6,458 ADT on the weekends. Farther south (between Figueroa Drive and Oak Grove Avenue), 2011 ADT ranged from 10,258 to 13,928 ADT on weekdays and 7,965 to 9,044 ADT on weekends (Los Angeles County 2013a).

Most of the existing vehicle trips on Windsor Avenue and Explorer Road in Area 3 are associated with employee travel to and from the JPL East Parking Lot during the morning and afternoon peak hours. In addition, there are paved and unpaved access roads that are also used by visitors to the HWP and maintenance workers to access the spreading basins, reservoir, and dam.

The Gabrielino Trail/access road is a paved road that runs on top of the slope east of the JPL East Parking Lot and goes into the Arroyo Seco Canyon, crossing the stream at several locations as it heads into the ANF. It becomes unpaved in Area 1 and farther north. This trail is used by hikers, bicyclists, and equestrians going into Arroyo Seco Canyon; it is also used by City, County, and USFS inspection and maintenance vehicles.

Transit Services

The Los Angeles County Metropolitan Transportation Authority (Metro) provides regional bus and passenger train services in the County. Metro Bus routes 177 and 268 run along Oak Grove Avenue and into the JPL campus, south and west of Area 3. The Glendale Beeline Route 3 also runs from Downtown Glendale to JPL (Metro 2013).

The Pasadena Area Rapid Transit System (ARTS) provides local bus services within the City. Route 52 goes into the JPL campus three times daily on weekdays from as far south as the intersection of Glenarm Street and Raymond Avenue (Pasadena 2013a). JPL also operates a shuttle from 7:00 AM to 9:00 AM and 3:00 PM to 5:00 PM that stops in the JPL East Parking Lot and at internal streets within the JPL campus (JPL 2012).

4.17.2 IMPACT ANALYSIS

Project Design Features

PDF TRA-1 During the construction phase, a temporary access road will be maintained in Area 3 prior to the availability of the permanent access road, to provide continued vehicle access to the Jet Propulsion Laboratory (JPL) campus via the JPL Bridge. During construction activities in Area 3, the temporary access road will be available for use by JPL employees and visitors during working weekdays, but the access road will be restricted at other times.

Regulatory Requirements

RR TRA-1 Construction activities are required to be conducted in accordance with the Standard Specifications for Public Works Construction (Greenbook) and the City's Supplements and Modifications to the Greenbook to maintain access to all parcels in and near the construction sites. This includes notification of residents and businesses affected by the road work; utility agencies with facilities in the area; the Pasadena Fire and Police Departments; and other emergency service providers.

The Greenbook also requires that access be made available at the end of each workday.

RR TRA-2 Temporary traffic control devices and methods used during construction are required to conform to the requirements of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD) and the California Supplement to the MUTCD. The contractor shall provide traffic tapers, traffic control devices, barricading, and signs necessary to ensure driver awareness and safety in construction areas and to assist fire and law enforcement personnel.

Impact Discussion

a) Would the project conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Less than Significant Impact with Mitigation.

Areas 1, 2 and 3 Impacts. Visitors to the Project site are expected to increase by a maximum of 20 to 25 percent with the Project. Weekday use at a current estimated average of 125 visitors could increase by 25 visitors to 150 visitors per weekday. These trips will be scattered throughout the day and would likely be outside peak hours. Weekly trash collection and twice weekly restroom cleaning would add minimal trips on a daily basis in the long-term. Intermittent sedimentation basin maintenance is estimated to generate approximately 100 truck trips every year and spreading basin maintenance would generate approximately 100 truck trips once every five years. While these truck trips can be spread out during the day and extended over several days, increases in AM and PM peak traffic volumes may occur.

Construction activities will also generate new vehicle trips from construction equipment and construction crews coming to the site; trucks bringing in building materials; trucks taking out excavated soils and other debris for off-site disposal; and construction equipment leaving the site after each construction phase. As shown in Table 3.2-1, Construction Assumptions, between 10 to 210 truckloads from one area would be hauling soils and debris to Scholl Canyon Landfill during each phase of construction.

Trucks would come to the site off I-210 at the Windsor Avenue off-ramp and head north on Windsor Avenue and on Explorer Road into Areas 3, 2, and 1. From the site, the trucks would head south on Windsor Avenue and onto the westbound on-ramp on I-210. From the I-210, trucks would head west on SR-134 and exit using the Figueroa Street/Scholl Canyon Road off-ramp before heading north-northeast toward the landfill. Trucks would come back from the landfill by entering the eastbound on-ramp on the SR-134 at Figueroa Street and heading east and then west on I-210 to Windsor Avenue, Explorer Road, and, ultimately, the site.

Roadway network performance is generally measured by the capacity of roadway intersections, including the ability of each leg of the intersection to handle traffic volumes and the average wait times of vehicles. Since AM and PM peak hours during weekdays handle the greatest amount of traffic at most intersections, the level of service (LOS) at intersections during the AM and PM peak hours is primarily used to evaluate the efficiency of the roadway system.

Project-related vehicle trips could increase AM and PM traffic volumes on Windsor Avenue, I-210, and other streets. Although construction-related vehicle trips are relatively small and not expected to significantly impact traffic or the circulation system along the truck route, restrictions on Project site construction activities to avoid adding new construction truck trips to local roads, arterials, and freeways during the AM and PM peak hours would further minimize impacts. MM TRA-1 would require Contractors to schedule the arrival and departure of the construction equipment and construction trucks outside the AM peak hours of 7:30 AM to 8:30 AM and the PM peak hours of 4:30 PM to 5:30 PM. In addition, trucks transporting debris from the site would be required to travel to and from the site outside the AM and PM peak hours. This would avoid adverse impacts to the peak hour operation of streets and intersections near the Project site.

There would be no impact on the use of mass transit systems with the Project because the Project site is not directly served by a public transportation system and is too far from public streets to encourage bicycle use or walking to the site by construction workers. Increase in trail users and visitors to the HWP and ANF will occur with the Project, which would be mainly recreational in nature. Impacts on non-motorized travel or pedestrian and bicycle paths are discussed under Section 4.15, Recreation, above. Impacts on the AM and PM peak hour operations of streets and intersections would be less than significant after mitigation.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan anticipated significant impacts on transportation and traffic and identified a number of intersection improvements as mitigation measures. The restriping of the I-210 westbound off-ramp at Windsor Avenue (Measure Transportation-1) has been implemented. Measures Transportation-2 and Transportation-3 call for a traffic control officer during large special events. The Arroyo Seco Canyon Project would result in approximately 25 additional visitors on weekdays and 100 additional visitors on weekends, with as much as 200 additional visitors on holiday weekends. These mitigation measures, when deemed appropriate by the City, are necessary for large special events, and the Project would not interfere with the implementation of these measures. Measure Transportation-4 calls for a wayfinding program for the Central Arroyo Seco and is not applicable to the Project.

b) Would the project conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand established by the county congestion management agency for designated roads or highways?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. The Los Angeles County Congestion Management Program (CMP) calls for monitoring of the highway and roadway system in the County and a multi-modal system performance analysis. It sets a Level of Service (LOS) standard of E for the CMP Highway System. The program also promotes alternative modes of transportation; requires monitoring of land use and roadway performance by individual jurisdictions; and provides guidelines for conducting a Traffic Impact Analysis (TIA). The CMP TIA guidelines require analysis of freeway segments, ramps, and intersections if a proposed project would add 50 or more trips to a CMP arterial intersection or 150 or more trips (in either direction) during either the AM or PM weekday peak periods at a mainline freeway monitoring location.

The 2010 CMP includes I-210 as part of the CMP Highway System. The segment of I-210 between SR 134 and SR 2 operated at LOS D or better northbound during the AM peak hour and at LOS F southbound during the AM peak hour in 2009. During the PM peak hour, it operated at LOS D or better in both directions (MTA 2010). Caltrans does not identify this segment of I-210 as being a “Congested Urban Area” (Caltrans 2010).

The Project would not generate 50 or more trips that would be added to any one intersection during the AM or PM peak hours on weekdays, as only 25 additional visitors per day are anticipated; therefore, no TIA is required. During the weekends, approximately 100 to 200 visitors per day would be added by the Project when the traffic volumes on local roads, arterials, and freeways are less (e.g., weekend daily traffic volumes are 1,681 to 3,636 vehicles less on Windsor Avenue north of Figueroa Drive and 2,293 to 4,884 vehicles less south of Figueroa Drive). The addition of weekend trips is not expected to adversely affect the CMP Highway System; conflict with CMP LOS standards; or require a TIA.

During construction, the I-210 freeway and major roadways in the County's CMP would be utilized by trucks and vehicles coming to and from the Project site. These vehicle trips would be highly variable depending on the construction phase, with 20 to 30 pieces of construction equipment coming to the site during each stage (e.g., clearing/grubbing, demolition, grading, infrastructure, and paving stages). With the addition of the construction crew and trucks traveling to and from the site to dispose of debris at Scholl Canyon Landfill, more than 50 vehicle trips may be generated daily during Project construction.

Implementation of MM TRA-1, as discussed above, would avoid adding 50 or more trips to local roads, arterials, and freeways during the AM and PM peak hours. Therefore, traffic increases from the Project during peak hours would be less than 50 trips; would not affect peak hour LOS; and thus, no TIA is needed. Impacts on the Los Angeles County CMP would be less than significant and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan included a traffic impact analysis and a transit impact review in accordance with the CMP guidelines.

c) Would the project result in a change in air traffic patterns, including either an increase in traffic levels or change in location that results in substantial safety risks?

No Impact.

Areas 1, 2 and 3 Impacts. There are no airports or airstrips within two miles of the Upper Arroyo Seco. The nearest airports are the Burbank Bob Hope Airport and the El Monte Airport, which are both approximately 11 miles from Area 3. There is a heliport and a helipad near the Arroyo Seco but the Project would not affect nearby helicopter operations at the helipad or heliport. The Project would have no impact on air traffic patterns, because the proposed habitat restoration, increased surface water diversion and groundwater recharge, and recreational and educational amenities would not generate a demand for air transportation. No impacts on air traffic patterns would occur with the Project.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify any adverse impacts to air traffic patterns or air transportation.

d) Would the project substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Less than Significant Impact with Mitigation.

Areas 1, 2 and 3 Impacts. The Project would not result in any new roadway features or alignments, with the exception of the temporary and final access road through Area 3 (PDF TRA-1). As a part of the termination of the lease agreement with the City for the JPL East

Parking Lot, and not as a component of the proposed Project, JPL is required to remove all constructed improvements on the parking lot site. It is anticipated that the City will request approximately 47,164 square feet of paving to remain in place for a 26-foot wide temporary access roadway that would provide vehicle access for JPL employees to the new JPL Parking Structure on the JPL property. Dedicated access times during commuting hours may be enforced during construction activities in Area 3, and JPL employees and visitors would have to use JPL's West Entrance during restricted access hours (outside peak commute hours). This temporary access road would remain in place during construction activities in Area 3 until the completion of the permanent access road. This temporary access road would be aligned and maintained in accordance with the Standard Specifications for Public Works Construction (Greenbook) and the City's Supplements and Modifications to the Greenbook (RR TRA-1) and would not increase hazards for users of the road.

Temporary bridges would be constructed over Bridge No. 1 and Bridge No. 3 in and near Area 2 to provide access for construction equipment and vehicles to reach Areas 1 and 2. The Gabrielino Trail/access road in Area 2 would also be reconstructed to prevent further slope erosion. During construction, there may be hazards from construction activities and the use of construction equipment near trail users and vehicles passing through construction areas. In Area 1, fencing around the construction area would prevent public access into Area 1, but would maintain public access on the Gabrielino Trail/access road adjacent to Area 1. Construction of the new diversion and weir structures in Area 2 would be located away from the Gabrielino Trail/access road. However, construction of the temporary bridges and access road reconstruction would be on or near the Gabrielino Trail/access road and could create temporary safety hazards to hikers, bicyclists, and equestrians. Because of the high number of recreational users on the Gabrielino Trail, any potential hazards along the trail would be a significant impact.

In order to protect the safety of trail users, MM TRA-2 requires that non-vehicular access, including hikers, bicyclists and equestrians, shall be limited or prohibited when work on the bridge and Gabrielino Trail/access road in Area 2 is ongoing, and that flagpersons shall be used as necessary to ensure the safety of recreational users.

An increase in the number of construction vehicles and trucks on Windsor Avenue during Project implementation would increase opportunities for traffic hazards. Flagpersons, signs, and traffic control devices would be provided at the intersection of Ventura Street and Windsor Avenue in accordance with the Greenbook (RR TRA-1) and MUTCD (RR TRA-2) to prevent hazards associated with construction vehicles merging with or diverging from vehicle traffic on Windsor Avenue. Compliance with RR TRA-1 and RR TRA-2 and with MM TRA-2 would reduce impacts to less than significant levels.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify any adverse impacts related to traffic hazards or incompatible uses.

e) Would the project result in inadequate emergency access?

Less than Significant Impact with Mitigation.

Areas 1 and 2 Impacts. The existing Gabrielino Trail/access road in Area 1 would be maintained, while portions of the access road in Area 2 would be improved. Thus, beneficial impacts on emergency access would occur in the long-term.

Construction activities on the Gabrielino Trail/access road would affect access to Areas 1 and 2, adjacent areas (including the USFS Ranger Station), and areas farther north in the ANF. Improvements to the Gabrielino Trail/access road, movement of heavy equipment, and the

installation of temporary bridges over Bridge No. 1 and Bridge No. 3 would result in short-term and partial obstruction of vehicular access, which would affect the ability of emergency responders to access the area.

Compliance with the Standard Specifications for Public Works Construction (Greenbook) and the City's Supplements and Modifications to the Greenbook (RR TRA-1) regarding maintenance of emergency access at all times would mean closure of only half of the access; the use of a flagperson to direct traffic, as necessary; and allowing for the public use of the Gabrielino Trail/access road at times when construction is not ongoing. Temporary traffic control devices are also required to be provided in conformance with the MUTCD and the California Supplement to the MUTCD (RR TRA-2).

However, there would still be times during the construction workday when very short-term closures of the temporary bridges and/or the access road would occur. Examples of temporary road closures include times when large equipment is in motion, requiring the full width of the Gabrielino Trail/access road, and when temporary bridges are being installed. If these activities would hinder emergency access to the USFS Ranger Station, impacts would be significant.

MM TRA-3 requires that prior to the start of construction, the Construction Contractor must provide written notice to the USFS and residences at the Ranger Station of the anticipated construction schedule, stating that access may be temporarily obstructed on an intermittent basis and providing a schedule of anticipated closures. In order to ensure that emergency vehicles would not be obstructed at any time, the measure also requires that any temporary obstructions to the Gabrielino Trail/access road that could hinder emergency vehicular access be mobile and able to be removed from the roadway immediately upon notice from emergency responders.

As discussed in Section 4.8, Hazards and Hazardous Materials, MM HAZ-3 requires that closures of the access road and bridge be shortened to the extent feasible and that the contractor inform the PWP, the Pasadena Fire Department, the Pasadena Police Department, the Los Angeles County Fire Department, and the USFS of the construction schedule and planned closures. This will allow for timely emergency response and evacuation of the USFS Ranger Station and areas farther to the north. Compliance with RR TRA-1, RR TRA-2, MM TRA-3, and MM HAZ-3 (from Section 4.8) would reduce impacts to emergency access to less than significant levels after mitigation.

Area 3 Impacts. Emergency access to the HWP and Devil's Gate Dam and Reservoir would not be affected by improvements in Area 3. Emergency access to the JPL campus would be provided by Oak Grove Avenue from the west. Secondary access from the east would continue to be provided by the temporary access road through Area 3 (PDF TRA-1) and by the Gabrielino Trail during construction activities in Area 3. Access to the existing spreading basins would also remain available from roads south of Area 3. Access to Areas 1 and 2 would remain available through the Gabrielino Trail along the east side of Area 3. Impacts on emergency access in Area 3 would be less than significant.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify any adverse impacts related to emergency access.

f) Would the project conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. Proposed habitat restoration, increased water diversion and groundwater recharge, and additional recreational and educational amenities would not affect existing public transit services, policies, plans, or programs.

The proposed nature trail, rest area/picnic area, horse water trough, and other improvements would provide beneficial recreational amenities that would support hiking, biking, and equestrian use on the Gabrielino Trail and in the ANF. The reconstruction/improvement of the access road in Area 2 would increase public safety for users of the access road, which would also benefit hikers, bicyclists, and equestrians using this Gabrielino Trail/access road. The proposed parking lot, restroom, signs, and potential future trail connection at the north end of Area 3 would improve facilities available to hikers, pedestrians, equestrians or bicyclists visiting the Arroyo Seco Canyon.

Shuttle service from the JPL East Parking Lot to the JPL campus will be discontinued when the new JPL On-Site Parking Structure is completed (JPL 2012). This impact is not related to the proposed Project but is a result of the new JPL On-Site Parking Structure that is currently under construction.

During construction, use of the Gabrielino Trail in Areas 1 and 2 may be temporarily restricted as recreational amenities are constructed in Area 1 and the access road is reconstructed in Area 2. Similarly, use of the existing trail that crosses Area 3 may be temporarily obstructed during excavation of the spreading basins. As discussed in Section 4.15, Recreation, temporary trail closure would occur during construction. MM REC-1 from Section 4.15, Recreation, requires the contractor to post signs to provide advanced notice of the dates and times of planned trail closures, along with directions to the nearest trails in the surrounding areas.

After construction, the trails will become available for long-term use at the same locations. Therefore, the Project would have less than significant impacts on public transit, bicycle, and pedestrian facilities and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify any adverse impacts related to alternative transportation policies, plans, or programs.

4.17.3 MITIGATION MEASURES

MM TRA-1 During construction activities in Areas 1, 2 and 3, all Contractors shall schedule the arrival and departure of the construction equipment, and construction trucks outside the AM peak hours of 7:30 AM to 8:30 AM and the PM peak hours of 4:30 PM to 5:30 PM. In addition, trucks transporting sediment and debris from the site shall travel to and from the site outside the AM and PM peak hours.

MM TRA-2 During construction activities in Areas 1 and 2, use of Bridge No. 1, Bridge No. 3, and the Gabrielino Trail/access road by hikers, bicyclists and equestrians shall be limited or prohibited when work on the temporary bridges and Gabrielino Trail/access road is ongoing. Flagpersons and/or other safety procedures shall be used as necessary to ensure the safety of recreational users.

MM TRA-3 Prior to the start of construction, the Construction Contractor shall provide written notice to the USFS and residences at the Ranger Station of the anticipated construction schedule, stating that access may be temporarily obstructed on an intermittent basis and providing a schedule of anticipated closures. In order to ensure that emergency vehicles would not be obstructed at any time, any temporary obstructions to the Gabrielino Trail/access road that could hinder emergency vehicular access shall be mobile and able to be removed from the roadway immediately upon notice from emergency responders.

4.18 UTILITIES AND SERVICE SYSTEMS	**Potentially Significant Impact**	**Less than Significant with Mitigation**	**Less than Significant Impact**	**No Impact**
Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

4.18.1 EXISTING CONDITIONS

There are several groundwater wells owned by PWP in and near Area 3. The Arroyo Well is located beside Basin 5 (at the southern end of Area 3) and Well 52 is located beside Basin 7. The Ventura Well is located beside Basin 10 (south of Area 3). PWP also has three water lines crossing Area 3. There are two 24-inch pipelines (influent and effluent) from the Behner Water Treatment Plant to the 30-inch hume line in Area 3. This water treatment plant was previously used to treat surface water as part of PWP's domestic supply but is no longer in use. A 30-inch diameter hume line conveys surface water from the intake structure in Area 2 to the spreading basins in Area 3. Another water line extends from the Calaveras pressure zone at Kent Street and runs north across Area 3 to the JPL Bridge and into the JPL campus. In addition, there are two monitoring wells owned by JPL located east of Area 3.

A number of storm drain lines from Altadena, La Cañada Flintridge, JPL and the HWP discharge into the Arroyo Seco. The outfalls of three lines are located east of Area 3 and cross the JPL parking lot and spreading basins toward the Arroyo Seco (Pasadena 2003a).

There are no sewer lines serving Areas 1, 2 or 3. Wastewater in the area is conveyed to the main trunks of the Los Angeles County Sanitation Districts (LACSD) for treatment at various treatment plants.

A Southern California Edison (SCE) overhead transmission line runs across the HWP to Ventura Street. There are PWP power and communication lines that serve PWP's wells near Area 3; along Johnson Field Road; and along the Gabrielino Trail.

4.18.2 IMPACT ANALYSIS

Regulatory Requirements

RR UTIL-1 The Contractor shall comply with the City's Construction and Demolition Waste Management Ordinance (Chapter 8.62 of the Pasadena Municipal Code), which requires preparation and implementation of a Waste Management Plan that shows how at least 50 percent of construction and demolition debris would be diverted away from landfills. The Waste Management Plan shall be subject to City approval prior to the start of construction activities, and the Contractor shall provide monthly reports to demonstrate compliance during the construction phase.

Impact Discussion

a) Would the project exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

b) Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

e) Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. No restroom or other wastewater generating facilities are proposed in Areas 1 or 2. The restroom proposed in Area 3 would generate wastewater that would be conveyed into an existing sewer line at the JPL campus for treatment and disposal at the Whittier Narrows Water Reclamation Plant (WNWRP) or the Joint Water Pollution Control Plant (JWPCP) of the LACSD. Based on an assumption of 20 gallons per day per parking stall, an estimated 2,000 gallons per day of wastewater would be generated by the restroom, which is a minimal amount. This wastewater generation would come from the toilets and sink in the restroom. The majority of this wastewater generation would occur during the weekend when visitors to the Project area are highest. JPL operations are limited on the weekends and capacity of the existing trunk sewer line in JPL would be adequate to accommodate the additional flows. Wastewater discharges from the proposed restroom would increase the amount of wastewater, but would be similar to wastewater from other common restroom and bathroom facilities. This wastewater would not exceed wastewater treatment requirements of the LACSD or the Los Angeles RWQCB. The WNWRP has capacity to treat 12 million gallons per day (mgd) of wastewater, with excess flows directed to the JWPCP, which has capacity to treat 280 mgd. The JWPCP treated 265 mgd of wastewater in 2012; thus, there is as much as 15 mgd of available wastewater treatment capacity to serve the proposed restroom in Area 3.

During construction, portable toilets would be provided at the site for the construction crew, and these portable toilets would be regularly cleaned and their contents disposed of off-site by an outside company. Wastewater from these portable toilets would not exceed Los Angeles RWQCB treatment requirements. Also, an insignificant amount of wastewater would be generated by these portable toilets, and the Project would not need new or expanded treatment facilities. Capacity at existing wastewater treatment plants would not be exceeded during construction or operation of the proposed Project. Impacts related to wastewater facilities would be less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential impacts to wastewater and included Measure Utilities and Service Systems-1 for the construction of a sewage collection system to serve the HWP prior to the renovation and construction of restrooms. The Master EIR considered the connection of the new restroom in Area 3 to the sewer line at the JPL campus, which is being proposed by the Project. Thus, Measure Utilities and Service Systems-1 is not applicable to the Project.

b) Would the project require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

d) Would the project have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Less than Significant Impact.

Areas 1, 2 and 3 Impacts. Temporary irrigation of the landscaping at the rest area/picnic area in Area 1 would be provided until native plants are established. Irrigation and horse water trough in Area 1 would be served by the water line at the USFS Ranger Station. The proposed restroom, drinking fountain, and parking lot landscaping in Area 3 would be served by the relocated water line in Area 3. As estimated above, approximately 2,000 gallons per day (gpd) would be used by the restroom.

The new diversion and weir structures in Area 2 and the expanded spreading basins in Area 3 would increase the PWP groundwater recharge by approximately 1,100 acre-feet per year (afy). With the PWP allowed to extract 60 percent this volume, its water supply could increase by over 580,000 gpd. Water use by the Project (associated with the proposed restroom, landscape irrigation, drinking fountain, and horse water trough) is expected to be minimal and would be substantially less than the projected increase in PWP supplies due to the Project.

The proposed Project would require water for the control of fugitive dust during grading and excavation activities. A water truck would come to the construction sites, with water obtained from off-site sources, as needed. This water demand would be short-term and minimal.

Surface water flows in the Arroyo Seco in Area 1 would be diverted away from the construction area when grading activities occur in the stream channel. Surface water in the Arroyo Seco in Area 2 would also be diverted from the diversion and weir structures and may be directed into the intake structure for conveyance into the spreading basins if basin excavation in Area 3 has not started. Stream flows in the Arroyo Seco would be uninterrupted during construction in Area 3. However, the spreading basins would be decommissioned while the new basins are being excavated and existing basins are expanded. During these times, the intake structure would be closed and PWP would not be recharging surface waters. Instead, stream flows in Area 2 would be diverted away from the construction area and discharged into the Arroyo Seco downstream of Area 2. However, PWP maintains a groundwater storage reserve and is capable of making up

the temporary interruption in spreading. Therefore, PWP would not require more imported water sources during Project construction.

The Project would not affect water wells located near Area 3, but it would be necessary to relocate the JPL water line that crosses Area 3. The new relocated line would be installed prior to removing the existing line to avoid disruption in water service to the JPL campus. Once the new water line is ready for use, the existing line would be removed. The hume line would be relocated and water conveyance would be disrupted during construction of the new line and the spreading basins. This impact would be temporary and would not cut off water services to existing PWP customers.

After construction, as much as 1,100 afy more water would be diverted and recharged due to the expanded basins and the improved diversion structure. This would allow the PWP to use less imported water sources in the long term. Impacts on water supplies would be temporary and less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan did not identify any adverse impacts on water supplies or services.

c) Would the project require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact.

Areas 1, 2 and 3 Impacts. The Project does not propose impervious areas that would increase runoff volumes and/or require new or expanded storm drainage. Improvements in Area 1 would retain storm water flows in the Arroyo Seco. Improvements in Area 2 would impound more water behind the new diversion and weir structures but would not affect the capacity of the Arroyo Seco. Instead, less surface water would flow in the Arroyo Seco downstream of the diversion structure and towards the Devil's Gate Reservoir. This would not require new storm drainage facilities and impacts on storm drainage would be less than significant.

The direction of drainage on the improved access road in Area 2 would not change from the existing as it would flow away from the stream and toward the eastern slope for discharge to the south. This would only affect the drainage pattern on the road but flows would still enter the Arroyo Seco downstream. Improvements in Area 3 would direct runoff into the spreading basins for recharge; and runoff from area storm drains would continue to discharge into the Arroyo Seco. The Project would not require any storm drainage facilities. Impacts on storm drainage would be less than significant, and no mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan stated that storm drain improvements would have beneficial impacts on storm runoff control but construction of these improvements would result in temporary impacts requiring mitigation. The Project does not proposed any of the storm drain improvements outlined in the Master Plan.

f) Would the project be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

g) Would the project comply with federal, state, and local statutes and regulations related to solid waste?

Less Than Significant Impact.

Areas 1, 2 and 3 Impacts. Trash cans and pet waste stations in Areas 1 and 3 would be subject to weekly maintenance and waste removal by City personnel. Solid wastes in these receptacles are expected to be minimal, although disposal is expected to slightly increase over existing conditions due to the presence of picnic tables in Area 1 and additional trail users, as discussed in Section 4.16, Recreation. The types of wastes generated would not change, but the amount would be slightly increased. Recycling bins at the restroom would also reduce demand for landfill space. Disposal of trash would continue through the City's current waste disposal and would not affect landfill capacity. Long-term impacts would be less than significant.

Temporary construction activities would generate solid wastes. Construction in Area 1 is estimated to generate 80 cubic yards (cy) of debris from clearing and grubbing activities and 64 cy of demolition wastes (with no excess cut soils) requiring disposal at Scholl Canyon Landfill.

Construction activities in Area 2 are estimated to generate 80 cy of debris from clearing and grubbing activities; 16 cy of demolition wastes; and 180 cy of cut soils requiring disposal at Scholl Canyon Landfill. Construction activities in Area 3 are estimated to generate 2,400 cy of debris from clearing and grubbing activities; 4,000 cy of demolition wastes; and 2,000 cy of excess cut soils requiring disposal at Scholl Canyon Landfill. It is anticipated that the 2,000 cy of excess cut soils would consist of larger rocks recovered through the use of an on-site shaker. It is the City's intention to utilize this recovered material on-site rather than disposing of the materials. However, in order to provide a conservative assessment of impacts, disposal at Scholl Canyon is considered. As such, a total of approximately 8,820 cy of soils and debris from Project construction would require off-site disposal.

The City's Construction and Demolition Waste Management Ordinance requires diversion of at least 50 percent of the total weight of construction and demolition debris away from landfills (RR UTIL-1). Compliance with this RR will reduce landfill demand from the Project.

The Scholl Canyon Landfill has a daily allowance to accept 3,400 tons per day and has 4.8 million tons of remaining capacity as of December 2010, and at current rates of disposal per day (approximately 1,400 tons/day), the landfill would reach its currently permitted capacity in the year 2021 (LACSD 2014). Additionally, the City of Glendale is currently considering ways to expand the capacity of the landfill, thereby extending its useful life by 13 to 19 years (LACSD 2014). There is adequate capacity (4.8 million tons) at Scholl Canyon Landfill to serve construction waste disposal needs (8,820 cy) of Project construction.

Hazardous materials would be disposed of in accordance with existing regulations (RR HAZ-1), as discussed in Section 4.8, Hazards and Hazardous Materials. Impacts related to landfill capacity and solid waste regulations would be less than significant. No mitigation is required.

Impact Comparison with Arroyo Seco Master EIR. The Master EIR for the Arroyo Seco Master Plan identified potential impacts on solid waste disposal capacity due to construction activities and additional park use; it included Measure Utilities and Service Systems-2 for the implementation of waste minimizing and recycling measures during construction activities. The Project would comply with RR UTIL-1, which is similar to Measure Utilities and Service Systems-2, for the recycling of construction wastes and debris. The Project would also comply with PDF MIN-1 and RR MIN-1 from Section 4.12, Mineral Resources, for the collection of arroyo stone

during excavation activities, which would reduce the need for solid waste disposal during construction.

The Project does not propose to relocate or replace electrical and communication lines. Thus, Measure Utilities and Service Systems-4, which calls for the undergrounding of utility lines, is not applicable.

4.18.3 MITIGATION MEASURES

There would be no significant impacts related to utilities and service systems with compliance with RR UTIL-1; therefore, no mitigation measures are required.

4.19 MANDATORY FINDINGS OF SIGNIFICANCE	Potentially Significant Impact	Less than Significant with Mitigation	Less than Significant Impact	No Impact
Does the project:				
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☒	☐	☐
c. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

4.19.1 MANDATORY FINDINGS OF SIGNIFICANCE ANALYSIS

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?

Less than Significant With Mitigation. As discussed above in Section 4.4, Biological Resources, and Section 4.5, Cultural Resources, the Project would lead to the disturbance of existing plant, aquatic, and animal habitats on and near the Arroyo Seco, as well as have potential impacts to cultural resources in the Project area. Mitigation measures have been developed to reduce potential environmental impacts on biological and cultural resources to less than significant levels.

Implementation of the mitigation measures would ensure that the Project does not degrade the quality of the environment; does not substantially reduce the habitat of fish or wildlife species; does not cause a fish or wildlife population to drop below self-sustaining levels; does not threaten to eliminate a plant or animal community; does not reduce the number or restrict the range of Rare or Endangered plant or animal; and does not eliminate important examples of the major periods of California history or prehistory. Impacts would be less than significant after mitigation.

In addition, beneficial impacts on biological resources would occur through the proposed restoration and revegetation of Area 1 and compliance with the Arroyo Seco Design Guidelines would promote the cultural heritage of the area.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Less than Significant Impact After Mitigation. A number of projects are ongoing and are proposed in the Hahamongna Watershed Park and adjacent areas. These cumulative projects include, but are not limited to those listed and described below.

1. The Los Angeles County Department of Public Works is planning to implement sediment removal activities in the Devil's Gate Reservoir. Temporary stockpiling at Johnson's Field occurred in 2011, 2012, and 2013, and the permanent sediment removal activities are currently being finalized. Sediment would be excavated and disposed off-site, including approximately 2.9 million cubic yards (cy) of sediment from a 120.42-acre area behind the dam; approximately 15,725 cy at the Johnson's Field stockpile; and additional sediment received by the dam during sediment removal. Sediment will be disposed at the Waste Management Facility in Azusa, the Vulcan Materials Reliance Facility in Irwindale, the Manning Pit Sediment Placement Site in Irwindale, and other secondary sites in Sun Valley. Vegetation and organic materials will be hauled to Scholl Canyon Landfill in Glendale. Sediment removal is expected to occur between Fall 2015 and Fall 2020, with annual reservoir management after 2020.

2. A new JPL On-Site Parking Structure is currently under construction on the west side of the Arroyo Seco, within the JPL campus, to replace the parking spaces in Area 3. When the City notified JPL of its intent not to renew the lease for the parking lot, JPL started to plan for a new parking structure and requested that its lease not be terminated until the JPL On-Site Parking Structure is built (expected to be completed in 2014). Removal of the existing parking pavement and associated improvements (e.g., bus stop, signs, light poles, fencing) at Area 3 is part of JPL's parking structure project. This project is anticipated to be completed before the Arroyo Seco Canyon Project begins construction.

3. The HWMP outlines the improvements for the HWP that include habitat establishment and restoration areas, spreading basins, an overnight camping area, park facilities, picnic areas, improved and new trails, restrooms, parking areas, overlooks, bicycle routes, storm drain improvements, flood management and water conservation facilities, trailheads, and bridges. None of the improvements proposed on the east side of the Arroyo Seco are planned for construction at the same time as the Project.

4. The HWMP Addendum for the Hahamongna Annex proposes improvements to a 30-acre site formerly owned by the Metropolitan Water District of Southern California that is developed with an abandoned USFS station, equestrian facilities, a fire camp, and open space. This site is west of the Arroyo Seco and south of the JPL campus. The HWMP Addendum calls for an education and conference facility, an equestrian facility, park offices, a fire camp (existing), passive recreational facilities, and open space. No timeline for construction of these improvements has been finalized.

5. The Hahamongna Multi-Benefit/Multi-Use Project proposes improvements at the Hahamongna Watershed Park on the west side of the Arroyo Seco, including: Westside Perimeter Trail; restoration of Berkshire Creek; Oak Grove Field restroom; Foothill drain improvements; and habitat restoration.

6. The Los Angeles County Flood Control District is planning a water conservation project at Devil's Gate Dam that involves the installation of a pump and intake structure at the upstream face of the dam, along with a five-mile pipeline from the pump easterly to Eaton Wash. This project will divert water from the dam for recharge at Eaton Wash and is in the conceptual design phase.

7. Pasadena Water and Power is currently planning for a recycled water project which would take recycled water from the Los Angeles Glendale Water Reclamation Plant (LAG). The proposed point of connection is at Scholl Canyon. The project proposes a pipeline from Scholl Canyon to the City near the intersection of Washington Blvd. and West Drive. The primary customers would be the Art Center College, Brookside Golf Course, Brookside Park, and Rose Bowl Stadium. PWP is currently preparing the environmental impact report. The goal is to begin construction in early 2016.

The Project would not lead to any significant long-term adverse impacts due to the type and size of the proposed improvements. The Project's environmental impacts would mainly be associated with construction activities and would be mitigated to levels considered less than significant, which would reduce the Project's contribution to cumulative impacts.

Construction of the Project would not contribute to cumulatively significant adverse impacts with the cumulative projects that would generally be located on the west side of the Arroyo Seco in the HWP or that would be constructed before the Project (e.g., JPL On-Site Parking Structure) or after the Project's construction schedule (e.g., Hahamongna Annex and Hahamongna Multi-Benefit/Multi-Use Project), or those that have not been specifically scheduled for construction (e.g., some HWMP improvements and Devil's Gate Dam/Eaton Wash water conservation project). However, the sediment removal activities in the Devil's Gate Reservoir are anticipated to begin in the Fall of 2015, during which the Project would have started construction. This construction schedule overlap would occur from Fall 2015 until Fall 2016, when Project construction would be completed (except for 5 months between December 2015 and April 2016 when the sediment removal project would not be ongoing). Thus, the Project's construction-related impacts (i.e., aesthetics, construction emissions, noise, recreation, and traffic) could cumulatively add to construction-related impacts of proposed sediment removal activities for approximately 8 months, assuming all projects move forward on their anticipated schedules. (The Draft EIR for the sediment removal activities considers the Arroyo Seco Canyon Project as a cumulative project and analyzes the cumulative impacts of both projects and other projects proposed in the surrounding area.)

Cumulative Impact Analysis

Aesthetics. As discussed in Section 4.1, Aesthetics, the Project would have no impacts on scenic highways and less than significant impacts related to new sources light and glare. Thus, the Project would not contribute to cumulative impacts on these issues. The Project would not lead to major permanent changes in the visual quality of the Arroyo Seco Canyon and the HWP with the design of public improvements in Areas 1 and 2 in accordance with the Arroyo Seco Design Guidelines (PDF AES-1) and the design of improvements in Area 3 in compliance with the Arroyo Seco Design Guidelines (RR AES-1). However, temporary changes in visual quality and scenic views would occur during the construction phase. Construction areas and staging areas would provide views of construction equipment, construction activities, disturbed soils, and building material stockpiles that would be visible to residents, employees and visitors in the area. The screening of construction sites and staging areas would limit these views.

Construction activities within Areas 1 and 2 would not be within the same viewshed as the sediment removal activities associated with the Devil's Gate Sediment Removal Project because they are upstream and obscured from view by topography and vegetation. However, construction activities within Area 3 would be within the same viewshed. Additionally, some truck traffic for the two projects would be using similar haul routes (i.e., Windsor Avenue for incoming trucks and I-210, SR 134, Scholl Canyon Road for outgoing trucks) when trees, vegetation and other organic materials from the reservoir are disposed of at the Scholl Canyon Landfill[8]. Therefore, cumulative projects in other areas of the HWP and sediment removal activities in the Devil's Gate Reservoir would expand views of construction equipment and activities that would detract from views of the natural open space and recreational areas in the HWP. This cumulative impact would be temporary and Project screening of construction areas and staging areas and MM TRA-1 (restrictions to non-peak hours) would reduce its contribution to cumulative short-term construction impacts on aesthetics to less than significant levels.

Agriculture and Forest Resources. As discussed in Section 4.2, Agriculture and Forest Resources, the Project would have no impact on agriculture and forest resources. Thus, the Project would not contribute to cumulative impacts on these resources.

Air Quality. As discussed in Section 4.3, the SCAQMD's approach for assessing cumulative impacts is based on the AQMP forecasts of attainment of ambient air quality standards in accordance with the requirements of the Federal and State Clean Air Acts. As discussed earlier in Threshold 4.3(a), the proposed Project would be consistent with the AQMP, which is intended to bring the SoCAB into attainment for all criteria pollutants. In addition, the mass regional emissions calculated for the proposed Project (Tables 4.3–4 and 4.3–6) would be less than SCAQMD's daily significance thresholds that are designed to assist the region in attaining the applicable State and national ambient air quality standards.

Short-term cumulative impacts related to air quality could occur if Project construction and nearby construction activities were to occur simultaneously. In particular, with respect to local impacts, cumulative construction particulate (i.e., fugitive dust) impacts are considered when projects are located within a few hundred yards of each other. As described above, sediment removal at the Devil's Gate Reservoir could have overlapping construction schedules with the Project. However, as shown in Table 4.3–5, Project construction emissions would be below the SCAQMD regional significance thresholds; particularly, particulate matter emissions would be less than ten percent of the thresholds. Therefore, the incremental effect of Project-related construction emissions of nonattainment pollutants would not be cumulatively considerable and Project impacts would be less than significant.

Biological Resources. As discussed in Section 4.4, Biological Resources, the Project would have potentially significant adverse impacts on biological resources. Several mitigation measures (MM BIO-1 through MM BIO-6) would be implemented to avoid and/or reduce these impacts to less than significant levels. The cumulative projects listed above would also have impacts on biological resources in the HWP and the Upper Arroyo Seco that could adversely change biodiversity and affect a number of sensitive species and their habitats; however, mitigation by individual projects and compliance with the permit conditions imposed by resource agencies are expected to mitigate project-specific impacts. Because all biological resources that would be impacted by the cumulative projects would be subject to mitigation to the satisfaction of the resource agencies and the lead agencies, and because the proposed Project would also mitigate all impacts to less than significant and would not alter the availability of open space or biological

[8] The proposed sediment removal activities at Devil's Gate Reservoir would utilize a number of disposal sites in the Cities of Azusa and Irwindale and other sites east and west of the reservoir, in addition to the Scholl Canyon Landfill.

resources in the Project area, incremental impacts would not be cumulatively considerable and no additional mitigation is required.

Cultural Resources. As discussed in Section 4.5, Cultural Resources, the Project would have potentially significant adverse impacts on historical resources, archaeological resources, and paleontological resources that are present within or near the construction sites. Mitigation measures (MMs CUL-1 through MM CUL-4) would be implemented to avoid and/or reduce these impacts to less than significant levels. The Project would also comply with RR CUL-1 in the event of discovery of human remains.

Since cultural resources are site-specific and since the Project site is not located within a historic district, no cumulative significant adverse impacts are expected from the Project with implementation of site-level surveys and mitigation outlined as part of cultural resource studies for individual development projects. Implementation of the proposed Project and the mitigation measures outlined above would prevent adverse impacts on cultural resources on the site. Thus, the Project would not have a cumulative contribution to the disturbance and/or destruction of cultural resources in the surrounding area.

Energy. The proposed Project would have a limited demand for energy when compared to the energy demand of the cumulative projects listed above or to the existing energy supplies that PWP provides to existing development in the City. The elimination of the existing JPL East Parking Lot lighting and reductions in demand for State Water Project water deliveries due to increased groundwater recharge would help partially off-set new Project-related electrical demand. Therefore, although the Project would result in a slight increase in overall electrical usage, no new infrastructure would be required and any new electrical connections would be constructed in accordance with the City's Building Code (RR GEO-1). Energy use by the Project would not be cumulatively considerable and cumulative impacts would be less than significant.

Geology and Soils. As discussed in Section 4.6, Geology and Soils, Project impacts associated with seismic and geologic hazards in the area would be less than significant with compliance with the City's Building Code (RR GEO-1) and the recommendations of the Project's Geotechnical Feasibility Report (RR GEO-2). Similarly, the cumulative projects would have to comply with the City's Building Code and the recommendations of geotechnical investigations prepared for individual projects. Geology and soils impacts are generally site specific and there is typically little, if any, cumulative relationship between the development of a proposed Project and development within a larger cumulative area. For example, development at the Project site would not alter geologic events or soil features/characteristics (such as ground shaking, seismic intensity, or soil expansion) at other locations; therefore, the Project would not result in cumulatively considerable impacts.

Greenhouse Gas (GHG) Emissions. As discussed in Section 4.7, Greenhouse Gas Emissions, it is very unlikely that any individual development project would have GHG emissions of a magnitude to directly impact global climate change; therefore, any impact would be considered on a cumulative basis. Because the proposed project's GHG emissions would be 126 $MTCO_2e$/yr and considerably less than 3,000 $MTCO_2e$/yr screening threshold recommended by SCAQMD, the Project's GHG emissions would not be cumulatively considerable. Cumulative impacts would be less than significant.

Hazards/Hazardous Materials. As discussed in Section 4.8, Hazards and Hazardous Materials, the Project's use, storage, transport, and disposal of hazardous materials will be made in accordance with existing regulations (RR HAZ-1). Similarly, the cumulative projects would have to comply with pertinent hazardous materials regulations. Compliance with existing regulations would reduce hazards to nearby schools, residences, and other land uses.

The Project would also implement MM HAZ-1, which includes measures to avoid adding to existing groundwater contamination, and MM HAZ-2, which requires sampling and remediation of discolored or odorous soils, as necessary, to avoid the dispersion of existing groundwater contamination. Neither the Project nor the cumulative projects are expected to interfere with the existing groundwater contamination, assuming compliance with existing regulations and applicable mitigation measures. Additionally, JPL's ongoing groundwater remediation and monitoring would continue to reduce these existing hazards over time.

There are no airports or airstrips within two miles of the Arroyo Seco Canyon, and the Project would not contribute to cumulative impacts on airport and aircraft operations. The Project and cumulative projects would be exposed to wildfire hazards present to the north, west, and south of the Reservoir, but with compliance with the City's Fire Prevention Code (RR PS-1), Project impacts would be less than significant. Thus, it would not contribute to cumulative impacts relate to wildfire hazards.

The Project may affect emergency response and evacuation due to temporary closure of the Gabrielino Trail/access road to the USFS Ranger Station and the ANF. Compliance with the Greenbook (RR TRA-1) and implementation of MM HAZ-3 (notification of public service agencies) would reduce the Project's contribution of cumulative impacts related to emergency response and evacuation. Continued implementation of the City's Emergency Operations Plan (RR HAZ-2) would also provide emergency access and evacuation in the HWP, as necessary. Cumulative impacts would be less than significant.

Hydrology and Water Quality. As discussed in Section 4.9, Hydrology and Water Quality, the Project would have beneficial impacts on hydrology and water quality by improving the riparian habitat in the Arroyo Seco (PDF HYD-1); increasing groundwater recharge (PDF HYD-1); and providing trash cans, pet waste stations, and a restroom (PDF HYD-3). Construction activities would result in pollutants in storm water and in the Arroyo Seco that would be reduced by compliance with the NPDES General Construction Permit (RR HYD-1), the City's Stormwater Management and Discharge Control Ordinance (RR HYD-4), and the SWRCB's Waste Discharge Requirements (RR HYD-2). Dewatering may also lead to the release of contaminated groundwater and would require compliance with the Los Angeles RWQCB's dewatering regulations (RR HYD-3). Cumulative projects would also have to comply with these regulations, as needed. Thus, cumulative impacts on storm water quality during the construction of individual projects would be less than significant.

Changes in drainage patterns due to habitat restoration in Area 1; surface water diversion in Area 2; and changes in drainage patterns in Area 3 would be less than significant. Changes in drainage patterns from cumulative projects are also expected to be confined to individual sites and would maintain flows into and in the Arroyo Seco. Cumulative impacts would be less than significant. No inundation hazards from dam or levee failure, seiche, tsunami, or mudflow would affect the Project, nor would they be created by the Project. Thus, no cumulative impacts related to these issues would occur.

Land Use and Planning. As discussed in Section 4.10, Land Use and Planning, the Project would not divide an established community and would not conflict with the City's Open Space designation and zoning. The Project would also comply with the HWMP (RR LU-1) and Arroyo Seco Design Guidelines (RR AES-1). Thus, the Project would not contribute to cumulative impacts related to land use and planning.

Mineral Resources. As discussed in Section 4.11, Mineral Resources, sand and gravel resources exist within the Devil's Gate Reservoir (although there are no active mining operations in the area), but the Project would not affect these resources. However, large cobbles and

boulders in and near the Arroyo Seco would be disturbed by the Project. These boulders would be reused for improvements in Areas 1, 2, and 3, and large cobbles and boulders in Area 2 would be stockpiled for future decorative uses (PDF MIN-1). Also, the Arroyo Seco Design Guidelines require the collection of arroyo stones during excavation activities in Area 3 (RR MIN-1). These would maintain the availability of local mineral resources. Improvements in Area 3 would not preclude future mining operations in this area. Also, long-term recreational activities in Arroyo Seco Canyon and operation and maintenance of the PWP facilities would not require mineral resources. Thus, the Project would not have a significant cumulative adverse impact on mineral resources.

Noise. As discussed in Section 4.12, Noise, changes in noise levels from Project construction and operation would be less than significant. The Project would comply with the City's Noise Ordinance (RR NOI-1) and would implement noise-control measures (MM NOI-1) to further reduce noise on adjacent land uses. While construction noise would be added to the construction noise impacts of the cumulative projects that are under construction at the same time (such as the sediment removal activities), noise levels generally dissipate rapidly from the source and would affect different receptors due to different construction site locations. Traffic noise impacts would occur on roadways used by construction equipment and haul trucks, but changes in noise levels would be intermittent and are not expected to increase by 5 dBA such that they will become discernible (since it would take a doubling of traffic volumes to increase noise levels by 3 dBA) and the Project would not lead to traffic increases equal to existing traffic volumes on Windsor Avenue, which ranged from 6,361 to 10,097 ADT on weekdays and from 4,680 to 6,458 ADT on the weekends in 2011. Additionally, MM TRA-1 requires construction equipment, construction vehicles, and the construction crew to avoid arrivals and departures during the AM peak hours (7:30 AM to 8:30 AM) and the PM peak hours (4:30 PM to 5:30 PM). Impacts on noise would be temporary and would not be cumulatively significant.

Population and Housing. As discussed in Section 4.13, Population and Housing, the Project would not introduce households or businesses, nor would it extend infrastructure that may induce growth in the area. It would also not displace existing housing or households in the area. Thus, the Project would not have cumulative impacts related to Population and Housing.

Public Services. As discussed in Section 4.14, Public Services, the Project would not create demands for school, library, or park services. Demands for fire and police protection services would be limited to the construction phase, and compliance with the City's Fire Prevention Code (RR PS-1) would reduce the incidence of fire and its associated demand for fire protection services. Similarly, the cumulative projects would comply with these City regulations and would not result in significant cumulative adverse impacts.

The Project's demand for police protection services would be reduced by screening construction areas and staging areas; complying with the Greenbook (RR TRA-1); and notifying public service providers (MM HAZ-3). While the Project would contribute to the cumulative demand for police protection services, its contribution would be minimal and would not be cumulatively considerable requiring new facilities. Long-term operation and maintenance for the proposed recreational amenities and improved PWP facilities would be largely similar to existing services. These impacts would be less than significant and would not be cumulatively considerable requiring new facilities.

Recreation. As discussed in Section 4.15, Recreation, the Project would improve recreational facilities in the Arroyo Seco Canyon, the ANF, and the HWP. This would result in beneficial impacts on Recreation in the long-term.

Concurrent construction of the Project and the cumulative projects would lead to the closure of some trails in the HWP and the ANF. Specifically, the sediment removal project would lead to the short-term closure of portions of the Altadena Crest Trail, Arroyo Seco Trail, and West Rim Trail. These closures may occur concurrent with closures of portions of the Gabrielino Trail, Altadena Crest Trail, and Arroyo Seco Trail that would occur during construction of the Project. MM REC-1 requires the Contractor to post signs at the parking lots and trail entrances providing at least one week of advanced notice of the dates and times of planned trail closures, along with directions to the nearest trails in the surrounding areas. To avoid directing trail users to nearby trails that would be closed due to other cumulative projects, this mitigation includes a provision that alternative trails be those that are not closed at the same times as the trails that would be closed by the Project. Impacts would be temporary and less than significant after mitigation. Thus, the Project would not contribute to significant cumulative impacts on Recreation.

Transportation/Traffic. As discussed in Section 4.16, Transportation and Traffic, the long-term increase in the number of vehicle trips associated with increases in trail users and visitors and maintenance vehicles would contribute to cumulative increases in existing traffic volumes on local streets and freeways. However, this increase is not considered cumulatively significant due to the limited number of trips expected during the AM and PM peak hours on weekdays.

During construction of the Project (Summer 2015 to Fall 2016), sediment removal activities at the Devil's Gate Reservoir would also be ongoing south of Area 3. While other cumulative projects may also be under construction at the same time, they are located on the other side of the Arroyo Seco and are likely to use a different set of roadways.

The I-210 off-ramps at Windsor Avenue and the segment of Windsor Avenue north to Oak Grove Drive would be used by construction equipment and trucks for the reservoir sediment removal and the Arroyo Seco Canyon Project. Sediment-removal trucks would turn left on Oak Grove Drive to enter the reservoir, while Arroyo Seco Canyon Project trucks would continue farther north. Departing trucks from the reservoir would use Oak Grove Drive and the Berkshire Place on-ramps to the I-210, while trucks departing from the Project would use Windsor Avenue south to the I-210 on-ramps.

Since arriving trucks from both the proposed Project and the Devil's Gate Project would use the same I-210 off-ramp and the segment of Windsor Avenue to Oak Grove Avenue throughout the work day, cumulative traffic impacts could occur. With the implementation of MM TRA-1 (which would restrict construction vehicles, construction equipment, and truck trips from the Project site to hours outside the AM and PM peak hours), the Project would not contribute to the significant adverse impacts of sediment removal haul trucks going to and from Devil's Gate Reservoir during the AM and PM peak hours. This would avoid cumulative impacts during AM and PM peak hours from the Project.

The sediment-removal activities at the Reservoir would also dispose of vegetation and organic materials at the Scholl Canyon Landfill, similar to the Project. Thus, the same route would be affected: I-210 east to SR-134 west and exit on Figueroa Street, north to Scholl Canyon Road. A maximum of 425 truck round trips per day (or 50 truck round trips per hour) are expected for sediment removal, with approximately 50 percent of the total going to Scholl Canyon Landfill during the first 3 weeks; and the remaining 50 percent to the other disposal sites. In subsequent years, 25 percent of the total trucks will go to Scholl Canyon Landfill during the first week; and the remaining 75 percent will go to other disposal sites.

In addition to MM TRA-1, the following mitigation is recommended to reduce cumulative impacts related to truck traffic near Scholl Canyon Landfill:

MM CUM-1 The Contractor for the Arroyo Seco Canyon Project shall coordinate with the Los Angeles County Department of Public Works and their contractor for the sediment removal activities at Devil's Gate Reservoir on the schedule of trucks coming to and from Scholl Canyon Landfill, such that the Project's truck traffic avoids the AM and PM peak hours to reduce conflict with local traffic and so that truck arrival times are staggered between the two projects to avoid queuing on Figueroa Street and on the State Route 134 on- and off-ramps.

The Project's contribution to cumulative traffic impacts would be temporary and less than significant after mitigation.

Utilities and Service Systems. As discussed in Section 4.17, Utilities and Service Systems, wastewater generation from the proposed restroom in Area 3 could be accommodated by wastewater treatment plants that would serve the Project. Cumulative impacts would be mitigated by the payment of connection and service fees by individual projects.

Long-term water use for the horse water trough, drinking fountain, restroom, and landscape irrigation and short-term construction site watering for dust control would be minimal and would not require new water supplies. Interruption of water diversion and groundwater recharge during construction would be temporary and would be compensated by the permanent increase in water diversion and recharge that would be provided by the improved diversion and weir structures in Area 2 and the expanded spreading basins in Area 3. No cumulative adverse impacts on water services and supplies would occur with the Project.

No storm drainage facilities are required by the Project; thus, no cumulative impacts on storm drainage would occur. Solid waste generation would be minimal in the long term and would be reduced during construction through compliance with the City's Construction and Demolition Waste Management Ordinance (RR UTIL-1). Cumulative projects would also have to comply with this ordinance during construction, and the Project's cumulative impacts on landfill capacity and solid waste regulations would be less than significant.

c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Less than Significant With Mitigation. The proposed Project would have environmental effects that could cause substantial adverse effects on human beings, either directly or indirectly, as they relate to Aesthetics, Air Quality, Hazards and Hazardous Materials, Recreation, and Transportation/Traffic (as previously discussed under these environmental issues). Mitigation measures have been provided to reduce these impacts to less than significant levels. The Project's significant adverse effects on human beings would be less than significant after mitigation. Implementation of the Project would also have beneficial impacts on Hydrology and Water Quality by restoring riparian habitat along the Arroyo Seco and by increasing groundwater recharge; there would also be beneficial impacts on Recreation since additional recreational and educational facilities would be provided in the HWP and the Arroyo Seco Canyon.

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[9] Although BonTerra Consulting merged with Psomas and became "BonTerra Psomas" as of January 1, 2014, "BonTerra Consulting" is still used throughout this document for all work completed and documents produced before January 1, 2014.

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Appendix B-1

Intake/Diversion Design (Area 2) Draft Basis of Design Report, March 2020

ARROYO SECO CANYON PROJECT – INTAKE/DIVERSION DESIGN (AREA 2)

DRAFT
BASIS OF DESIGN REPORT

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1 BACKGROUND AND PURPOSE

The City of Pasadena Department of Water and Power (PWP) is conducting a project for improvement of the diversion and groundwater recharge system in Arroyo Seco Canyon. The Arroyo Seco Canyon Project includes work in three distinct areas for removal of a non-operational headworks structure, modification of the storm-damaged diversion structure, and improvements to the groundwater recharge system. A design for the project was completed in 2017 (Carollo Engineers, 2017). The California Environmental Quality Act (CEQA) Mitigated Negative Declaration (MND) was challenged, and PWP initiated an environmental compliance process for preparation of an Environmental Impact Report (EIR), which is now in progress.

A California Department of Fish and Wildlife (CDFW) Streambed Alteration Agreement was drafted during the project development and review process (CDFW, 2017a). CDFW also provided additional comments (CDFW, 2017b) from engineering review of the project regarding HEC-RAS hydraulic modeling, planted riprap revetment, grouted riprap, fish screens, fish passage, flows below the dam, and the geotechnical report.

PWP retained Kennedy/Jenks and subcontractor Northwest Hydraulic Consultants (NHC) to develop conceptual designs to address the topics raised in the draft agreement and CDFW comments and to develop modifications to the design of the diversion in Area 2 of the project. NHC was assisted in the fisheries review by Dr. Camm Smith, a leading authority on native fish in the Southern California region. The modified design must also consider maintaining the yield of the diversion to the extent feasible for recharge of groundwater resources, operational safety and reliability, and achievement of other environmental objectives.

1.1 PWP Diversion Operation

PWP currently diverts most of the flow from Arroyo Seco upstream of the diversion weir, when stream flows are below their full water right of 25 cfs. PWP plans to divert 25 cfs up to a higher threshold of streamflow before lowering an operable weir and allowing more turbid flow to pass downstream. Diversion during flood flows is not anticipated due to high turbidity levels and risk to diversion facilities. A primary benefit of the modified diversion will be to allow diversion during higher flows, at least during periods when turbidity and suspended sediment concentrations are considered acceptably low.

1.2 Environmental Process

PWP has completed an Initial Study for the project (Dudek, 2019) and conducted a public scoping meeting on 21 November 2019. Environmental analysis to evaluate potential impacts identified in the Initial Study, including assessment of biological resources in the area of the diversion, is in progress. The design of the diversion is being coordinated with the environmental evaluation to identify and minimize potential impacts.

1.3 Purpose of this Basis of Design Report

The purpose of this report is to present the design criteria and basis of design for the proposed modified diversion and intake system. A key objective of this report is to provide detailed information that can be reviewed with CDFW and other stakeholders to confirm the specific design direction for the project.

2 HYDROLOGIC SETTING

2.1 Hydrology of Arroyo Seco

Arroyo Seco is a tributary to the Los Angeles River that drains approximately 18 square miles of the Angeles National Forest in the San Gabriel Mountains at the site of the diversion. The diversion is located in the Arroyo Seco canyon approximately one-half mile upstream of the canyon mouth and the head of the alluvial fan now occupied by the reservoir area behind Devil's Gate Dam. The dam was constructed in 1920 and is owned and operated by Los Angeles County Flood Control District. A bridge crosses the stream at the Jet Propulsion Laboratory (JPL) east gate and is approximately located at the transition between confinement of the stream in the canyon and the unconfined alluvial fan and reservoir deposits downstream. Three other bridges are located between the JPL bridge and the diversion intake, and the Millard Creek tributary joins Arroyo Seco approximately 600 feet upstream of the JPL bridge.

2.1.1 Flow Frequency and Duration Characteristics

Deere and Ault (2017) used the USGS stream gage 11098000 on Arroyo Seco to assess hydrologic characteristics of the stream, adjusting the gage values by about 10 percent to account for additional watershed area between the gage and the diversion, which is located about one mile downstream of the gage. Estimated flow frequencies are shown in **Table 2.1.**

The flood of record at the gage occurred in the 1938 Water Year with a peak flow of approximately 8,600 cubic feet per second (cfs). A peak of approximately 8,500 cfs occurred in the 1969 Water Year. Since that time, no flood larger than 5,400 cfs has occurred. The most recent large flood events occurred in January 2005 (3,540 cfs), February 2010 (4,620 cfs) and Dec 2011 (2,260 cfs). The 2010 event followed the 2009 Station Fire that burned 160,000 acres, including much of the upper Arroyo Seco watershed. The 2010 event carried high sediment and debris loads, removed much of the riparian vegetation along the stream corridor, and damaged the diversion and access road. Flood flows and debris in the 2010 event overtopped the diversion intake vault and access road.

Table 2.1 Flow frequencies at Arroyo Seco diversion based on annual peaks at USGS Gage 11098000 for period 1914 to 2015 (from Deere and Ault, 2017)

Recurrence Interval, years	Peak Flow, cfs
2	613
5	1,878
10	3,204
50	7,543
100	9,962

Flow duration characteristics were also compiled by Deere and Ault from mean daily flow gage records for the full annual record and for specific months. The annual flow duration curve is shown in **Figure 2.1**.

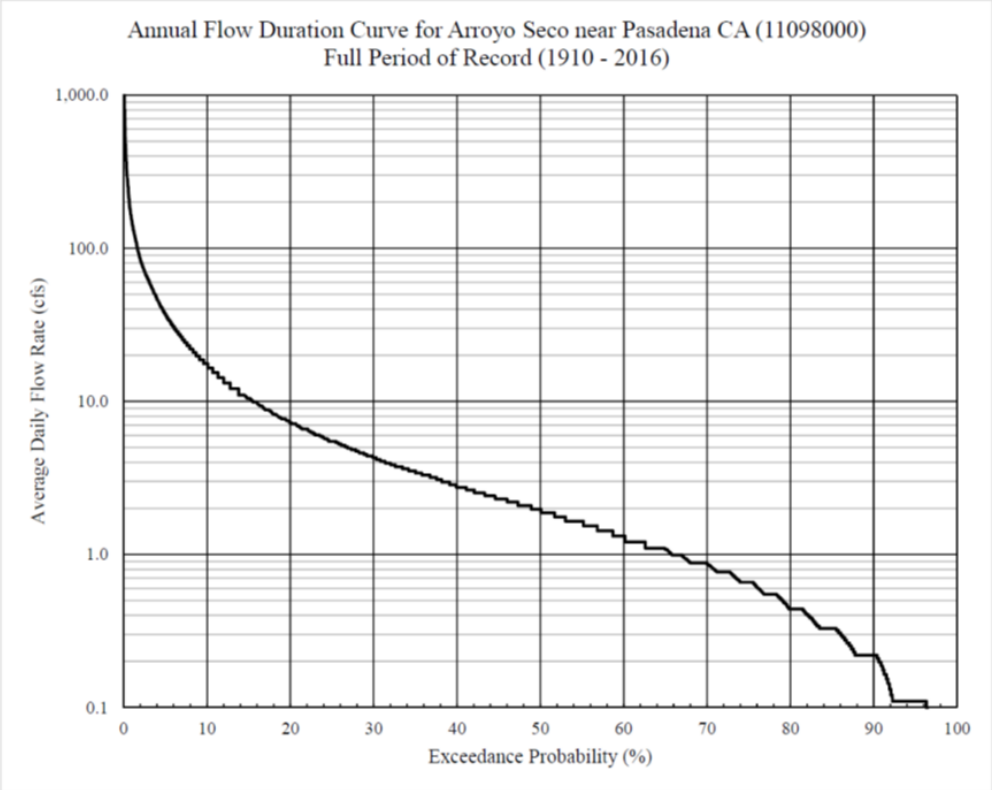


FIGURE B-13 – Annual flow duration curve for Arroyo Seco.

Figure 2.1 Annual flow duration curve for Arroyo Seco at USGS Gage 11098000 (from Deere and Ault, 2017)

On an annual basis, flows below 1 cfs occur about 35 percent of the time and flows above 25 cfs occur only about 7 percent of the time. The flow duration analysis indicated that the wettest months are typically February (**Figure 2.2**) and March, with flows above 1 cfs about 95 percent of the time and flows above 10 cfs about 35 percent of the time. The lowest flows occur in summer and fall months and the gage analysis indicates that zero flow occurs at the gage 24 percent of the time in August and 26 percent of the time in September (**Figure 2.3**). Flows less than 1 cfs occur 70 and 75 percent of the time in August and September, respectively. The gage record shows significant diurnal variation in summer months, presumably due to evapotranspiration by stream vegetation.

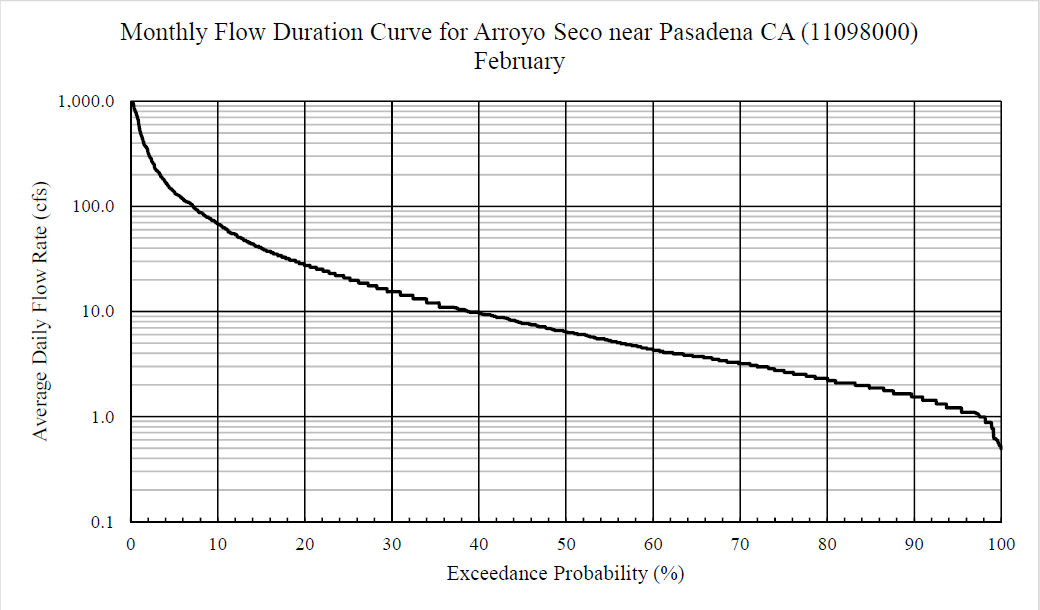


FIGURE B-5 – February flow duration curve for Arroyo Seco.

Figure 2.2 February flow duration curve for Arroyo Seco at USGS Gage 11098000 (from Deere and Ault, 2017)

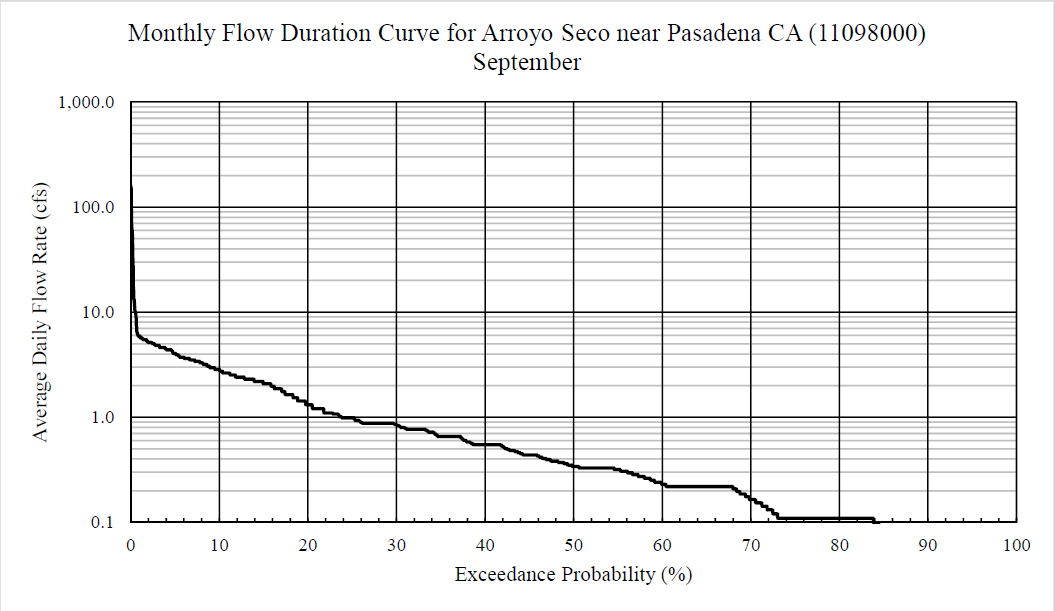


FIGURE B-12 – September flow duration curve for Arroyo Seco.

Figure 2.3 September flow duration for Arroyo Seco at USGS Gage 11098000 (from Deere and Ault, 2017)

Adjustments to gage values for watershed area differences are reasonable for flow frequency estimates but the accuracy of area-based adjustments such as the one applied in the Deere and Ault study may be less accurate for flow duration analysis because of large variations in lower flows that may occur with geology, stream substrate, vegetation, and other factors. On 17 August 2019 NHC made rough estimates of flow at the diversion of about 1 cfs and the gage recorded about 0.8 cfs on the same day, indicating that for at least one observation, little gain or loss was evident between the gage and the diversion at low flows. The median mean daily flow for this date according to the USGS gaging statistics is 0.4 cfs.

Under existing conditions, PWP diverts all flow in the creek at the diversion during periods of low flow, except for an amount that leaks or seeps past the dam. Millard Creek contributes flow downstream, but likely does not contribute perennial flow. On 17 August 2019, about 0.4 cfs of flow was estimated below Millard Creek, with about one third coming from Millard Creek and two thirds from Arroyo Seco. This flow estimate is very rough due to the difficulty in estimating shallow flow rates over a rough streambed and is only a single observation that may not be representative of typical conditions.

Flow frequency and flow duration information are relevant to fish passage design and instream flow objectives, as described in subsequent sections.

2.1.2 Storm Event Characteristics

The Arroyo Seco watershed generates relatively high unit runoff rates due to its geology, hypsography, and climatic setting. The computed 100-year recurrence peak flow corresponds to a unit flow rate of

about 550 cfs per square mile. Although high runoff may be generated by convective storms, the largest peaks in the record are generally associated with multi-day frontal storms and atmospheric river events from the Pacific Ocean. The steepness of the watershed and the potential for intense rainfall rates associated with some frontal storms produces very rapid increases in flow. **Figure 2.4** shows the hydrographs associated with the 2010 and 2005 annual peak events from USGS Gage 11098000. Differences in hydrograph shapes are due to antecedent conditions and precipitation patterns, but in both cases, flows increase and decrease rapidly in response to precipitation. In the 2010 event, flows increased from about 5 cfs on 5 February to the peak of 4,620 cfs only 24 hours later on 6 February and receded to about 30 cfs another 24 hours later on 7 February. Rapid changes in stage and flow can be expected to produce large sediment and debris loads and adjustment of channel beds and banks.

The most productive periods for diversion are associated with prolonged wet periods that are associated with light or moderate rainfall, such that flows remain above 5 to 10 cfs for prolonged periods of time and turbidity levels are not excessive.

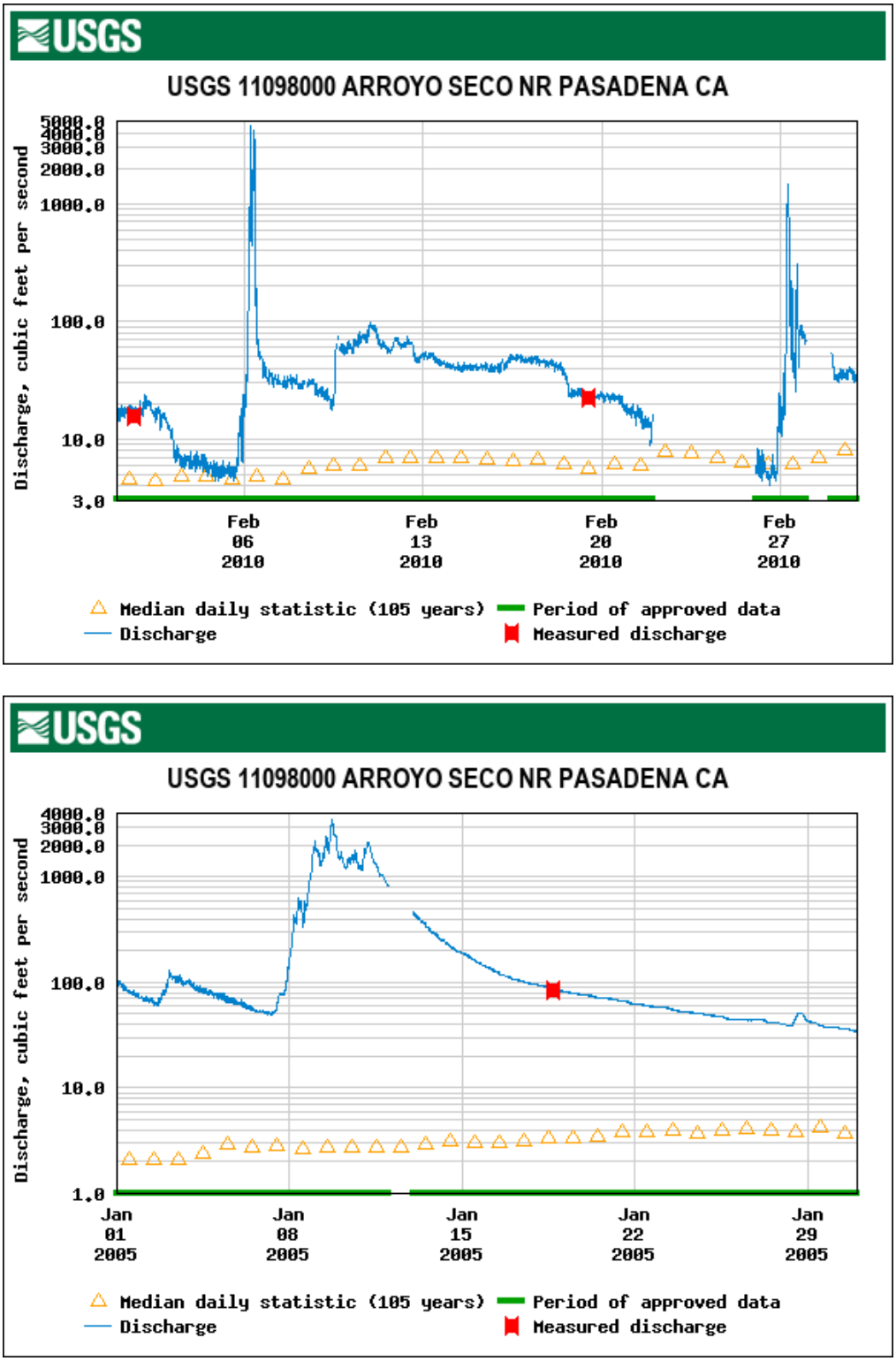


Figure 2.4 Storm hydrographs for 2010 (top) and 2005 (bottom) events

2.2 Geomorphic Characteristics

The streambed in the project area is generally comprised of coarse sediments ranging from sand to boulders. During an NHC site reconnaissance, bedrock exposure was noted in several locations between JPL bridge and the diversion in the banks and bed of the channel. Active streambed widths vary between about 20 and 40 feet. The channel varies between step-pool and plane bed morphology, with step-pools associated with steeper reaches and very coarse (cobble to boulder) bed material and bedrock exposures. These two channel morphologies are consistent with the overall slope of the channel of about 2.5 to 3 percent.

The watershed was severely burned in the 2009 Station Fire and was subject to elevated sediment debris and sediment loads in the years following the fire. As noted above, peak flows of approximately 4,600 cfs and 2,300 cfs were recorded at the gage in Water Years 2010 and 2011, respectively. At the present time, there is very little fine-grained material (silt or clay) in the present bed material in the reach between the JPL bridge and the diversion.

The channel between JPL and the diversion is densely vegetated, with willow dominant in some segments of the banks and alder dominant in others. There are numerous areas where alders of the same age class occur in stands along the bank, potentially indicating cycles of scouring and regrowth. The latest cycle may be associated with post-Station Fire flows. Aerial photography from March 2011 shows a scoured channel and vegetation mostly removed in a swath 60 to 100 feet wide between the headworks and JPL. Given the magnitude of the scour and deposition areas in 2011, the recovery of riparian vegetation along this reach of channel in less than 10 years is remarkable. **Figure 2.5** and **Figure 2.6** show typical sections of stream bed in this reach in August 2019. Vegetation characteristics upstream of the diversion to the headworks in Area 1 of the project area are similar. Riparian vegetation likely plays a role in channel stability during some flood flows, but due to the steepness of the channel and high sediment and debris loads, may be partially or nearly entirely lost in the largest events.

The diversion dam forms a small high point in the bed to facilitate flow into the intake. **Figure 2.7** shows a plot of the stream profile taken from aerial topography developed by PWP in 2015. **Figure 2.8** shows a similar plot in the immediate vicinity of the diversion. The stream slope is flattened upstream of the diversion but maintains a continuous positive slope of about 1.5 percent.



Figure 2.5 Arroyo Seco streambed and small bedrock drop between Millard Creek and diversion



Figure 2.6 Arroyo Seco streambed and small boulder drop downstream of first bridge upstream of Millard Creek

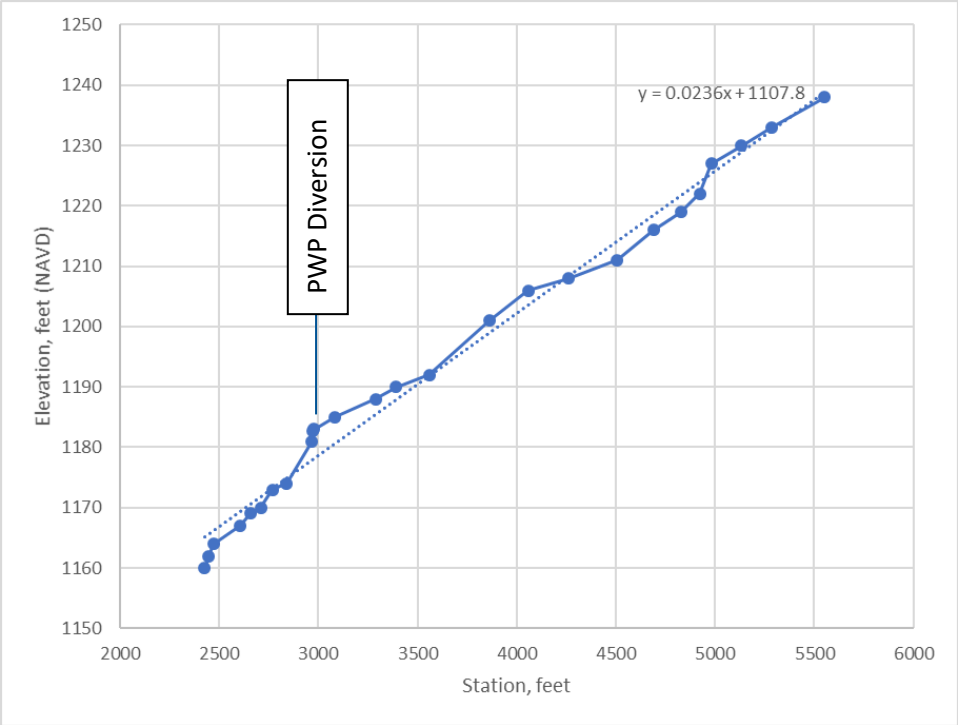


Figure 2.7 Profile of Arroyo Seco near PWP diversion, 2015 topography

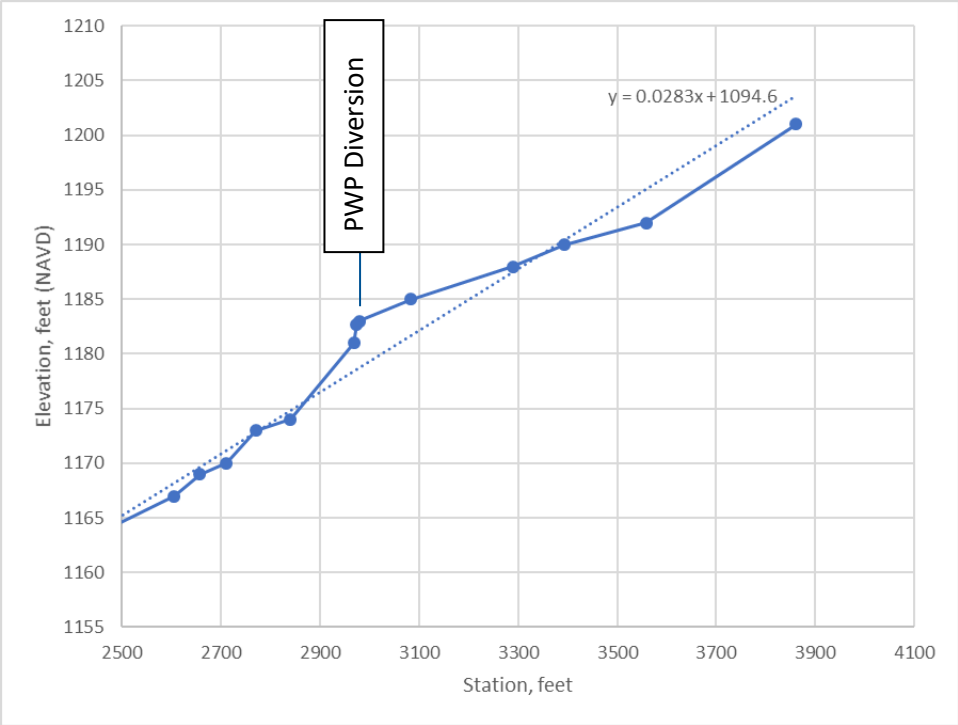


Figure 2.8 Stream slope in immediate vicinity of diversion, 2015 topography

Numerous barriers to aquatic organism passage are present in Arroyo Seco and Los Angeles River downstream of the project area. In the vicinity of the project, Devil's Gate Dam is a complete barrier and the reservoir stream segment above the dam is subject to deposition, channel shifting, and frequent dry conditions due to loss of flow into the alluvium as the channel emerges from the canyon. Upstream of the JPL bridge, partial temporal barriers may be present during low flows due to steep channel segments and step-pool or bedrock drops. An anthropogenic barrier exists at the road crossing approximately 500 feet downstream of the diversion at a channel spanning weir that apparently was the site of a historical stream gage. A drop of approximately three feet occurs at this concrete structure, shown in **Figure 2.9.**

At the diversion, a drop of approximately 2 feet occurs from the base of the flashboard notch to the water surface in the scour pool downstream. The top of the diversion dam is approximately 2.5 feet higher than the notch. A photo of the diversion dam and sluice notch is shown in **Figure 2.10.**



Figure 2.9 Barrier approximately 500 feet downstream of diversion



Figure 2.10 Diversion dam and sluice notch looking upstream

2.3 Fish and Aquatic Habitat

NHC retained Camm C. Swift, PhD, an expert in southern California native fish, to provide input on fisheries conditions in the project reach. The discussion below primarily summarizes information from a review letter provided by Dr. Smith, which is also included as Appendix A (Swift, 2019).

2.3.1 Historical Fish Habitat and Presence

The Arroyo Seco historically provided habitat for seven species of native freshwater fish, namely Pacific brook lamprey, *Lampetra spp.;* Pacific lamprey, *Entosphenus tridentata;* rainbow trout/steelhead, *Oncorhynchus mykiss;* arroyo chub, *Gila orcutti;* Santa Ana speckled dace, *Rhinichthys cf osculus;* Santa Ana sucker, *Catostomus santaanae;*and unarmored threespine stickleback, *Gasterosteus aculeatus williamsoni*. Judging by their occurrences elsewhere in the Los Angeles and Santa Ana rivers, only the dace and trout would have been common in Arroyo Seco from JPL upstream and the others would have primarily been in the lower reaches in habitats with lower gradients.

None except rainbow trout have been recorded as present in Arroyo Seco upstream of Devil's Gate Dam for at least 50 years and probably much longer due to major modifications to the watercourse downstream (Swift, et al, 1993). The rainbow trout is essentially the freshwater resident population of the species; if and when some go to sea to mature and return to the natal stream, they become steelhead. Rainbow Trout were present in upper Arroyo Seco for a long time and the stream was

accessible to steelhead at some time in the past. A population had maintained itself there more or less, possibly augmented by hatchery fish planted intermittently over time, but several surveys since the 2009 Station Fire by CDFW and NOAA biologists have not detected any fish.

No non-native species are known above Devil's Gate Dam except for possibly the descendants of introduced trout. Historical records exist of brown trout being placed in upper Arroyo Seco but there are no recorded observations of brown trout.

2.3.2 Present Conditions

Given the historical presence and successful reproduction of rainbow trout in the watershed upstream of the diversion, the Arroyo Seco watershed is assumed to include habitat in at least some locations that is potentially suitable for future establishment/recurrence of rainbow trout. Vegetation and undercut boulders or rock provide cover, and groundwater upwelling and extensive canopy keeps the water cool enough for them. Even in the dry season a few large pools may provide refuge to support a small population.

In the reach downstream of the diversion, recent observations indicate a few deeper pools with protection of undercut boulders and/or woody debris. However, many reaches are very shallow and exposed and the bulk of suitable habitat is likely upstream of the diversion, as it has been for a long time. The habitat currently present downstream of the diversion could support a small number of trout but clearly only a few tens of small fish, if that. In addition, this habitat is only suitable if pools are maintained during the summer months and it is not clear from recent observations (in a relatively wet water year) whether this is typically the case in late summer and fall. In addition, limited pool areas receive significant recreational use for swimming/bathing, and this disturbance would be adverse for fish in the limited areas available.

The flow duration curve in **Figure 2.3** indicates that flows at the gage upstream are less than 1 cfs almost 80 percent of the time in September, and the gage records indicate that zero flow occurs a large fraction of the time in August and September. Any trout downstream of the diversion would presently be unable to migrate upstream during drying conditions due to long areas of shallow flow and the barrier at the bridge downstream of the diversion. Migration downstream would be impossible due to dry conditions at the head of the reservoir. No fish have been observed in this reach in recent biological surveys.

Very high flows may wash fish downstream to the reservoir where they will likely perish under current conditions and remove riparian vegetation, as noted in recent observations of single age class stands of riparian trees. In addition, sediment delivery associated with mass wasting processes or wildfire may bury suitable substrates and vegetation, eliminate cover, and change turbidity and temperatures in the stream. The observations of fish in the Arroyo Seco watershed before the Station Fire and no observations almost a decade later are indicative of the significance of these types of events to fish populations.

Although suitable habitat may be present for reestablishment of rainbow trout in the upper watershed, anadromy is currently prevented for steelhead trout by multiple significant barriers downstream,

including the Los Angeles River flood control channel and Devil's Gate Dam. Access to upstream spawning and rearing habitat may also be limited by Brown Mountain Dam, located about 3 miles upstream of the diversion.

2.3.3 Future Conditions

The Southern California Steelhead Recovery Plan (NOAA, 2012) describes priority actions for recovery of steelhead in the region, including the Los Angeles River basin. The Los Angeles River is listed as a Core 3 population, indicating lower priority than some other regional streams with Core 1 and Core 2 populations. The Recovery Plan lists removal of barriers at dams, diversions, roads, and other structures as a priority action in the Los Angeles River biogeographic region. Steelhead recovery in Arroyo Seco would involve modification of multiple flood control facilities and removal of multiple barriers between the project area and the ocean, but efforts are underway to investigate the potential of restoring anadromous access in the Los Angeles River. For example, the Council for Watershed Health is currently working under a grant from the Wildlife Conservation Board to investigate and design passage and habitat features in a portion of the Los Angeles River. Access to tributaries and headwater areas for spawning and rearing would be a vital part of any recovery strategy for steelhead in the watershed. Speckled dace or arroyo chub might also be considered for re-establishment on lower gradient portions of the stream but are considered unlikely to survive in the mountainous conditions of the upper Arroyo Seco.

3 DESIGN OBJECTIVES AND CRITERIA

3.1 Diversion Flows

The proposed surface diversion is intended to provide a reliable source of surface water diversion throughout the year and over a range of flows. Diversion during flood flows is not anticipated due to high turbidity levels and risk to diversion facilities. PWP currently diverts most of the flow when flows are below their full water right of 25 cfs and is planning to divert 25 cfs up to a higher threshold before shutting down the diversion and allowing more turbid flow to pass downstream. Potential thresholds considered have included 50 cfs, 100 cfs and higher values. For the purposes of this report, a threshold of 100 cfs is referenced, but this may be adjusted in the future based on a better understanding of the relationship between turbidity and stream flow, and refinement of the fish protection and sediment management design approaches. A primary benefit of the modified diversion will be to allow diversion during higher flows, at least during periods when turbidity and suspended sediment concentrations are considered acceptably low. The previous design for the diversion (Deere and Ault, 2017) utilized an operable weir in a modified diversion structure, and this basic configuration was retained for the current design effort.

3.1.1 Instream Flow

CDFW draft permit conditions and comments on the previous design refer to the need to maintain instream flows downstream of the diversion, but do not provide specific targets. PWP conducted a study to address CDFW concerns and concluded that the diversion does not impact habitat in the downstream reach such as to require a release of surface water for instream flow, as long as the flow of groundwater remains unobstructed (Psomas, 2018). The present condition of seepage past the dam was intended to be maintained by constructing a modified structure at similar depth. No instream flow release criteria have been used in the preliminary design, but the diversion design includes gates and piping that would allow for release of surface water for instream flow in the future, if such requirements are developed. Instream flow releases would not, however, prevent flows from becoming very low or zero when natural inflows are low. Based on the flow duration analysis, this occurs during most years in the summer and fall.

3.2 Operation of the Diversion Weir

The proposed design for the diversion uses an operable weir to pond water at the intake during flows below an operating threshold. The proposed diversion weir will be operated to divert up to 25 cfs through the intake and pass all remaining flow downstream. The weir will be fully raised during low flows and will modulate during stream flows between 25 cfs and 100 cfs to maintain 25 cfs through the intake. Once the high flow threshold of 100 cfs stream flow is reached, the weir will be fully lowered. Operating criteria will need to be established for lowering the weir at a controlled rate to avoid rapid changes in upstream water surface that might result in stranding or other adverse conditions for aquatic organisms, and rapid increases in flow downstream that exceed the naturally high rates due to storm events.

The operable weir concept has advantages for managing sediment and minimizing effects on the channel morphology. Flow in the channel is relatively shallow at the diversion flow rates and a small range of streamside operating water levels is desirable to manage sediment, minimize drop to the downstream channel, and minimize the size of the operable weir required. It is desirable to set the open weir crest elevation slightly below the intake invert to allow for some sediment accumulation upstream of the dam without entraining it in the diversion and screens. During periods of high flows, lowering the weir would allow removal of accumulated sediment by erosion and transport downstream, to restore the streambed elevation to the crest of the notch. An operational plan is needed to turn the diversion out and flush accumulated sediment, if needed prior to stream flows reaching the threshold at which the crest gate would be lowered. The crest gate can be divided into sections to facilitate level control and sediment removal. An objective of the design is to provide operational flexibility with the crest gates to avoid the need to excavate sediment out of the stream bed in the vicinity of the intake.

3.3 Stream Habitat

In NHC's August 2019 site observations in the reach downstream of the diversion, flows on the order of 0.5 cfs were maintaining isolated pool habitats and relatively cool water. However, this is based on a

single site observation and may not be characteristic of all years. The physical habitat associated with the channel bed and banks includes a mixture of coarse sediments and riparian vegetation that could support aquatic species, including fish. Limiting factors for fish include low or zero flows in the late summer and fall, associated loss of connectivity and isolation of pools, and numerous bedrock and boulder drops that would prevent mobility during low flows.

Upstream of the diversion, physical habitat conditions appear to be similar and dry weather flows are higher, although still subject to low or zero flows in late summer.

3.4 Fish Protection

Fish are typically protected from entrainment in diversion flows using a screening system. CDFW (2002) and NMFS (1997) have published screen design criteria for anadromous salmonids. The criteria established by the two agencies are similar, and include requirements for screen size opening, screen approach velocity, and sweeping velocity. CDFW guidance expresses a preference for on-channel screens but provides criteria for off-channel screens as well. Numerous screen types and configurations have been used for exclusion of fish including end of pipe screens, cone screens, cylinder screens, drum screens, vertical screens, and horizontal screens.

A key criterion for screen sizing is approach velocity, the velocity vector component perpendicular to the screen, as this determines the screen area required. CDFW and NMFS criteria for salmonid fry set design approach velocity at 0.33 fps for on-channel screens and 0.4 fps for off-channel screens. Much lower values apply if the screens are not self-cleaning (passive). Sweeping velocity, the velocity vector component parallel to the screen, is typically designed to be greater than the approach velocity.

Although off-channel screens are considered less desirable in the CDFW guidance, potential advantages include lower potential for damage during floods and better control over depth and velocity distribution on the screens.

Based on the review of fisheries conditions in the project area, the screens will be designed for approach velocities consistent with protection of salmonid fry as described in the CDFW and NMFS guidance.

3.5 Aquatic Organism Passage

The existing diversion structure presents a barrier to passage due to the drop height, limited flow width through the flashboard slots, and high velocities during high flows.

Passage of fish downstream during diversion operations would result in fish being transported to the downstream reach and reservoir area in low flows. Under current conditions, fish may perish in this reach due to isolation or stranding in low or zero flow periods. The preliminary design focuses on excluding fish from the diversion and downstream reach while considering potential for future downstream passage during diversions if connectivity is re-established for passage through Devil's Gate Dam and downstream channels to the ocean.

The diversion weir will be lowered during periods of higher flows, and some passage of fish downstream may occur during these periods. The preliminary design will include features to allow upstream passage when the weir is lowered, and diversions are not occurring.

CDFW (2002) and NMFS (2019) standards for adult salmonid high fish passage design flows are typically the 1 percent exceedance flow or 50 percent of the 2-year flow. Juvenile salmonid high fish passage design flow is typically the 10 percent exceedance flow or 10 percent of the 2-year flow. **Table 3.1** shows potential fish passage design flows based on these criteria and analysis of the stream flow records for Arroyo Seco. It should be noted that low design flows provided by the criteria may not be passable in adjacent stream reaches due to the natural bed morphology. Additional analysis may be necessary to establish appropriate low fish passage design flows based on hydraulic characteristics of critical riffles or drops in adjacent reaches, but preliminary designs were evaluated based on the standard criteria listed.

Table 3.1 Potential fish passage design flows

High Design Flows	**% 2-Year**	**Q, cfs**
Adult Anadromous Salmonid	50	306.5
Juvenile Salmonid	10	61.3
Low Design Flows		**Q, cfs**
Adult Anadromous Salmonid		3
Juvenile Salmonid		1

As noted above, the design considers the need for potential downstream passage at the diversion if safe passage to the ocean is re-established downstream. The design should also consider the potential need for future upstream passage at the facility during diversions, if connectivity from the Pacific Ocean is re-established and steelhead are able to ascend the stream.

3.6 Flood and Erosion Protection

The design should allow flood flows to pass the intake, while minimizing potential for substantial damage to the facilities, and without significant adverse impact on the roadway or other infrastructure compared to existing conditions.

Very high velocities occur during flood flows and native bed materials include large rock, boulders, and bedrock. Some use of rock is needed in the design to stabilize the bed and bank against future flood events. Assuming an ample source of native rock, natural materials can be used to design fish and wildlife friendly biotechnical bed and bank stabilization that matches natural conditions in the stream as much as possible and minimizes the use of structural concrete and grouted rock. However, because of the high velocities during flood flows, some use of these materials is anticipated.

Where feasible, vegetation should be incorporated into the design to reduce velocities and boundary shear stresses, especially in areas adjacent to the main channel such as the left overbank downstream of the diversion. The design will be based on hydraulic model output, geomorphic assessment of potential profile and lateral adjustments, computation of stability for various material types, and incorporation of scour protection.

4 BASIS OF DESIGN

4.1 Project Elements

All project elements are shown on the preliminary (30%) plans included in Appendix B and are described in the following sections. It should be noted that final design plans will include a survey map showing current topography, existing structures and trees within the project area. Project elements include the following: diversion weir, downstream roughened channel, diversion intake and fish screens, gates and controls, the intake service building, and potential future elements including instream flow release, fish bypass and fishway.

4.2 Diversion Weir

4.2.1 Structure and Gate Type

The proposed diversion control structure spans the entire width of the existing channel in the same general location as the existing structure. A 30-foot long operable weir crest gate is located in a notch section of the structure. The diversion weir may be designed to operate using cable, hydraulic, or inflatable operating mechanisms. The design is investigating the potential for the weir to be split into two crest gate sections, 10 feet and 20 feet in length, so that the shorter section can be used for normal operations. The invert of the gated notch section is set at an elevation of 1177.8 feet, approximately 4 feet lower than the existing diversion weir, and the crest gates will raise to a maximum elevation of approximately 1183.0 feet. The structure section is 7.5 feet wide in the stream longitudinal direction and has a top elevation of 1183 feet.

The lowered crest elevation of the structure is based on review of stream profile and existing diversion information. The lowered crest is intended to reduce the structure's effects on hydraulics and sediment transport in the stream when the gate is lowered, while allowing diversion to the existing pipeline that conveys flows to the recharge facilities. The notch width in the diversion structure was set by estimating the active bed width of the stream upstream and downstream of the diversion and by evaluation of two-dimensional (2D) hydraulic modeling results to attempt to provide a velocity distribution similar to adjacent stream reaches.

Additional geotechnical investigation is required to support the design of the new diversion structure, including the foundation for the structure, effect of the structure on seepage flows, foundation for the right abutment, and the tie-in to the existing valley slope to prevent flanking.

4.2.2 Operation and Controls

Operation of the crest gates will be controlled by water depth measurements from a transducer located immediately upstream of the diversion. The transducer will communicate with a programmable logic controller (PLC) housed in the Intake Service Building. The PLC will control the modulation of the diversion weir gates to accurately deliver flow through the intake.

The diversion weirs will remain fully raised until the total streamflow reaches 25 cfs at an upstream water surface elevation of 1183.45 feet. The diversion weirs can then be modulated to maintain this water surface elevation, and the full 25 cfs diversion, up to a total streamflow of 100 cfs, at which point the weirs will be fully lowered and the intake will be isolated from the stream.

A diversion gate on the downstream side of the screens has the capability for automatic and remote operation such that the diversion flows can be fully shut down when the crest gates lower. Full isolation of the intake would be accomplished by manual installation of bulkhead flashboards upstream of the screens.

4.2.3 Effects of Flood Flows

A preliminary evaluation of hydraulic characteristics of Arroyo Seco in the project vicinity under existing and proposed conditions was completed using the HEC-RAS computational package developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers (USACE). A 2D model of existing conditions was developed using 2016 LiDAR topography, and was modified for proposed conditions. For purposes of preliminary comparison, the Manning's roughness value for both models was set to 0.06 for all cells in the 2D flow area, representing the composite roughness of the floodplain vegetation and channel bed material. In the next phase of design, 2D modeling will be refined to include additional land surface categories with varying roughness values.

Peak 2-year, 10-year and 100-year peak velocities through the project vicinity for existing and proposed conditions are shown in **Figures 4.1** through **4.6** (flow direction is from top to bottom). These results indicate that under proposed conditions, when the gates are fully down and the crest elevation is approximately 4 feet lower than the existing weir elevation, flood water surface elevations (indicated by extent of inundation in the figures) are at or below existing conditions and maximum velocities are similar to existing condition. The figures show flood flows greater than about the 10-year flow spilling out of the channel under existing conditions, and 100-year flows spilling out of the channel in both existing and proposed conditions. These results will be refined as the design progresses but are generally consistent with observed behavior in the 2010 event.

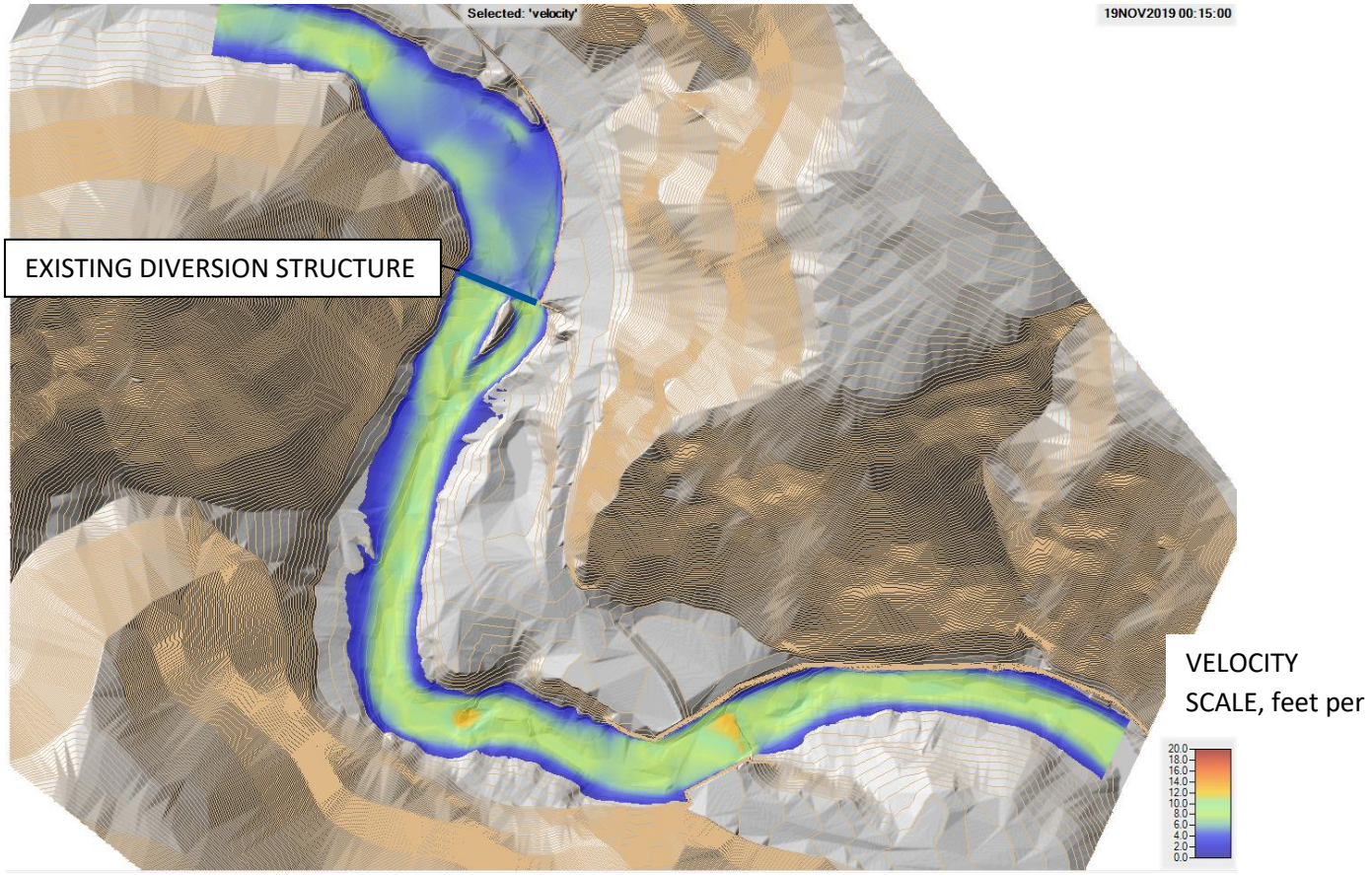


Figure 4.1 2-year flood extent and peak velocities, existing conditions

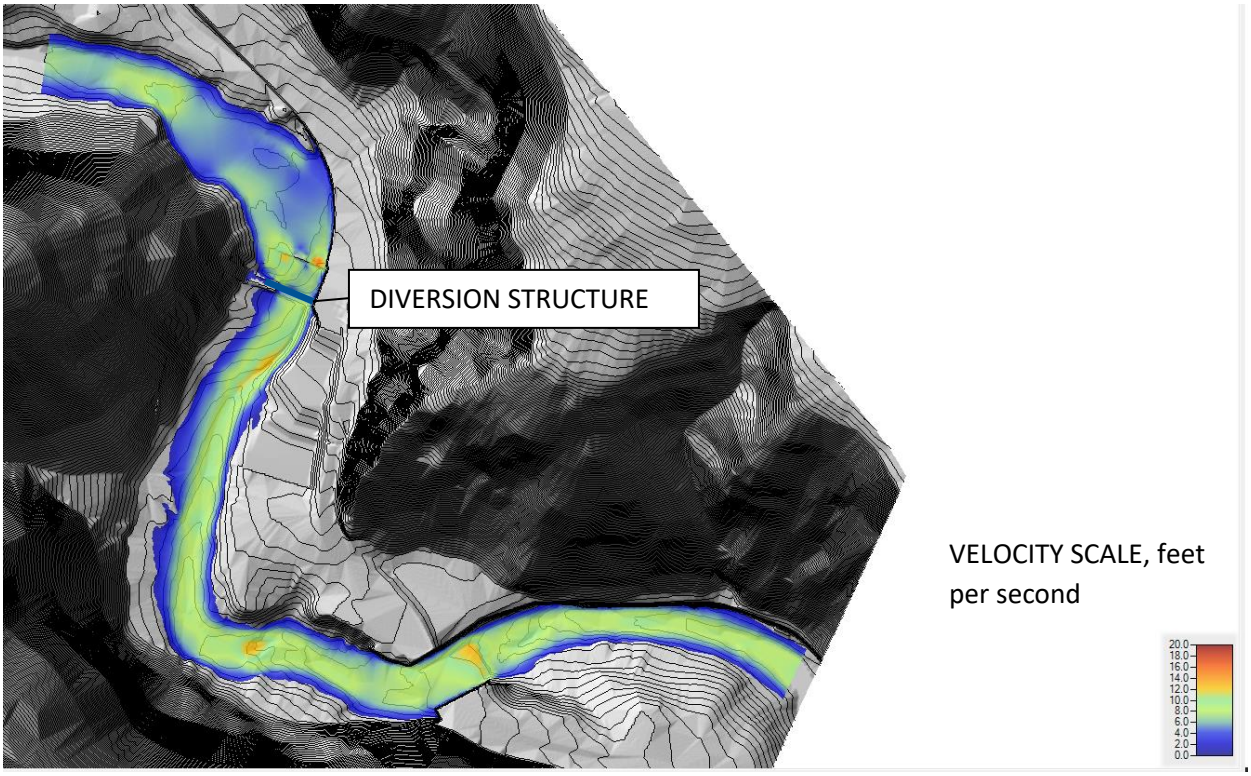


Figure 4.2 2-year flood extent and peak velocities, proposed conditions

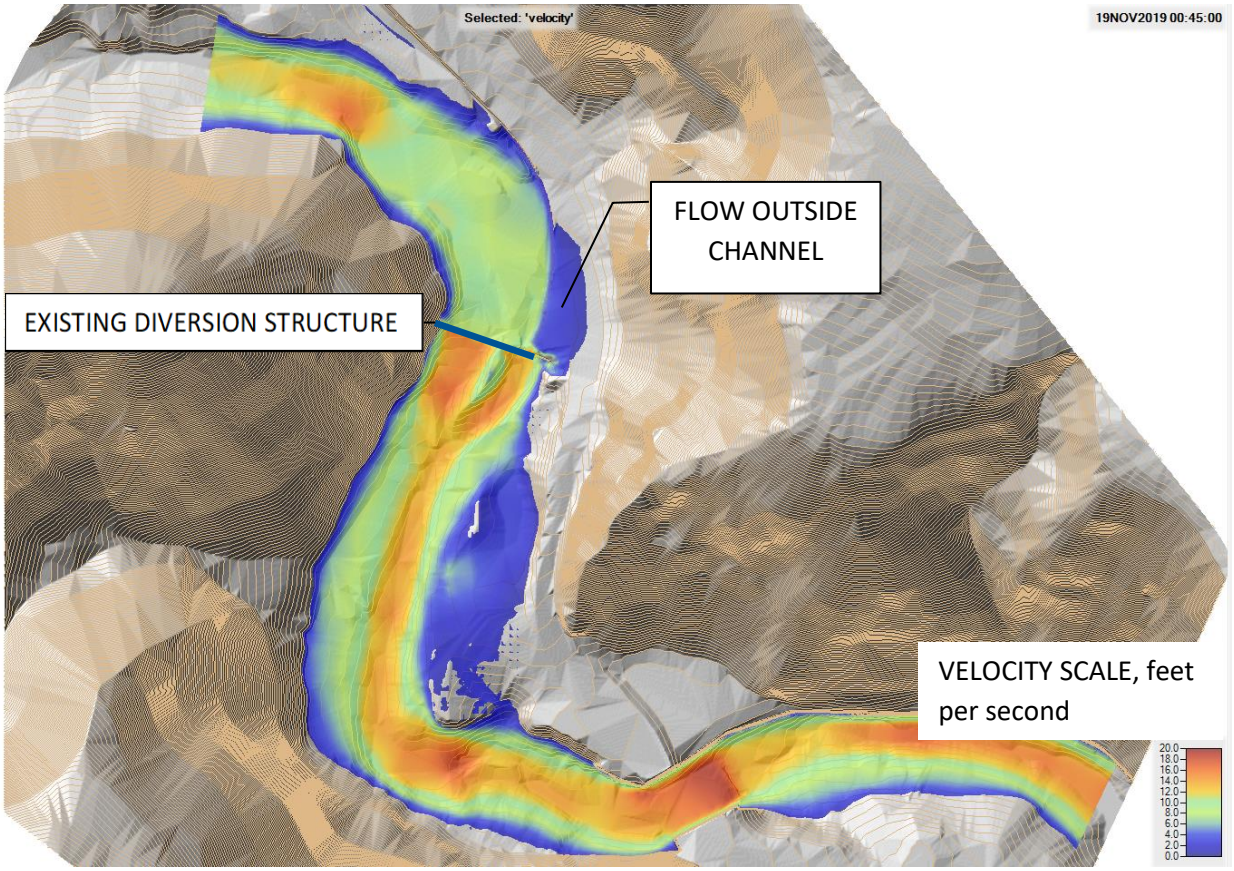


Figure 4.3 10-year flood extent and peak velocities, existing conditions

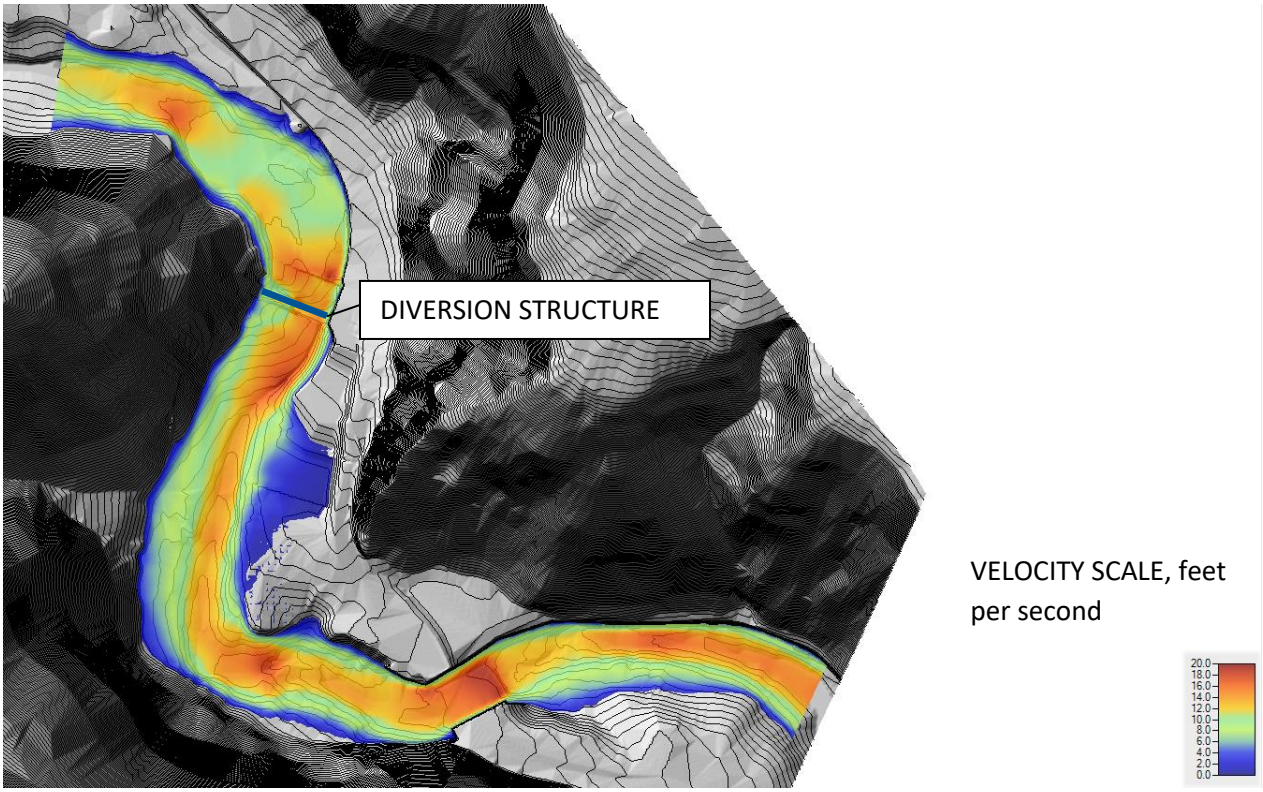


Figure 4.4 10-year flood extent and peak velocities, proposed conditions

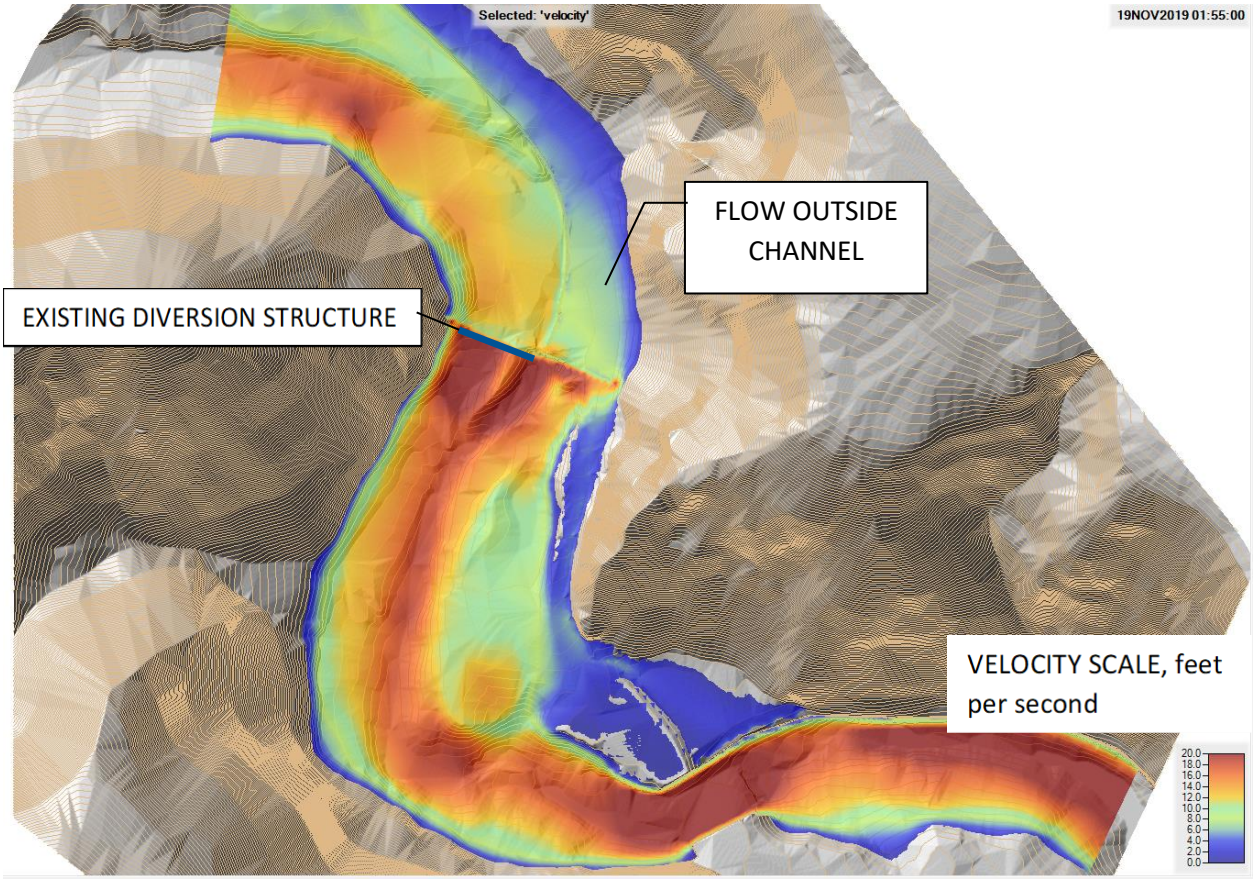


Figure 4.5 100-year flood extent and peak velocities, existing conditions

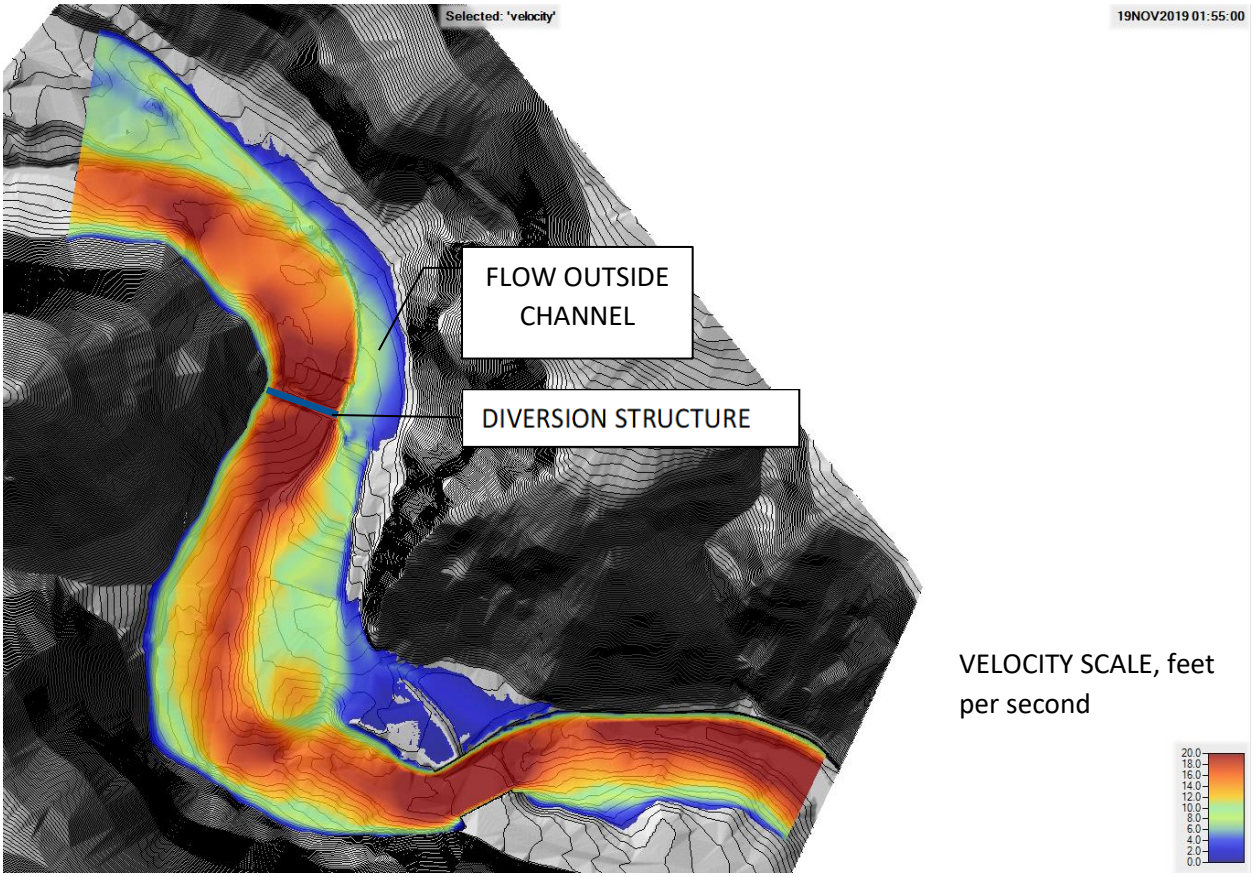


Figure 4.6 100-year flood extent and peak velocities, proposed conditions

4.3 Roughened Channel

The existing diversion structure creates a drop in stream profile and is a barrier to aquatic organism passage under most flows. In the proposed design, a roughened channel section downstream of the diversion structure is proposed to allow upstream passage when the weir crest gates are lowered.

Roughened channels are an accepted method of providing passage for steelhead trout in CDFW's Salmonid Stream Restoration Manual (CDFW, 2010), requiring site specific design and review. The roughened channel configuration proposed is a channel approximately the width of the active channel in adjacent stream segments, with an asymmetric v-shaped cross section to concentrate lower flows and provide adequate depth. Compared to other potential types of upstream passage features, the roughened channel type has the advantage of providing a range of velocities and depths at a given flow rate. Thus, smaller or weaker swimming native fish and other aquatic organisms can pass along the margins of the channel or near the bottom, using spaces in the bed material for hydraulic cover.

The roughened channel design follows the depth and velocity criteria established by CDFW (2002) and NMFS (2019) guidance for fish passage at road crossings, shown in **Table 4.1**. These criteria are typically

assumed relevant for design at features other than road crossings, but roughened channel designs are considered on a case-by-case basis for specific sites.

Table 4.1 Depth and velocity criteria from CDFW and NMFS road crossing guidelines

Species	Min Depth, ft	Max Velocity, fps (<60 ft passage length)	Max Hydraulic Drop, ft	Notes
Adult Anadromous Salmonid	1.0	6	1	
Juvenile Salmonid	0.5	1 1 (2 short distance)	0.5 1	CDFW NMFS

The proposed roughened channel profile slope downstream of the diversion weir is 4%. This is about twice the average bed slope and thus would be reasonably similar to a natural steep section or chute in the adjacent reaches of channel. The proposed typical channel section is an asymmetrical v-section with dimensions as shown in **Figure 4.7**.

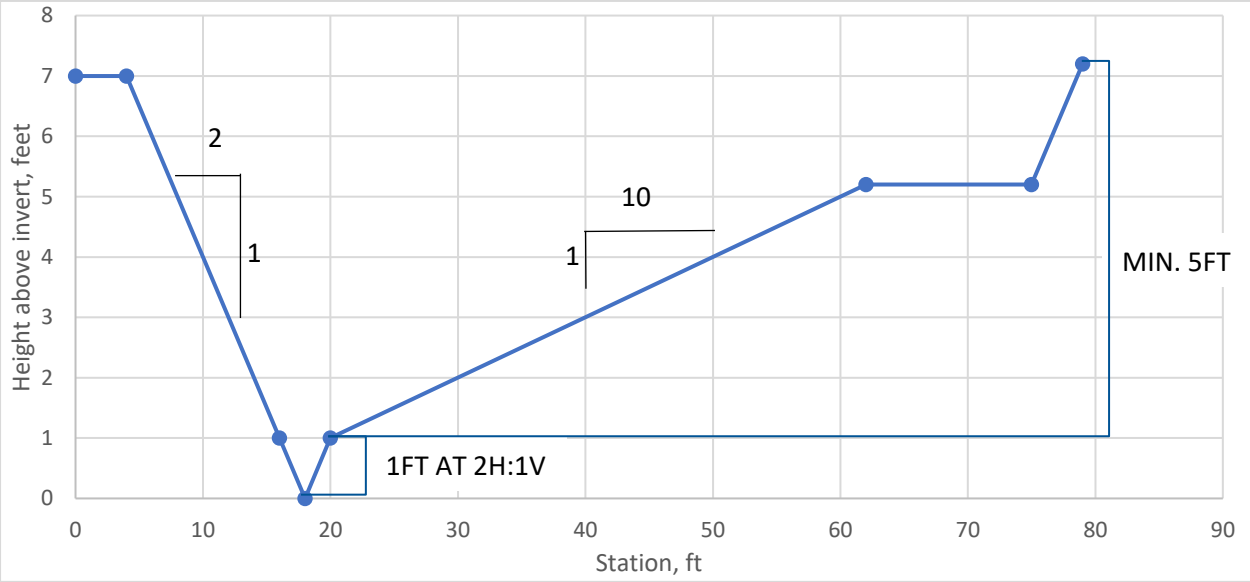


Figure 4.7 Typical Roughened Channel Section

Potential passage conditions were assessed using HEC-RAS over a range of flows based on channel cross sections constructed of Engineered Streambed Material (ESM). The size of a stable ESM was estimated using the CDFW guidance (2009) for roughened channels. The CDFW equation is based on the USACE (EM 1110-2-1601 Hydraulic Design of *Flood Control Channels*, 1994) equation for steep slopes, but is modified to produce a well-graded mixture of rock, gravel and sand similar to natural streambeds. One of the key parameters in the CDFW equation is slope. Using the bed slope (4%), the D84 rock size to resist motion in the 100-year flood event was estimated at approximately 6 feet, and the D50 at 2 to 3 feet. These sizes are probably impractical or at least very costly for construction, and extremely large

rock will potentially make fish passage difficult at lower flows. However, at the 100-yr flow, the slope of the energy grade line is approximately 2.6%, which is closer to the overall slope of Arroyo Seco. Using the energy grade slope, the D84 rock size was estimated at approximately 4.7 feet, and the D50 at approximately 2 feet. These sizes are more practical for use in construction and were adopted for the preliminary design. It should be noted that some potential for damage during extreme events will remain, and maintenance of the roughened channel may be required after large events to repair damage and maintain conditions for fish passage. Details for the ESM sizing calculations, gradations and assumptions can be found in Appendix C.

A one-dimensional (1D) HEC-RAS model was used to simulate the high and low design flows for juvenile and adult anadromous salmonid fish passage for cross sections representing the roughened channel. For this assessment, depth-dependent roughness values were estimated using the Mussetter equation, following methods provided in the CDFW (2009) guidance.

Figures 4.8 and 4.9 show the depth of flow and velocity distributions from the 1D model in a typical channel section representing the roughened channel under high design flow conditions for juvenile salmonids and adult anadromous salmonids. Maximum channel velocities under proposed conditions are approximately 4 fps for the juvenile high design flow and 8 fps for the adult passage flow. The velocity plots indicate the potential importance of channel margins for passage at higher flows, where lower velocity zones meeting the passage design criteria are maintained.

Figures 4.10 and 4.11 show the depth of flow and velocity under minimum low design flow conditions for juvenile salmonids and adult anadromous salmonids. The 1D model does not fully represent the complex shape of the low flow portion of the channel formed by intersecting rock surfaces, but the roughness estimate is intended to approximate the effect of an irregular flow path. Results indicate that depth and velocity conditions consistent with design criteria could be met.

At flows above 25 cfs, there is some potential that fish would pass over the weir, and a cushion pool downstream of the weir at the head of the roughened channel would be desirable to prevent injury.

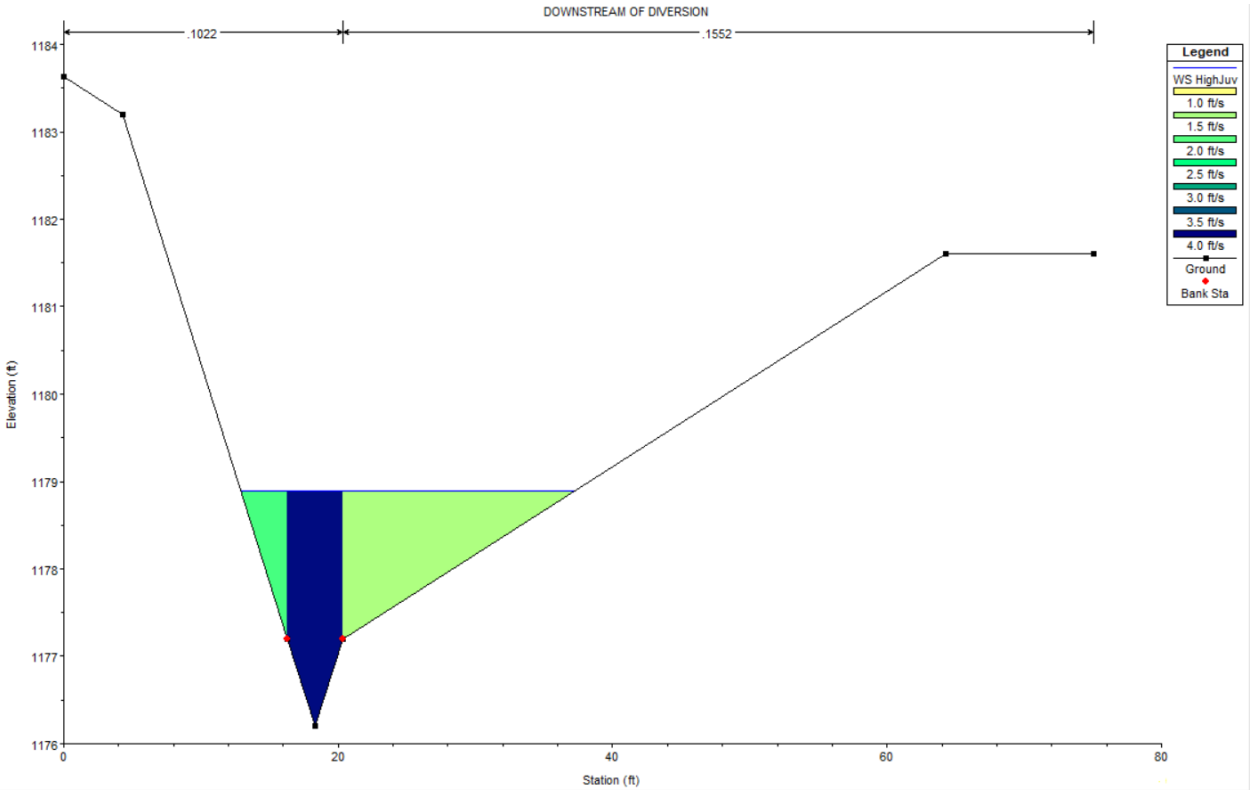


Figure 4.8 Hydraulic model proposed roughened channel cross section showing flow depth and velocity distribution at high design flow for juvenile fish passage (61.3 cfs)

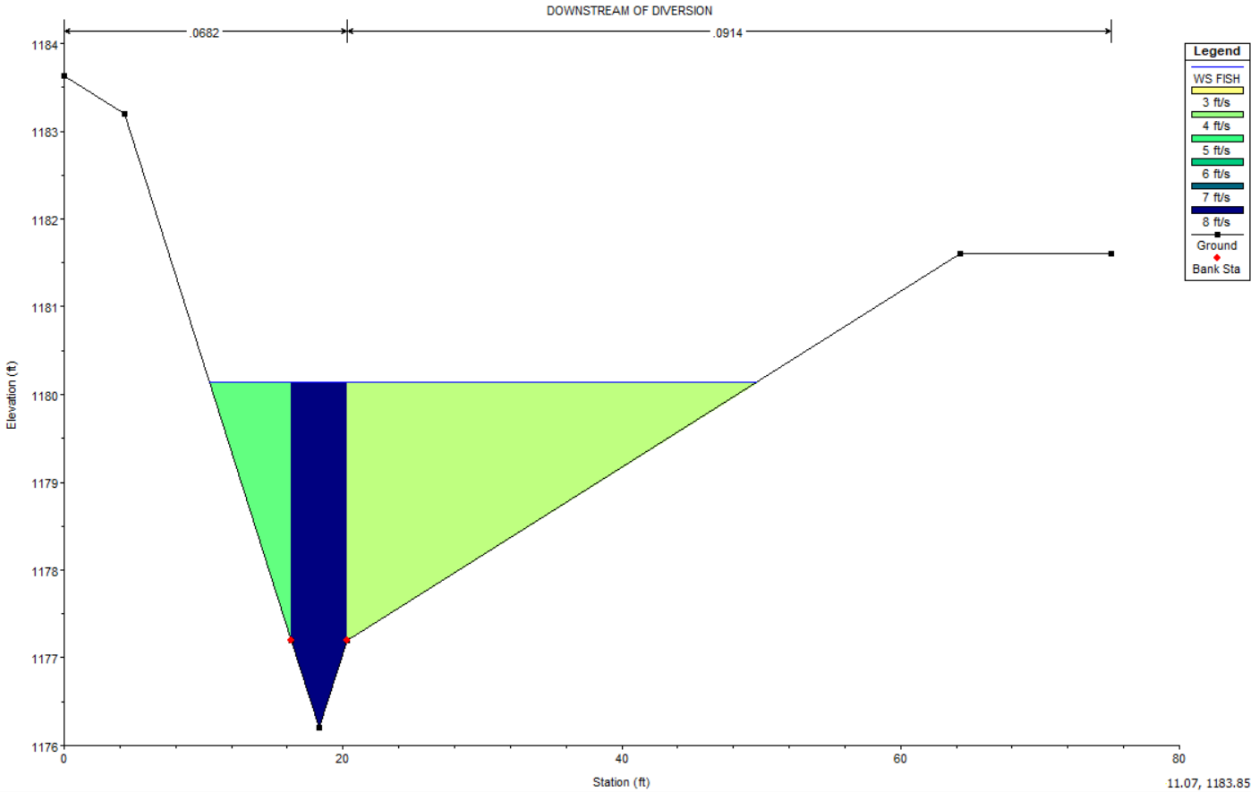


Figure 4.9 Hydraulic model proposed roughened channel cross section showing flow depth and velocity distribution at high design flow for adult anadromous salmonid fish passage (306.5 cfs)

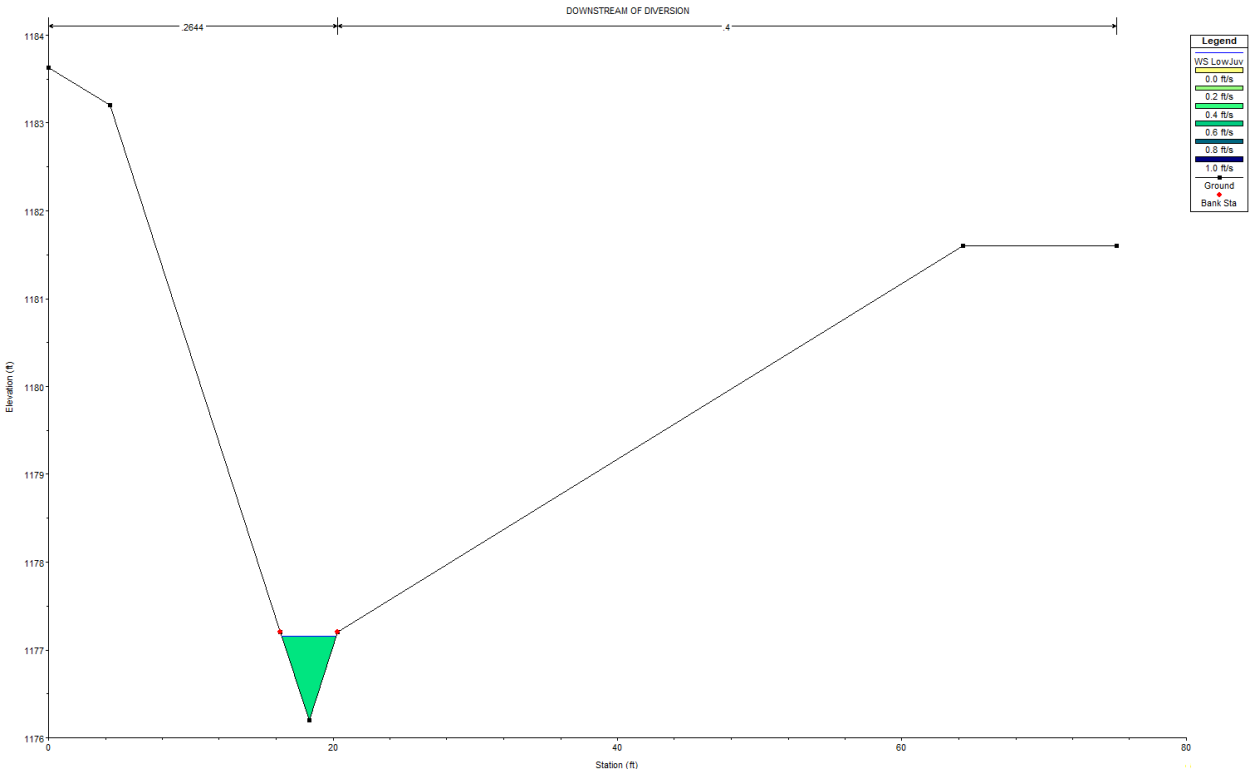


Figure 4.10 Hydraulic model proposed roughened channel cross section showing flow depth and velocity distribution at low design flow for juvenile fish passage (1 cfs)

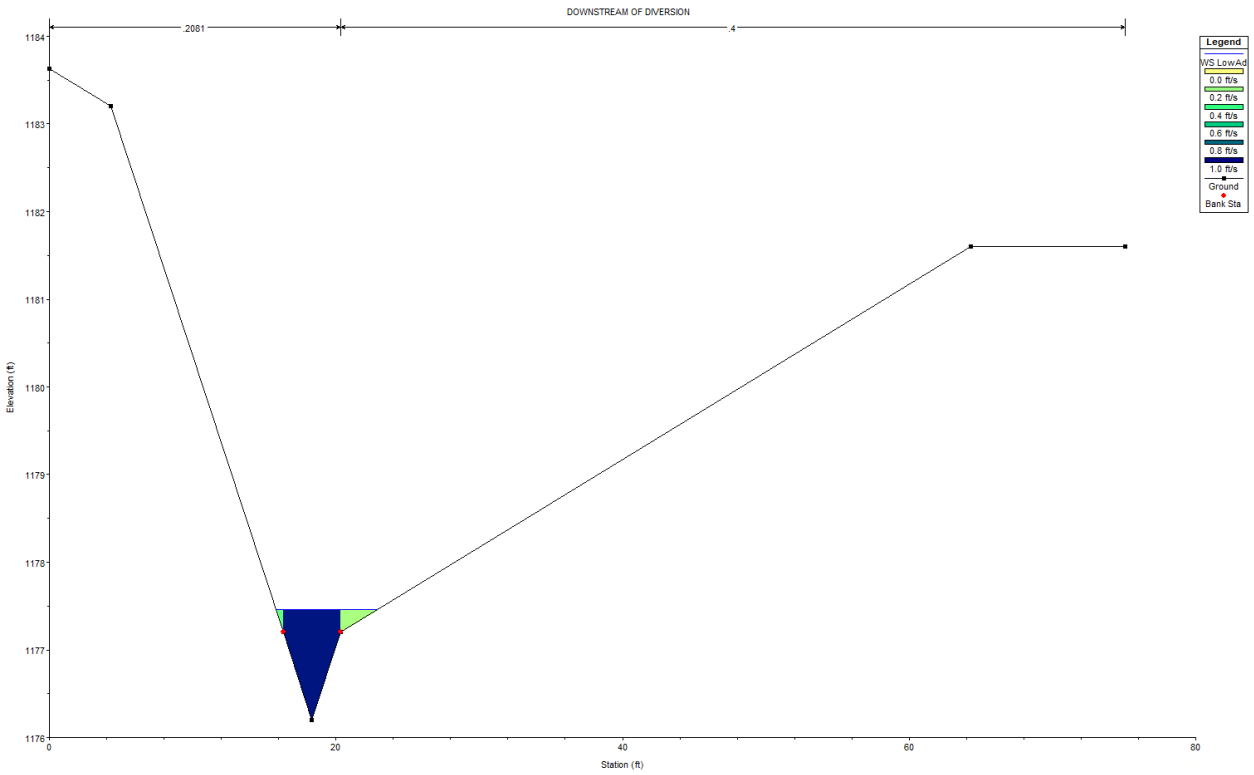


Figure 4.11 Hydraulic model proposed roughened channel cross section showing flow depth and velocity distribution at low design flow for adult anadromous salmonid fish passage (3 cfs)

The crest gate sill elevation was selected to more closely represent the general profile of the stream without the influence of the existing diversion. This will promote sediment transport continuity through the diversion reach during larger flows when bed material is mobilized and when the crest gate will be down. Grading upstream of the structure during construction will be limited to the immediate area of the diversion, and some evolution of the stream profile can be expected after construction. Bed material that has aggraded upstream of the structure is expected to be transported downstream, establishing a more uniform profile upstream of the diversion.

4.4 Intake Components

The proposed diversion intake is located on the left bank of the stream immediately upstream of the diversion weir. The intake is equipped with a trash rack mounted parallel to the stream flow and a bulkhead, allowing the diversion to be shut off during flood flows. Two configurations for the intake and screen bay were developed. The first configuration places the screens along the left bank of the stream immediately behind the trash rack. The second configuration uses an intake angled upstream and a tapered off-channel screen bay. **Figure 4.12** shows the conceptual layout for the two options. After review with the City, the tapered screen bay option was selected for use in the preliminary plans for its ability to flush sediments through the bay, protection of the screens, and potential adaptability in future

conditions for passage of fish downstream. Potential disadvantages are that any fish that enter the screen bay under present conditions would be further from the stream and might not find their way back to the channel as easily. The tapered bay would ultimately allow a sweeping velocity to meet design criteria when used with a downstream fish bypass, but prior to that time the sweeping velocity would decrease through the bay. Review with CDFW is anticipated prior to advancing the design.

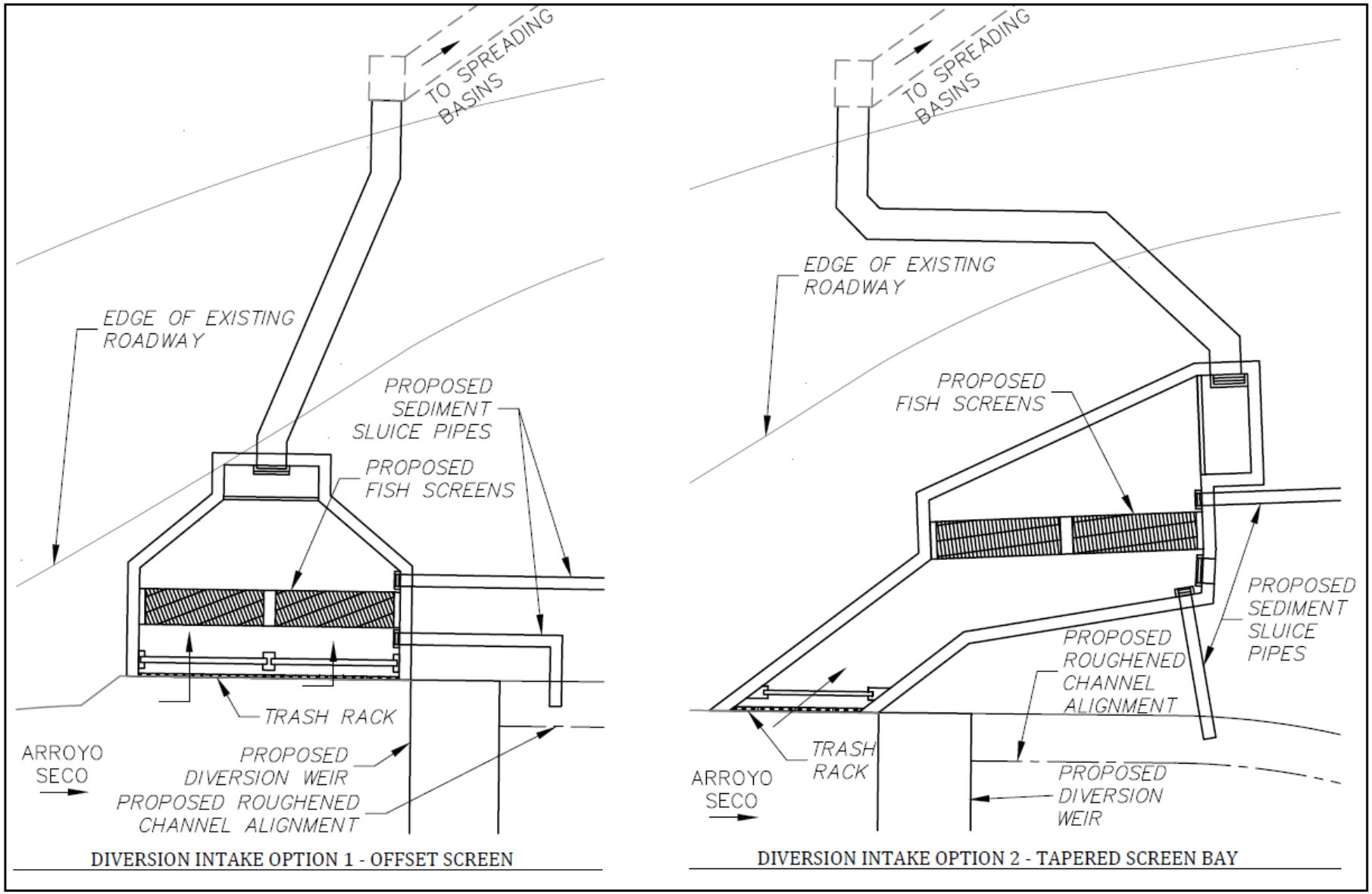


Figure 4.12 Screen bay configuration options (not to scale)

The intake shown in the drawings in Appendix B is an angled approach channel to a tapered fish screen bay. The tapered bay ends at a 12-inch diameter slide gate and flushing pipe for removing sediment and small debris build-up in front of the screens. Potential for future fish bypass at this location is described in Section 4.6.

The screening system will be designed to meet current NMFS and CDFW design guidelines for approach velocity. For a 4-foot diameter drum screen and a maximum approach velocity of 0.4 fps at the maximum diversion flow of 25 cfs, the minimum screen length required is approximately 20 feet. For ease of fabrication, installation and maintenance, two 10-foot-long drum screens are proposed.

Vertical screens and drum screens were considered for use at the site, and the preliminary design is laid out for use of drum screens. Drum screens are frequently used in small irrigation diversions and consist of a cylinder of screen material that rotates in the flow. The rotating action is used to clean small debris from the screen. The drum screen was initially conceived based on the configuration with the screens immediately behind the trash rack but was retained for use in the tapered screen bay. Additional review with the screen manufacturers and CDFW will influence the final selection of screen type.

Under current conditions, no flow would normally be bypassed from the upstream side of the screen bay and sweeping velocity will decrease along the screens. In this configuration, sweeping velocity is not relevant to downstream passage, as fish would be excluded from the downstream reach. At the 25 cfs design flow, sweeping velocity is approximately 1 fps at the bay inlet, and approximately 0.4 fps after traveling three-quarters of the length of the screens. See Appendix C for sweeping velocities along the length of the screen across a range of design flows without a bypass flow.

A second 12-inch diameter slide-gated cleanout pipe is located at the back of the fish screens to remove any sediment build-up behind the screens. This pipe could also be used to convey any future instream flows determined to be needed, as described in Section 4.8.

The final component of the intake structure is the outlet weir, located behind the fish screens. The drums screens must be designed to operate with submergence of 65 to 85 percent of diameter, and tailwater control is needed for this purpose. The design uses an 8-foot-long outlet weir that would be fitted with an adjustable weir plate set at an elevation of approximately 1182.5 feet. In conjunction with the diversion weir, this height maintains a minimum depth on the screens of 2.5 feet, or approximately 70% of the total diameter. Flow over the weir spills to a small vault and a 30-inch diameter slide-gated outlet pipe that conveys the diverted flow to existing Tunnel #4 and the spreading basins downstream.

The hydraulic profile of the system is shown in **Figure 4.13** below. This figure displays the calculated water surface elevation profile over a range of design flows.

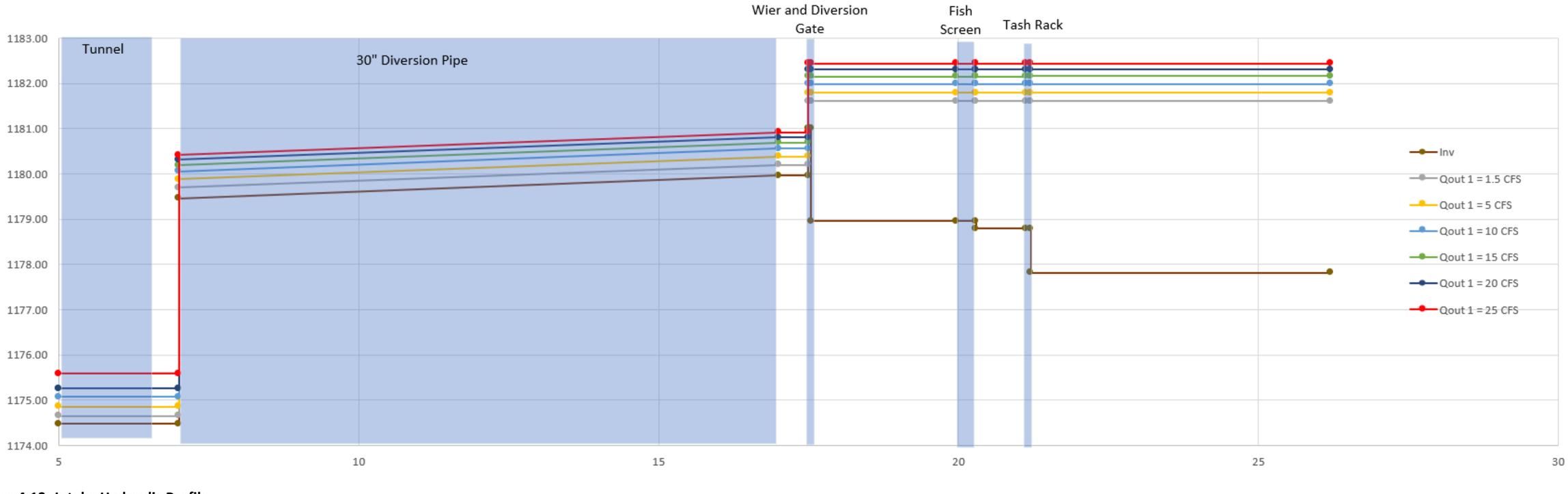


Figure 4.13 Intake Hydraulic Profile

4.5 Gates and Controls

The gate on the 30-inch diameter outlet pipe will be controlled by the PLC and automated based on water surface level readings immediately upstream of the diversion. The gate will close once stream flow reaches the 100 cfs threshold. High flow events will be forecasted and flow into the intake structure will be shut off pre-emptively and manually, using the bulkhead behind the trash rack, to prevent damage and large amounts of sediment and debris from entering the structure. The two 12-inch diameter cleanout pipes will be manually operated for the removal of sediment build-up, during routine maintenance of the intake.

4.6 Road Stabilization

The methods described in USACE Engineer Manual 1110-2-1601 were followed to develop the gradation of rock slope protection for the road stabilization on the left overbank (USACE, 1994). This rock slope protection will protect the roadway and shoulder and will be separated from the roughened channel by a regraded and replanted area. To the extent feasible, this overbank area would be stabilized by vegetative or biotechnical methods, but additional hydraulic analysis will be required to establish design parameters in subsequent design phases.

For the preliminary design of the road stabilization, velocity, depth, and channel curve radius to width ratio were developed from the preliminary 2D modeling results and applied in the USACE rock sizing equation for D30. A previous geotechnical report (Converse Consultants, 2013) recommended use of a Cast-In-Drilled-Hole (CIDH) pile-supported retaining wall along the west side of the road and included general recommendations for rock slope protection. However, this protection was associated with grading that created a slope set back from the stream adjacent to the road. The proposed design would fill the area between the roughened channel to restore vegetated floodplain. This area is proposed to be stabilized by biotechnical methods, with additional rock slope protection along the road, with a toe down into the fill to protect against scour. The geotechnical report included a boring near the southern end of this area that encountered granitic bedrock at less than 5 feet of depth, but site observations indicate that the road is located on a greater depth of alluvial material for most of its length. Additional subsurface exploration may be needed to define the limits of shallow bedrock.

2D modeling for 100-year flow conditions show a depth of approximately 3 feet and a velocity of approximate 9 fps on the left bank. The road stabilization is relatively straight, however the overall channel curves at a radius to width ratio of 4/1, which will direct flows toward the left bank. Using the USACE equation and these input parameters, the D30 rock size to resist motion in the 100-year flood event was estimated at approximately 1.85 feet. See Appendix C for additional details on the sizing calculations. This sizing falls within the range for the USACE typical 42” riprap gradation, shown in **Table 4.2** below. Although this rock could be vegetated, the slope protection is very close to the road and vegetation might reduce roadway clearance. Instead of joint planting the rock, dense planting or biotechnical stabilization is recommended along the toe and transverse to flow between the rock slope protection and the roughened channel.

Although the preliminary modeling indicates depths and velocities that can be addressed using vegetated floodplain and rock slope protection along the road, more detailed 2D modeling will be performed as the design progresses to represent the floodplain area and consider potential risks of erosion during extreme events. Additional measures such as subsurface groins or a return to the retaining wall concept might be considered if the risks are considered excessive.

Table 4.2 Riprap Sizing for Road Stabilization

	Rock Size (ft)
D30 min	1.70
D50 min	2.47
D90 min	2.04
D100 min	2.57
D100 max	3.46

4.7 Intake Service Building

The Intake Service building will house electrical and control equipment and potentially a compressor for operation of the crest gates. The structure could potentially be a prefabricated metal building, concrete masonry unit structure, or wood frame structure. Concrete masonry construction may offer the most protection from vandalism. The need for elevation above the roadway grade or floodproofing will be evaluated in subsequent phases of design.

4.8 Potential Future Components

4.8.1 Optional Bypass Pipe

Downstream fish passage is not considered beneficial in low flows under current conditions. However, the intake design can accommodate an optional 24" diameter slide-gated pipe from the screen bay to bypass fish downstream of the diversion while the diversion is in operation, if safe passage is re-established downstream to the ocean. If a bypass is required in the future, the design would conform to CDFW and NMFS criteria.

4.8.2 Instream Flow

PWP has determined that instream flow releases beyond seepage and leakage at the diversion are not needed to maintain stream habitat downstream. If instream flows are determined beneficial in the future, the proposed design can accommodate release of surface water for instream flows from the downstream side of the screens.

4.8.3 Optional Fishway

Under existing conditions, no fish have been observed in the downstream reach and anadromous passage from the ocean is not possible due to various infrastructure barriers. However, the proposed design can accommodate a future bypass fishway to allow for upstream passage while the diversion is operating, if access for steelhead should be re-established. Preliminary hydraulic calculations for the sizing of a bypass roughened channel pool and chute fishway with a maximum flow of 10 cfs was used to size and develop a preliminary layout for a potential future fishway. Adequate length is provided if the fishway begins immediately upstream of the intake structure and runs to the east, around the outside of the structure, then along the left bank and down the hillslope to connect with the stream at the end of the proposed roughened channel section. Other types of fishways may be considered in the future, but layout of this fishway type provides a conservative check on space requirements. The fishway is not proposed to be designed at this time.

5 CONSTRUCTION CONSIDERATIONS

5.1 Construction Timing

The project will require instream work and will benefit from construction during the lowest flows possible, which would be in late summer and early fall. Some work is outside the limits of the channel and could be performed earlier in the year if other environmental protections are in place in accordance with project permits and mitigation measures. A key schedule constraint may be surveys and monitoring for nesting birds. To the extent feasible, vegetation removal outside the nesting bird season may reduce the risk of delays. Except for potential vegetation removal phasing, the project is expected to be constructed in a single construction season. Some mechanical components, such as fish screens and crest gates may have long lead times for preparation of shop drawings, submittals, and fabrication which should be considered in construction scheduling. Coordination between construction activities in Areas 1 and 3 may also influence construction timing and scheduling and could provide some construction and cost efficiencies in shared or phased use of equipment, materials, and staging areas.

5.2 Elements of Construction

5.2.1 Instream Construction

A temporary stream bypass system, via gravity or pump, will need to be implemented to isolate the project reach from streamflow prior to and throughout construction. If the instream portion of the work is conducted in late summer, typical flows would be feasible to pump around the excavation with a portable pump. Monitoring of weather forecasts and provision for a larger gravity bypass may be needed to address the potential for higher flows that could occur due to rain events as part of a rain event action plan. Dewatering will likely be required for excavation and installation of the diversion structure. Water quality protection measures will be needed for control of turbidity in the dewatering flows and release back to the stream or adjacent infiltration area.

5.2.2 Grading

Grading for the roughened channel design and roadway/hillslope protection is estimated at approximately 2000 CY of cut and 2010 CY of fill. A portion of the cut may be suitable for reuse in the ESM or as other fill on the site. However, because the ESM requires a specific gradation, some or most of this material may be required to be imported. For the purpose of preliminary estimation of haul quantities, approximately 20 percent of the excavated material was assumed to be reused as fill, resulting in a preliminary estimate for import material of 1,600 cubic yards and export of about the same amount. A portion of the export may be used for other areas of the project.

5.2.3 Structures

The intake and diversion structures will be constructed of reinforced concrete. Structural design will be performed in subsequent design steps and wall and footing thicknesses and configurations shown in the drawings are approximate. The intake structure will be designed for access from the ground level adjacent to the roadway, similar to the existing intake vault, and the top is anticipated to be partly solid and partly constructed as removable grating or access cover.

A geotechnical investigation will be required to support design of the diversion structure and intake. A previous geotechnical assessment (Converse Consultants, 2013) addressed stabilization of the roadway at the site but did not include exploration or recommendations for the diversion structure and intake.

5.2.4 Piping

Installation of new piping from the intake vault to the conveyance line is anticipated. The new piping would extend from the outlet vault downstream of the screen bay to an existing vault at the head of the tunnel section of conveyance piping on the east side of the road. Additional piping will be required for flushing pipes from the screen bay and for electrical and control lines. The deepest trenching will likely be associated with the outlet pipe, which is estimated to be about ten feet deep based on the profile in **Figure 4.13**.

5.2.5 Electrical and Controls

Electrical power will be required to operate the crest gates and outlet slide gate. The other small gates and bulkhead are expected to be operated manually. Overhead power supply presently exists to the location of the former traveling screen site and would need to be extended to the diversion site. Automatic control is anticipated for the crest gates and remote control for the crest gates and pipeline outlet gate will be investigated during subsequent phases of design. Methods for providing site security and protection of mechanical and control equipment will also be investigated.

5.2.6 Revegetation

Revegetation for the project would include riparian planting on the left and right banks along the roughened channel and right bank key for the diversion structure. The left overbank area is vulnerable to

erosion during large floods and more intensive biotechnical stabilization may be needed in this area. The preliminary design would restore this area as high vegetated floodplain between the roughened channel and the roadway stabilization slope protection. Revegetation species will be selected based on native species present in the project vicinity, including willow, alder, and sycamore. Willow species may be emphasized in areas with high erosion potential to take advantage of high roughness, low stature, and extensive root systems for reduction of flood velocities and increased stability of bank and floodplain surfaces. Revegetation plans would also consider trees and species that are required to be removed for construction to mitigate these losses.

5.3 Temporary Construction Effects

5.3.1 Access and Public Safety

Construction access to and from the project site will be exclusively via the paved roadway of Gabrieleno Trail, a route used heavily by hikers, equestrians and bikers year-round. Due to the limited width of the existing trail and the intake area, temporary closures and use restrictions may be required during construction. However, the roadway is not anticipated to be fully closed during the entire construction period, and daily access to the USFS residential area should be feasible to maintain. The roadway/trail can be open during times when construction is not active, such as weekends, and when construction activities do not require equipment to be positioned in the roadway. Construction activities would be isolated with construction fencing, and temporary traffic control may be required for some activities. An access plan and project schedule will be required as part of construction contract administration to minimize closure and restrictions on use of the roadway.

5.3.2 Control of Water and Water Quality Protection

As noted above, a temporary stream bypass and dewatering facilities with water quality protection for discharges back to the stream will be required. In addition, the project will require development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) for construction Best Management Practices (BMPs) for erosion control and water quality protection.

5.3.3 Material Import and Export

Hauling of import and export materials is anticipated to be in conventional road legal dump trucks with loads not to exceed standard highway limits. Approximately 1600 yards each of import and export is currently estimated, which may require approximately 200 truck trips. This estimate will be refined in subsequent phases of design. Stockpiling area is very limited at the site and the opportunity for back hauling to reduce truck trips and cost may be limited.

5.3.4 Dust Control and Noise

Sweeping and watering will need to be used for dust control during construction. Construction activities should be limited to normal working hours on weekdays, unless otherwise approved by PWP, and noise levels from construction equipment would be limited to 85 dBA at 100 feet as provided in the City

Municipal Code. If a pumped stream bypass is used, night operation of a generator and pumps may be needed, and a sound enclosure should be considered for this application in the subsequent phases of design.

5.3.5 Operations and Maintenance

A detailed operations and maintenance plan will be developed during the detailed design phase to address normal operation of the crest gate, fish screens, sediment management, mechanical components, control system, security, structural integrity, and other elements of the project. The operations plan will include procedures for shutting down the diversion during high flows and for post-flood inspections and repairs.

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APPENDIX A

FISHERIES REVIEW LETTER, DR. CAMM SWIFT

October 29, 2019

To: Ed Wallace

Northwest Hydraulics Consultants

200 S Los Robles Avenue, Suite 405

Pasadena, CA 91101

From: Camm C. Swift, PhD, 6465 Elmo Road, Cumming, Georgia 30028

Subject: Fish and fish passage related to Pasadena Water and Power Department diversion on Arroyo Seco above Pasadena.

Pasadena Water and Power Department (PWP) has a water diversion on Arroyo Seco that requires upgrading and repair. Part of this work involves consideration of possible protection of, and accommodation for, potential native fishes of the Arroyo Seco, tributary to the Los Angeles River. The following assessment/analysis is based on extensive knowledge of the original fish fauna of the area as well as review of the recent plans for upgrading this diversion, comments from the California Department of Fish and Wildlife (CDFW), and communications with National Marine Fisheries Service (NMFS) and CDFW biologists specifically working with the fishes in the area.

The section of Arroyo Seco from the narrowing at the Jet Propulsion Laboratory (JPL) bridge upstream, including the PWP diversion, is a relatively small upland extent of the entire Arroyo Seco, a major tributary of the Los Angeles River. The whole Los Angeles River system is identified as one of the core populations of steelhead in the Mojave Rim Biogeographic Population Group identified in the NMFS Southern California Steelhead Recovery Plan. As such, the Los Angeles River system is considered essential for recovery of the Southern California Distinct Population Segment of Steelhead, a federally endangered species. Planning efforts by several agencies are underway to promote steelhead recovery. The Bureau of Reclamation has done a preliminary study of modifying the concrete portion of the Los Angeles River to facilitate steelhead and other anadromous fish passage. The (State of California) Wildlife Conservation Board recently awarded a grant to the Council for Watershed Health for design of channel modifications to the Los Angeles River. The City of Los Angeles and project partners are working with multiple agencies to increase biodiversity and restore native fish habitat and fish passage migration corridors to upper tributaries with high intrinsic potential spawning and rearing habitat for not only steelhead/ rainbow trout, but also arroyo chub, speckled dace, unarmored threespine stickleback, and Santa Ana sucker. This native fish project is aligned with approved and ongoing plans for the Los Angeles River watershed and tributaries (http://lariver.org/) including the City of Los Angeles Biodiversity Motion (Mayor's Sustainability Plan, LA Olympics 2028 biodiversity implementation), Greater LAR IRWMP, CDFW native fish habitat priorities and limiting factors analyses, minimum stream flow and water temperature studies, and related multi-benefit projects with ecosystem restoration components.

Seven species of native freshwater fishes historically occurred in Arroyo Seco as documented by Culver and Hubbs (1917): Pacific Brook Lamprey, *Lampetra spp.*, Pacific Lamprey, *Entosphenus tridentata*, Rainbow Trout/Steelhead, *Oncorhynchus mykiss*, Arroyo Chub, *Gila orcutti*, (California species of special concern), Santa Ana Speckled Dace, *Rhinichthys cf osculus*, Santa Ana Sucker, *Catostomus santaanae* (federally threatened), and Unarmored Threespine Stickleback, *Gasterosteus aculeatus williamsoni* (federally endangered). The Speckled Dace ostensibly occurs widely over much of the western United

States, but the Los Angeles basin populations are among the most distinctive genetically and may be a distinct and separate species (Smith et al. 2017). The seven native fish species identified by Culver and Hubbs constitute a distinct, endemic part of the aquatic fauna in the Los Angeles River basin, as part of what was called the Santa Ana system of streams which also included the San Gabriel and Santa Ana River basins and a few nearby areas. The fish were widespread from the base of the mountains to the ocean in the originally relatively well-watered systems (Swift et al. 1993; Mendenhall 1908).

Based on historical information, observations, and studies on other streams in the Los Angeles River? Basin (Swift et al. 1993; Swift and Drill 2008), most of the seven species occurred largely downstream of the canyon mouths where gradients decreased, more consistent water supplies upwelled from the ground, and riparian habitat was more extensive. In the case of the Arroyo Seco, the species likely to have penetrated farther upstream in the steeper gradients of the canyon are the Rainbow Trout and Speckled Dace, and these would have been the only species consistently present in the Arroyo above the JPL bridge. Analogous situations apply across the Los Angeles Basin system of streams where Rainbow Trout and sometimes dace or Arroyo Chubs exist in the upper part of tributaries. These include the streams, above Pacoima and Tujunga dams, above Cogswell Reservoir in the west Fork San Gabriel River, above Seven Oaks Dam in the Santa Ana River, in the Santiago Creek drainage above Irvine Lake, and in upper Trabuco Creek and other tributaries of San Juan Creek. The dace legitimately inhabit such upstream areas, whereas the Arroyo Chub usually has established populations in the reservoirs, occasionally moving upstream in the lower gradient areas in and above the reservoir footprint. Arroyo Chubs usually do not penetrate upstream in higher gradient areas inhabited only by Rainbow Trout and Speckled Dace.

Upstream of the JPL bridge, partial temporal barriers may be present during low flows due to steep channel segments and step-pool or bedrock drops. An anthropogenic barrier exists at the road crossing approximately 500 feet downstream of the diversion at a channel spanning weir that may have been installed for flow measurement. A drop of approximately three feet occurs at this concrete structure. Chubs are less able to migrate through locally steep gradients and away from drying conditions than Rainbow Trout, and in the reach downstream of the diversion would be stranded in pools during low or zero flow periods.

In the project area only Rainbow Trout have been present within the last 50 years (Swift, et al 1993) and probably much longer due to major modifications to the watercourse downstream. Rainbow Trout were still surviving in the upper Arroyo Seco until the flooding and scouring of the canyon after the large 2009 Station Fire. Currently, however, no fish are known to inhabit the Arroyo Seco above Devils Gate Dam, according to surveys and observations made by NOAA Steelhead Recovery coordinator Mark Capelli In August, 2018 (email 22 August 2019) and by California Fish and Wildlife Fishery Biologist John O'Brien "…in the last few years." (email 22 August 2019). While Rainbow Trout/Steelhead are not currently present, the design of the diversion should concentrate on this species because it is the only one with a possibility to reoccur and survive until major restoration efforts occur.

The multi-agency plans and projections noted above for the restoration of aquatic habitats for fishes and other native fauna would necessarily involve removal of, or passage around, Devils Gate Dam to provide access for steelhead returning from the ocean. Returning to Arroyo Seco above Devils Gate Dam is now impossible. Such capability as well as actually making passage possible from Devils Gate Dam to the ocean will be a major undertaking to be accomplished many years in the future. The main strategy for the present would presumably be to re-establish genetically identified southern steelhead populations in the upper Arroyo Seco until such time as viable connectivity is established to the ocean.

Speckled Dace an Arroyo Chub might also be considered, but are unlikely to survive in the mountainous conditions of the upper Arroyo Seco. Several similar upper watershed areas are have been considered desirable for re-establishing native fishes because of their remaining natural features, despite the fact that the evidence indicates most of the target fish would not survive there very long. The fact that pushing these fish farther upstream is relatively easy compared to trying to bring back the original and more optimal habitat in the lowlands does not mean it will be beneficial to the fish in the long run and likely threatens the likelihood of success.

Currently, conditions below the diversion and out onto the surface of the sediment-filled basin behind Devils Gate Dam are marginal or non-existent to support fishes largely due to the very low flows in the Arroyo Seco above the diversion for much of the year. Lack of water is the primary deficiency from about the JPL bridge upstream where substrate and cover is good but water is lacking and barriers to upstream movement are present. Below the JPL bridge the flatter sediment load of the reservoir is open to solar heating, is dominated by finer substrates, and cover and pools are rare or absent. This means fish that get past the diversion due to screening facilities face poor conditions downstream and may not be helped by such passage. During winter high flows fish would go over Devils Gate Dam only to perish over the long concrete-lined channels of Arroyo Seco and Los Angeles River. Even if they reached the ocean (actually the upper end of Los Angeles Harbor) it is unlikely the harbor would provide the beneficial growth conditions provided by relatively natural estuaries and lagoons farther north. During the summer/dry periods of the year, sections of the Arroyo Seco run dry and would leave fish stranded in isolated pools. Also, if significant amounts of sediment were removed from behind Devils Gate, almost certainly the water body would intentionally or unintentionally become home to a variety of exotic aquatic species that adversely affect survival of the native species. This is already true at several other sites in the Los Angeles basin where native stream fish populations interface downstream with flood control reservoirs. Thus, any downstream passage in the next few years at least would send fish into suboptimal conditions and any survivors would need a way to return upstream as the conditions dry out downstream. Another barrier likely may develop when the sediment is removed and the flow into the reservoir area above Devils Gate Dam becomes more precipitous at the mouth of the canyon above the reservoir footprint.

In summary, the primary concern for the diversion should be for minimizing adverse effects on Rainbow Trout/Steelhead. This species would be protected by incorporating screens in the diversion/intake structure designed to prevent Rainbow Trout fry from being entrained with the intake of stream water, and without bypassing the fish downstream where their survival is unlikely. If the introduction of Arroyo Chub and Speckled Dace is to be given consideration in the future, despite the constraints to their existence as noted above, their juvenile and adult sizes are similar to steelhead and the screens would accommodate these later life stages as well. Some calculated loss of very small larvae of the minnows would likely result as is the case in many other places where minnows occur with larger salmonids. Dace larvae occupy margins of the flowing streams, whereas Arroyo Chub larvae drift downstream more and invade standing waters as well (Feeney and Swift 2008). Thus the Arroyo Chub larvae are more likely to be impinged in any diversion screen. As noted above, however, consideration should be given as to the overall likelihood of reintroducing chub in this area before designing to mitigate for a small loss that may not occur.

It is also advisable to provide passage at the diversion dam during higher flows when the diversion is not operating and the flow volume will enable fish to return upstream before flows decline. As much as possible, the diversion should be designed for potential future change in operations to accommodate actual anadromous steelhead arriving from the ocean.

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APPENDIX B

PRELIMINARY (30%) PLANS

SHEET INDEX

	DWG	SHT
COVER SHEET	T1	1
GENERAL NOTES SHEET	G1	2
ACCESS & STAGING SHEET	G2	3
DEMOLITION SHEET	G3	4
PLAN SHEET	C1	5
ROUGHENED CHANNEL PROFILE SHEET	C2	6
ROUGHENED CHANNEL CROSS SECTIONS SHEET	C3	7
DETAILS SHEET	D1	8

LEGEND

- (E) TREES
- (E) PAVED ROAD
- (E) GRAVEL ROAD
- 60 (E) CONTOURS (MAJOR)
- 61 (E) CONTOURS (MINOR)
- (E) FENCE
- (E) EDGE OF WATER
- (E) BUILDINGS & STRUCTURES
- EARTHWORK
- 1+00 CONSTRUCTION BASELINE
- PRESERVATION FENCE
- PRESERVATION FENCE WITH SILT BARRIER
- HORIZONTAL AND VERTICAL CONTROL POINT
- HORIZONTAL CONTROL POINT
- VERTICAL CONTROL POINT
- WORK AREA LIMIT

City of Pasadena
Department of Water and Power

CONSTRUCTION PLANS FOR

Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement

MARCH 2020

PROJECT MANAGER

Elisa Ventura, PE

APPROVED BY:

xxxxxxxxxxx, title *(date)*

xxxxxxxxxxx, title *(date)*

xxxxxxxxxxx, title *(date)*



Vicinity Map

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xxxxxxxxxxxxxxxxxx *(date)*
XXXXXXXXXX REGISTERED
PROFESSIONAL ENGINEER NO. # xxxxxxxx
northwest hydraulic consultants



Project Location Map

Drawing Name				Date
ARROYO SECO COVER				5 March 2020 11:00
Drawing Status	**Designer**	**Drafter**	**Checked**	**Job Number**
65% Submittal	tvs/gp	tvs	eew	6004878

Title Sheet, Location Map, and Vicinity

Sheet 1 of 8

D.S 206
207

Sheet Number
T1
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FILE LOCATION:P:\6004878-ARROYO_SECO\AC-6004878\DWG\ARROYO SECO COVER.DWG

GENERAL NOTES

1. THE CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR THE JOB SITE DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS.

2. THE CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT (USA) AT (800) 227-2600 (www.usanorth.org) PRIOR TO START OF ANY CONSTRUCTION.

3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING AND AVOIDING DAMAGE TO UNDERGROUND UTILITIES. THE CONTRACTOR SHALL LOCATE EXISTING UTILITIES AT LEAST 48 HOURS PRIOR TO EXCAVATION. ANY RELOCATIONS OR TEMPORARY OUTAGES SHALL BE COORDINATED WITH THE STATE. IF UTILITY CONFLICTS ARE IDENTIFIED, THE CONTRACTOR SHALL HALT ALL WORK IN THE AREA AFFECTED BY THE UTILITY CONFLICT AND SHALL IMMEDIATELY NOTIFY THE STATE. CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY AND ALL DAMAGE TO EXISTING STRUCTURES AND UTILITIES DURING CONSTRUCTION.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING MONUMENTS AND ANY OTHER SURVEY MARKERS DURING CONSTRUCTION. ALL SUCH MONUMENTS OR MARKERS DESTROYED DURING CONSTRUCTION SHALL BE REPLACED AT CONTRACTOR'S EXPENSE.

5. THIS PROJECT IS SUBJECT TO REQUIREMENTS OF PERMITS ISSUED BY VARIOUS REGULATORY AGENCIES, INCLUDING THE US ARMY CORPS OF ENGINEERS, CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE, REGIONAL WATER QUALITY CONTROL BOARD. THE CONTRACTOR IS RESPONSIBLE TO UNDERSTAND AND PERFORM ALL WORK IN ACCORDANCE WITH THE REQUIREMENTS OF THE PERMITS FROM ALL AGENCIES.

6. THE CONTRACTOR IS RESPONSIBLE FOR COMPLETING, SUBMITTING, AND ADHERING TO THE PROJECT STORM WATER POLLUTION PREVENTION PLAN (SWPPP) FOR CONSTRUCTION ACTIVITIES.

7. TEMPORARY ISOLATION OF IN-STREAM WORK AND CONTROL OF WATER WILL BE REQUIRED. CONSTRUCTION OF WATER CONTROL AND ISOLATION FEATURES SHOWN IN THE PLANS ILLUSTRATES ONE POTENTIAL METHOD. OTHER METHODS MAY BE PROPOSED BY THE CONTRACTOR FOR APPROVAL BY THE STATE. CONTRACTOR SHALL SUBMIT A PLAN FOR CONTROL OF WATER, STREAM ISOLATION, AND DEWATERING, INCLUDING MAINTENANCE AND RELOCATION DURING CONSTRUCTION TO ACCOMMODATE GRADING ACTIVITIES. AT THE COMPLETION OF CONSTRUCTION, ALL MATERIALS USED FOR THE STREAM ISOLATION AND DEWATERING SYSTEMS SHALL BE COMPLETELY REMOVED. IF CONSTRUCTION EXTENDS OVER MORE THAN ONE SEASON, CONTRACTOR SHALL REMOVE TEMPORARY FACILITIES IN THE CREEK CHANNEL AND WINTERIZE THE SYSTEM AS PROVIDED IN THE SWPPP.

8. EXISTING PRIVATE PROPERTY SHALL BE PROTECTED IN PLACE.

9. EXISTING VEGETATION OUTSIDE THE WORK AREA LIMIT IS TO BE PROTECTED PER REQUIREMENTS OF THE AND SWPPP.

10. CONTRACTOR WILL VERIFY AND CHECK EXISTING CONDITIONS PRIOR TO CONSTRUCTION. CONTRACTOR SHALL VERIFY LOCATIONS, LEVELS, DISTANCES, AND FEATURES THAT MAY AFFECT THE WORK. SHOULD EXISTING CONDITIONS DIFFER FROM THOSE SHOWN OR INDICATED, CONTRACTOR SHALL NOTIFY THE STATE PRIOR TO CONTINUING WITH ANY RELATED WORK.

11. ALL MATERIALS SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR UNLESS OTHERWISE NOTED.

12. THE NORMAL WORK WEEK FOR CONSTRUCTION AT THE PROJECT SITE SHALL BE MONDAY THROUGH FRIDAY, 8:00AM TO 5:00PM, UNLESS OTHERWISE DIRECTED BY THE STATE. ALL WORK SHALL BE ACCOMPLISHED IN A MANNER THAT CAUSES MINIMAL DISRUPTION TO LOCAL RESIDENTS.

13. A GEOTECHNICAL REPORT FOR THIS PROJECT WAS PREPARED AND IS PROVIDED FOR IN THE PROJECT MANUAL,

14. SHOULD ARCHEOLOGICAL REMAINS OR ARTIFACTS BE ENCOUNTERED DURING ANY PHASE OF CONSTRUCTION, LAND ALTERATION WORK IN THE GENERAL VICINITY OF THE FINDS SHALL BE HALTED AND A QUALIFIED ARCHEOLOGIST AND THE STATE SHALL BE NOTIFIED IMMEDIATELY. WORK ON THE PROJECT SHALL NOT BE RESUMED UNTIL A MITIGATION PLAN WITH ADEQUATE MEASURES FOR SITE PROTECTION IS REVIEWED AND APPROVED BY THE STATE.

15. CONTRACTOR SHALL PREPARE A TRAFFIC CONTROL PLAN FOR REVIEW AND APPROVAL BY THE TRAFFIC CONTROL PLAN SHALL BE SUBMITTED TO THE FOR APPROVAL. ENCROACHMENT PERMITS FOR WORK OR STORAGE OF MATERIALS IN CITY RIGHTS OF WAY ARE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR SHALL COORDINATE WITH THE FOR CONTROL OF PUBLIC ACCESS TO THE SITE DURING CONSTRUCTION.

16. CONTRACTOR SHALL PROVIDE A WATER TRUCK TO WATER AREAS AS NECESSARY TO CONTROL DUST. SOIL AND CONSTRUCTION MATERIAL SHALL NOT BE TRACKED OFF THE CONSTRUCTION SITE. SEE SHEET G3 AND PROJECT SPECIFICATIONS FOR WATER SUPPLY CONNECTIONS.

17. ALL IN-WATER/IN-CHANNEL WORK SHALL BE COMPLETED BY OCT 1. ALL OTHER GRADING WORK AND SITE STABILIZATION SHALL BE COMPLETED BY OCT 15.

18. AREAS THAT WILL BE INACTIVE BETWEEN OCTOBER 15 AND MAY 1 SHALL BE WINTERIZED IN ACCORDANCE WITH THE SWPPP, INCLUDING:

1) TEMPORARY EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED
2) DISTURBED AREAS SHALL BE STABILIZED
3) ONSITE CONSTRUCTION SLASH AND DEBRIS SHALL BE CLEANED UP AND REMOVED
4) EXCESS MATERIAL SOIL SHALL BE REMOVED FROM THE SITE AND TRANSPORTED TO A DESIGNATED STOCKPILE OR DISPOSAL AREA.
5) TEMPORARY IRRIGATION FACILITIES, IF INSTALLED, SHALL BE REMOVED OR WINTERIZED.

19. THE PROJECT BASE MAP WAS PRODUCED FROM AND FIELD SURVEY ACTUAL TOPOGRAPHY IS SUBJECT TO MINOR DEVIATIONS FROM THE GRADES SHOWN, AND CHANNEL CHANGES MAY OCCUR BETWEEN THE TIME OF FINAL PLANS AND BEGINNING OF CONSTRUCTION. THE STATE WILL PROVIDE FIELD DIRECTION FOR ADJUSTMENTS IN PROJECT FEATURES, LINES, AND GRADES TO FIT ACTUAL CONDITIONS AT THE TIME OF CONSTRUCTION.

20. ALL ELEVATIONS SHOWN ARE IN THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88). LOCAL CONVERSION FROM TO NAVD88 IS +2.88 FEET.

23. APPLICABLE BUILDING CODES: 2016 CALIFORNIA BUILDING CODE, CCR TITLE 24, PART 2, VOLUME 1 OF 2 (BASED ON THE 2015 IBC).

TYPICAL ABBREVIATIONS

A		E		M		S	
ABAN	ABANDONED	EA	EACH	MH	MANHOLE	SS	SANITARY SEWER
&	AND	E	EAST	MAX	MAXIMUM	S	SOUTH
∠	ANGLE	EG	EXISTING GROUND	MI	MILES	SD	STORM DRAIN
AB	AGGREGATE BASE	EL	ELEVATION	MIN	MINIMUM	SF	SQUARE FEET
ABA	ARCHITECTURAL BARRIERS ACT	ELEC	ELECTRIC	MM	MILLIMETER	SHT	SHEET
AC	ASPHALT CONCRETE	EP	EDGE OF PAVEMENT	MPH	MILES PER HOUR	SLP	SLOPE
ADA	AMERICANS WITH DISABILITIES ACT	ESM	ENGINEERED STREAMBED MATERIAL	N		SPEC	SPECIFICATION
AIS	AQUATIC INVASIVE SPECIES	EW	EDGE OF WATER	N	NORTH	SQ	SQUARE
ALT	ALTERNATIVE	EX	EXISTING	#	NUMBER	SRL	SMALL ROOTWAD LOG
APN	ASSESSOR PARCEL NUMBER	F		≠	NOT EQUAL	SSTL	STAINLESS STEEL
APPROX	APPROXIMATE	FT	FEET	NA	NOT APPLICABLE	STA	STATION
ASCII	AMERICAN STANDARD CODE	FG	FINISHED GROUND	NE	NORTHEAST	STD	STANDARD
ASPH	ASPHALT	FH	FIRE HYDRANT	NTS	NOT TO SCALE	STL	STEEL
AUX	AUXILIARY	FIG	FIGURE	NW	NORTHWEST	SWPPP	STORM WATER POLLUTION PREVENTION PLAN
B		FL	FLOW LINE	O		SYM	SYMBOL
BL	BASELINE	G		O.C.	ON CENTER	T	
BLK	BLOCK	GAL	US GALLONS	OH	OVERHEAD	TEMP	TEMPORARY
BM	BENCHMARK	GALV.	GALVANIZED	OPT	OPTIONAL	TBC	TOP BACK OF CURB
BMP	BEST MANAGEMENT PRACTICE	GB	GRADE BREAK	P		TBM	TEMPORARY BENCH MARK
BOT	BOTTOM	GL	GUTTER LIP	P	PROTECT (MAY BE PRUNED)	TC	TOP OF CONCRETE
C		GND	GROUND	±	PLUS/MINUS	TKPOA	TAHOE KEYS PROPERTY OWNERS ASSOCIATION
C	COTTONWOOD	GPM	US GALLONS PER MINUTE	LB	POUND	TOE	TOE OF SLOPE
CF	CUBIC FEET	H		PC	PILOT CHANNEL	TOP	TOP OF SLOPE
CFS	CUBIC FEET PER SECOND	HAZ	HAZARDOUS	PE	POLYETHYLENE	TP	TOP OF PAVEMENT
CLR	CLEAR	H/V	HORIZONTAL/VERTICAL	PERF	PERFORATED	TRPA	TAHOE REGIONAL PLANNING AGENCY
CM	CENTIMETER	HORIZ	HORIZONTAL	PERP	PERPENDICULAR	TSOM	TOPSOIL, SOD, ORGANIC MATERIAL
CMP	CORRUGATED METAL PIPE	HP	HORSEPOWER	PROP	PROPERTY	TW	TOP OF WALL
CONC	CONCRETE	HWL	HIGH WATER LEVEL	PSF	POUNDS PER SQUARE FOOT	TYP	TYPICAL
CONN	CONNECTION	I		PSI	POUNDS PER SQUARE INCH	U	
CONT	CONTINUOUS	IN	INCHES	PT	POINT	UNK	UNKNOWN
CP	CONTROL POINT	INTX	INTERSECTION	PVC	POLYVINYL CHLORIDE PIPE	UNO	UNLESS NOTED OTHERWISE
CRNR	CORNER	INV	INVERT	PVMT	PAVEMENT	UTIL	UTILITY
CTC	CALIFORNIA TAHOE CONSERVANCY	ISA	INTERNATIONAL SYMBOL OF ACCESSIBILITY	Q		UTM	UPPER TRUCKEE MARSH
CTR	CENTER	J		QTY	QUANTITY	UTR	UPPER TRUCKEE RIVER
CULV	CULVERT	JCT	JUNCTION	R		V	
CY	CUBIC YARDS	JP	JEFFREY PINE	R	RADIUS	VB	VALVE BOX
℄	CENTERLINE	L		RB	RIGHT BANK	VEL	VELOCITY
D		LB	LEFT BANK	RC	ROSE/CURRANT CLUMP	VOL	VOLUME
°	DEGREES	LF	LINEAR FEET	RC	RELATIVE COMPACTION	W	
⌀	DIAMETER	LO	LOG ONLY	REF	REFERENCE	WC	WILLOW CLUMP
DG	DECOMPOSED GRANITE	LOC	LOCATION	REL	RELATIVE	W	WEST
DI	DRAIN INLET	LP	LODGEPOLE PINE	REQ	REQUIRED	W/O	WITHOUT
DIA	DIAMETER	LRL	LARGE ROOTWAD LOG	REV	REVISION	WSEL	WATER SURFACE ELEVATION
DWG	DRAWING	LT	LEFT	RGB	RED GREEN BLUE	Y	
Δ	DELTA	LVL	LEVEL	RT	RIGHT	YR	YEAR

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Revisions

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Drawing Information

Date	05 March 2020 (11:22)
Status	PRELIMINARY
Designer	tvs/gp
Drafter	tvs
Checked	eew
File Name	ARROYO SECO COVER
Plotted Scale	0 1/2 1

Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement
General Notes Sheet

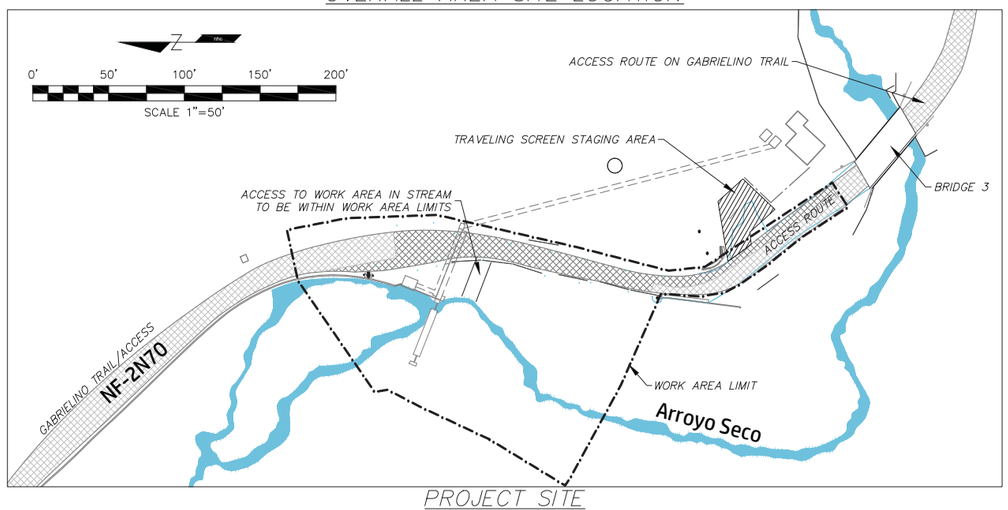
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Sheet Number G1
Sheet 2 of 8

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OVERALL AREA SITE LOCATION

NOTES
1. BRIDGE #1 AND BRIDGE #3 ARE TEMPORARY STRUCTURES WITH A 12'-WIDE DRIVE WIDTH AND HS-20 LOAD RATINGS.
2. BRIDGE #2 IS A HISTORICAL STRUCTURE TO BE PROTECTED WITH A 58,000 LB LOAD LIMIT.



PROJECT SITE

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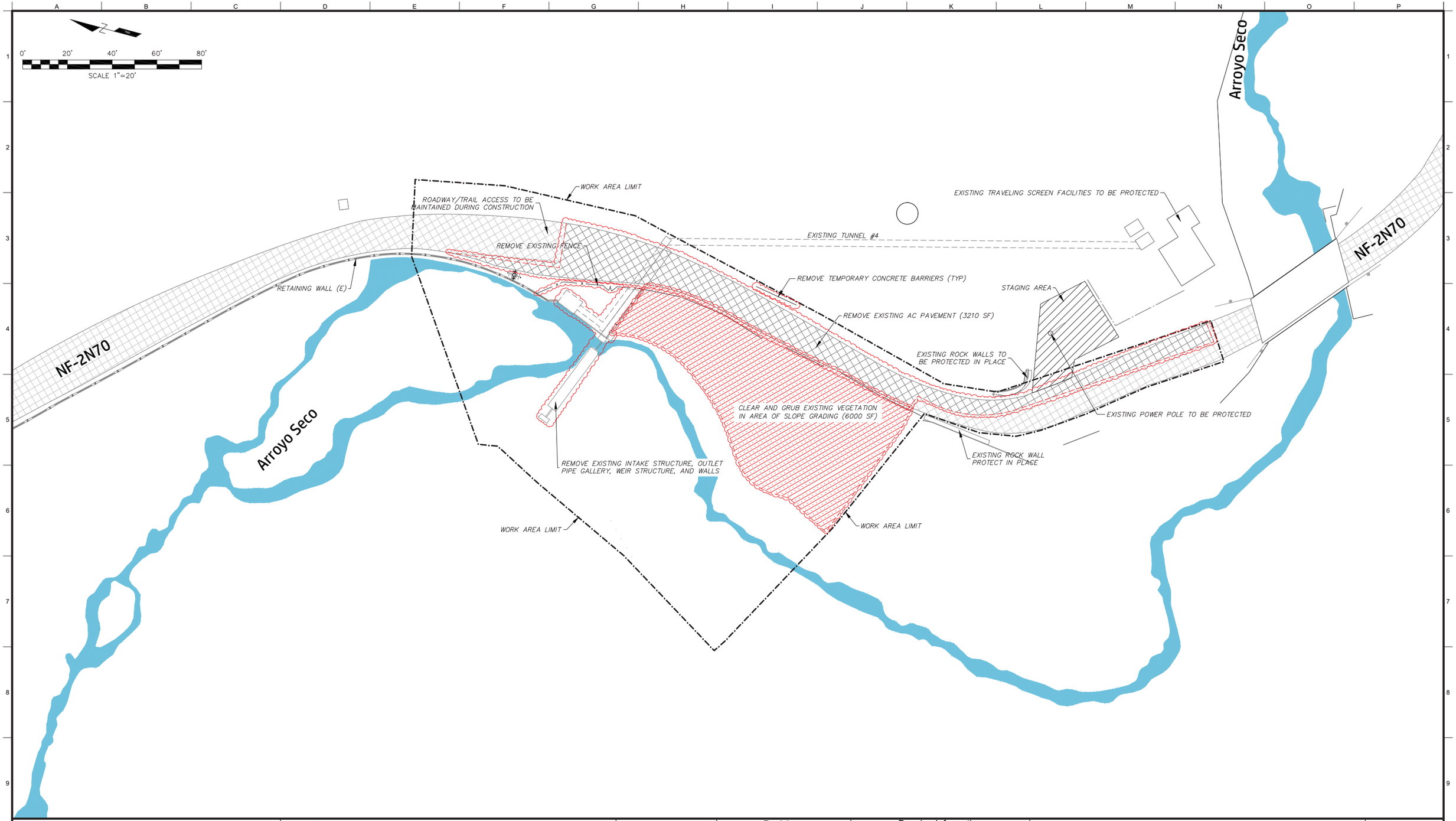
Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement
Access & Staging Sheet

Job Number 6004878

Sheet Number G2

Sheet 3 of 8

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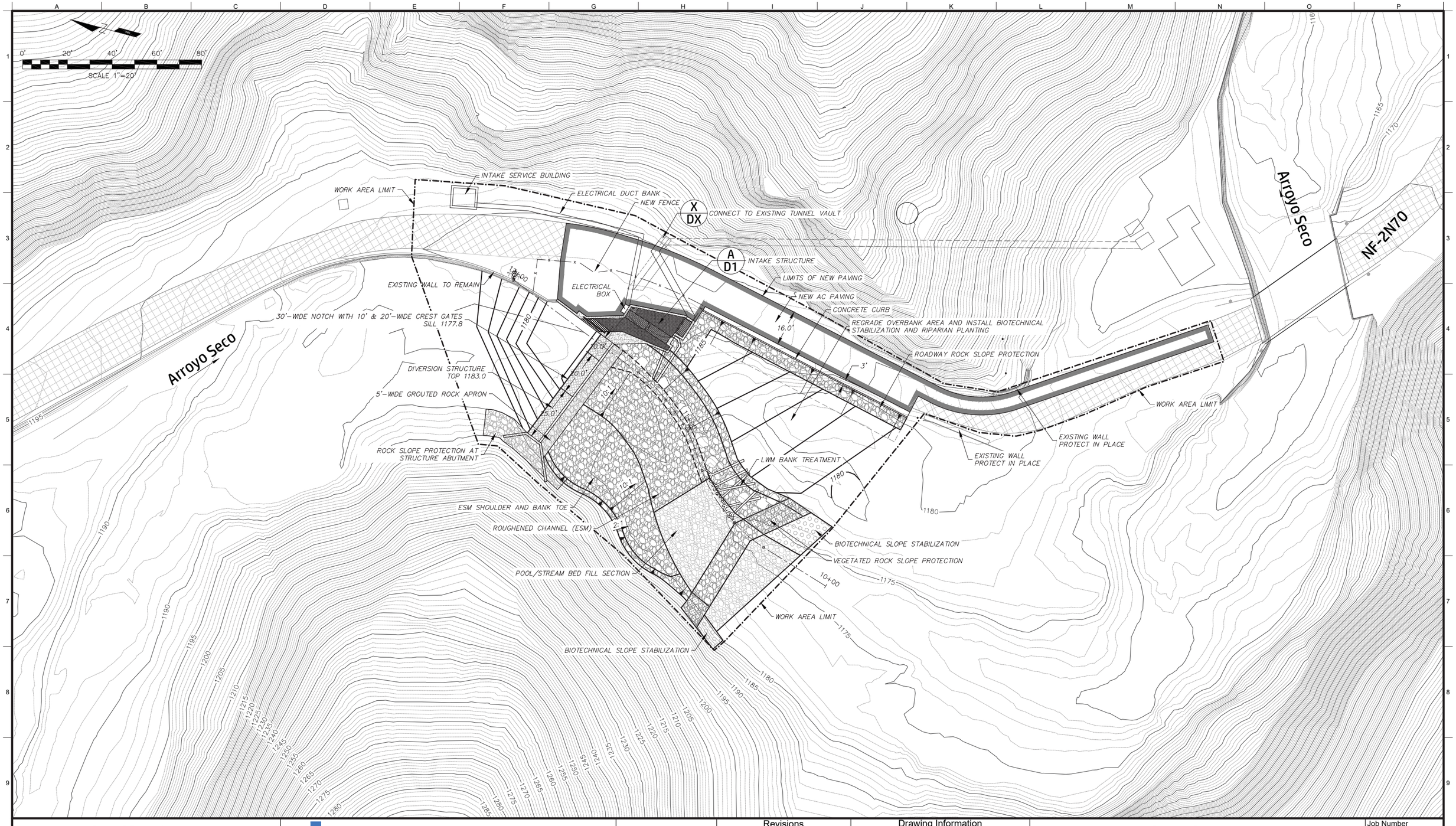
Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement
Demolition Sheet

Job Number 6004878

Sheet Number G3

Sheet 4 of 8

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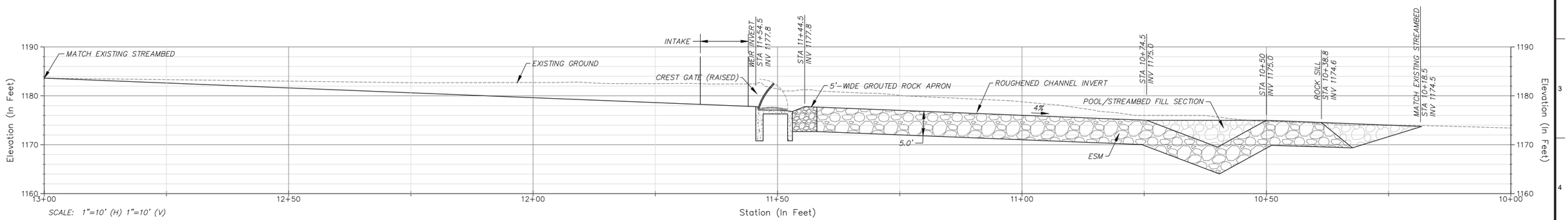
Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement
Site Plan Sheet

Job Number 6004878

Sheet Number C1

Sheet 5 of 8

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SCALE: 1"=10' (H) 1"=10' (V)

ROUGHENED CHANNEL PROFILE

H: 1"=10' V: 1"=10'

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File Name	ARROYO SECO
Plotted Scale	0 1/2 1

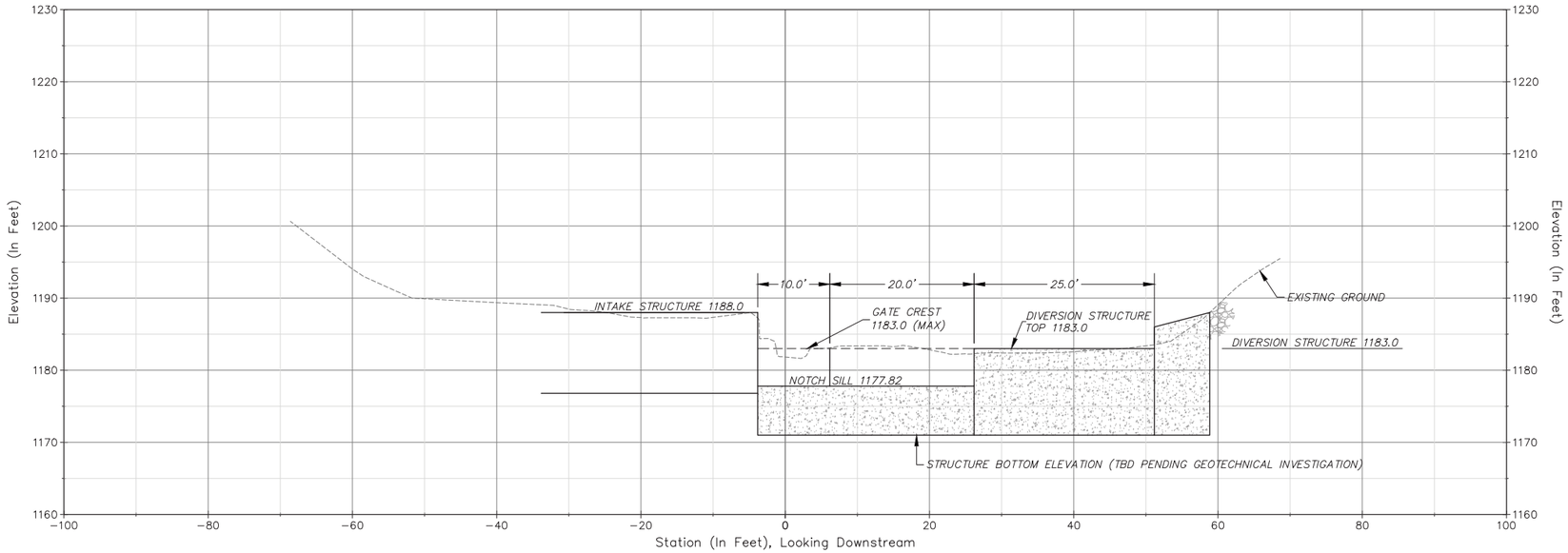
Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement
Roughened Channel Profile Sheet

Job Number 6004878

Sheet Number C2

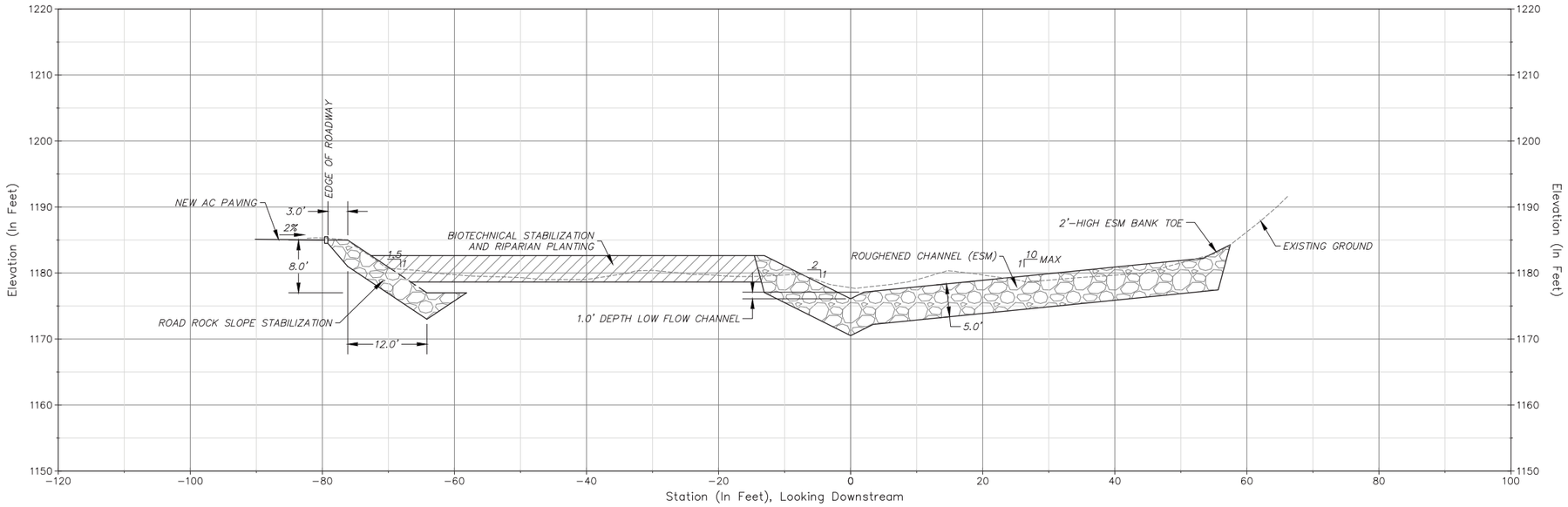
Sheet 6 of 8

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FILE LOCATION:P:\6004878-ARROYO_SECO\AC-6004878\DWG\ARROYO SECO.DWG



SECTION STA 11+52

H: 1"=10' V: 1"=10'



SECTION STA 10+90

H: 1"=10' V: 1"=10'

City of Pasadena
Department of Water and Power
150 South Los Robles Avenue, Suite 300
Pasadena, California 91101
(626) 744-4005
www.cityofpasadena.net/water-and-power

northwest hydraulic consultants
200 south los robles avenue, suite 405
pasadena, california 91101-2479
phone: (626) 440-0080
fax: (626) 440-1881
www.nhcweb.com

Kennedy Jenks
300 North Lake Avenue, Suite 1020
Pasadena, California 91101
(626) 568-4300
Kennedy Jenks www.kennedyjenks.com

PRELIMINARY
NOT FOR CONSTRUCTION

Revisions		
No.	Date	Description

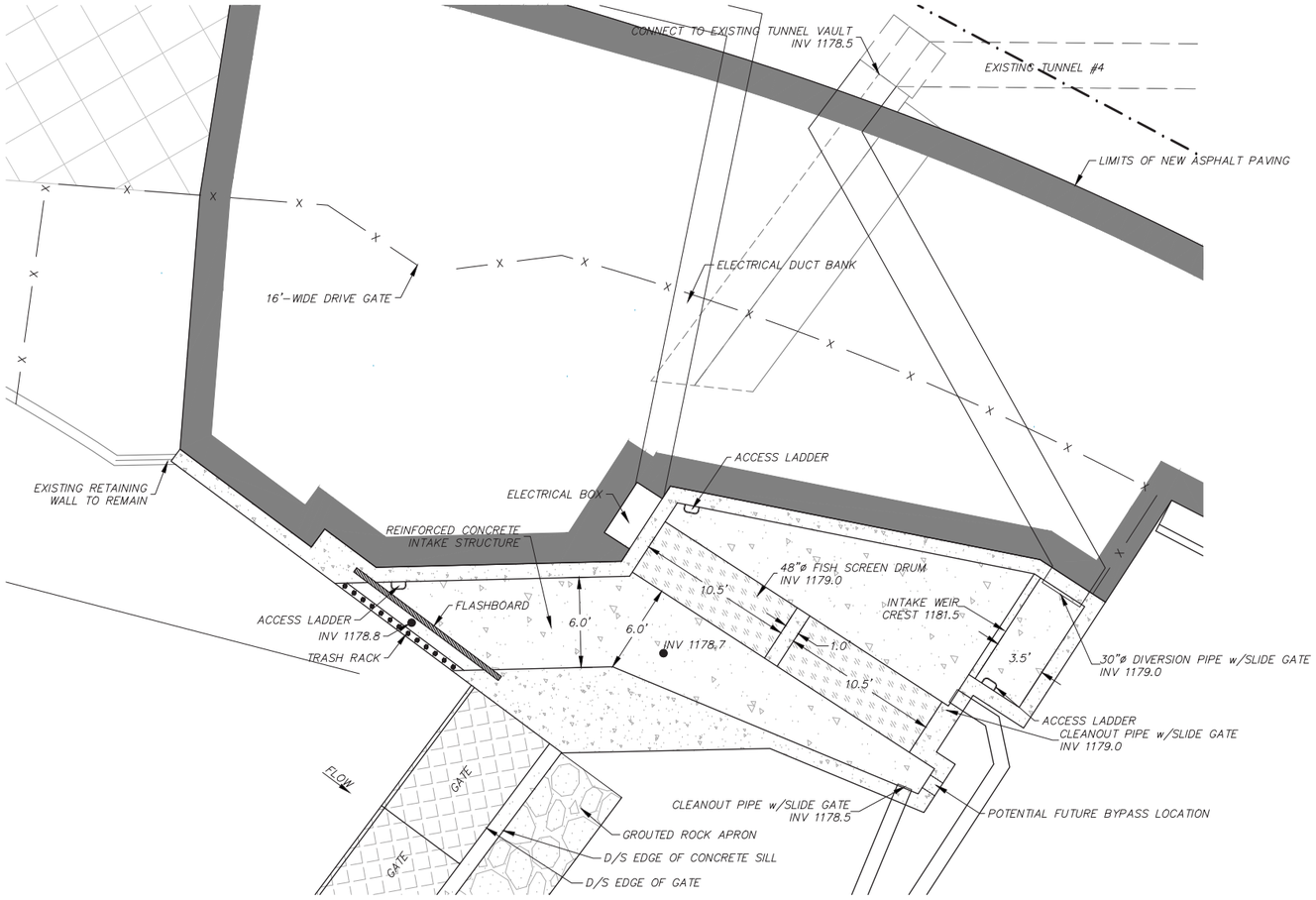
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Date	05 March 2020 (11:23)
Status	PRELIMINARY
Designer	tvs/gp
Drafter	tvs
Checked	eew
File Name	ARROYO SECO
Plotted Scale	0 1/2 1

Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement
Roughened Channel Cross Sections Sheet

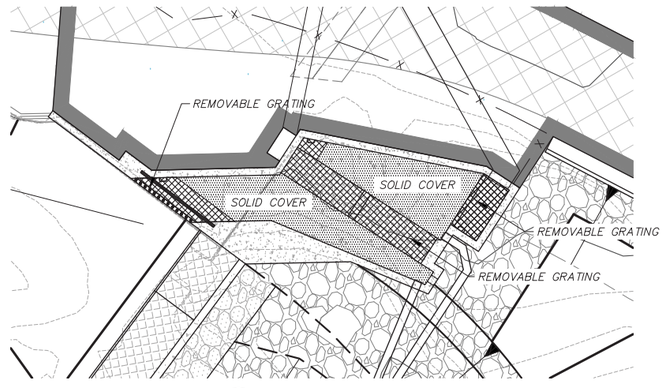
Job Number 6004878

Sheet Number C3

LAST SAVED BY:tshinkle LAST DATE SAVED:03/05/2020 11:09
FILE LOCATION:P:\6004878-ARROYO_SECO\AC-6004878\DWG\ARROYO SECO.DWG



A/D1 **INTAKE STRUCTURE PLAN VIEW - (COVER NOT SHOWN)**
H: 1"=5'



B/D1 **COVER PLAN**
H: 1"=5'

City of Pasadena
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Revisions		
No.	Date	Description

Drawing Information	
Date	05 March 2020 (11:23)
Status	PRELIMINARY
Designer	tvs/gp
Drafter	tvs
Checked	eew
File Name	ARROYO SECO DETAILS
Plotted Scale	0 1/2 1

Arroyo Seco Canyon Project
Area 2 Diversion/Intake Replacement
Details Sheet

Job Number 6004878

Sheet Number **D1**

Sheet 8 of 8

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FILE LOCATION:P:\6004878-ARROYO_SECO\AC-6004878\DWG\ARROYO SECO DETAILS.DWG

APPENDIX C

HYDRAULIC INFORMATION

INTAKE/DIVERSION HYDRAULIC DESIGN

Arroyo Seco

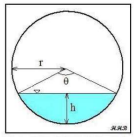
Outlet 1 - Diversion

Tunnel Entrance

Normal depth from Manning's eq.
Bottom Width (FT) 4
Side Slopes (H:V) 0
Invert Slope 0.005
n 0.015
Inv Elevation (FT) 1174.47

Diversion Pipe Outlet

Normal depth from Manning's eq.
Radius (FT) 1.25
Invert Slope 0.05
n 0.015
Inv Elevation (FT) 1179.46



Diversion Pipe Inlet

Inv Elevation (FT) 1179.96

				Design for Max Qd -->	Qd (CFS)	A (SF)	R (FT)	d (FT)	WSE (FT)	Q (CFS)	Theta	A (SF)	R (FT)	d (FT)	WSE (FT)	d (FT)	WSE (FT)
					25	4.45	0.71	1.11	1175.59	25	2.68	1.74	0.52	0.96	1180.42	0.96	1180.92
WSE at Diversion Weir (FT)	Outlet 1 Q (CFS)	Outlet 2 Q (CFS)	Total Q (CFS)		Q (CFS)	A (SF)	R (FT)	d (FT)	WSE (FT)	Q (CFS)	Theta	A (SF)	R (FT)	d (FT)	WSE (FT)	d (FT)	WSE (FT)
1181.61	1.50	0.00	1.50		1.50	0.71	0.16	0.18	1174.65	1.50	1.25	0.24	0.15	0.24	1179.70	0.24	1180.20
1181.79	5.00	0.00	5.00		5.00	1.52	0.32	0.38	1174.85	5.00	1.70	0.55	0.26	0.42	1179.88	0.42	1180.38
1181.99	10.00	0.00	10.00		10.00	2.39	0.46	0.60	1175.07	10.00	2.04	0.90	0.35	0.60	1180.06	0.60	1180.56
1182.16	15.00	0.00	15.00		15.00	3.13	0.56	0.78	1175.26	15.00	2.29	1.20	0.42	0.73	1180.19	0.73	1180.69
1182.31	20.00	0.00	20.00		20.00	3.81	0.65	0.95	1175.43	20.00	2.49	1.48	0.47	0.85	1180.31	0.85	1180.81
1182.45	25.00	0.00	25.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	5.00	30.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	10.00	35.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	20.00	45.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	30.00	55.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	40.00	65.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	50.00	75.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	60.00	85.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	70.00	95.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92
1182.45	25.00	75.00	100.00		25.00	4.45	0.71	1.11	1175.59	25.00	2.67	1.74	0.52	0.96	1180.42	0.96	1180.92

INTAKE/DIVERSION HYDRAULIC DESIGN (CONTINUED)

Outlet 1 - Diversion

Intake Weir and Diversion Gate

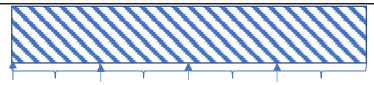
Weir Equation	
Q=C L H^3/2	
Weir Coeff (C)	3.2
Weir Width	8
Top of Weir Elevation (FT)	1181.46

	US	DS	Drop
Optional Fishway IE (FT)	1180.66	1174.80	5.86

Q (CFS)	A (SF)	H (FT)	WSE (FT)
25	7.87	0.98	1182.44

Fish Screen

Exit Head Loss			
HL=K(V^2)/2g			
Max appoach velocity (FPS)	0.4		
Screen Length (FT)	20		
K	1.5		
Inv Elevation (FT)	1178.79		
Bottom of Screen (FT)	1178.96	Top of Screen (FT)	1182.96
Low Flow depth on Screen	2.50	% of Total Height	63%
High Flow % Screer	87%		



Depth (FT)	Check Screen Length (FT)	Screen Area (SF)
3.48	18.18	63.33

Q (CFS)	A (SF)	H (FT)	WSE (FT)	Depth (FT)	Check Approach Vel	Sweep Vel Point 1	Sweep Vel Point 2	Sweep Vel Point 3	Sweep Vel Point 4	HL (FT)	WSE US (FT)
1.50	1.21	0.15	1181.61	2.65	0.03	0.1	0.1	0.1	0.0	0.000	1181.61
5.00	2.69	0.34	1181.79	2.84	0.09	0.2	0.2	0.2	0.1	0.000	1181.79
10.00	4.27	0.53	1181.99	3.03	0.16	0.4	0.4	0.3	0.2	0.001	1181.99
15.00	5.60	0.70	1182.16	3.20	0.23	0.6	0.6	0.5	0.3	0.001	1182.16
20.00	6.79	0.85	1182.30	3.35	0.30	0.8	0.8	0.6	0.4	0.002	1182.31
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44
25.00	7.87	0.98	1182.44	3.48	0.36	1.0	1.0	0.7	0.4	0.003	1182.44

INTAKE/DIVERSION HYDRAULIC DESIGN (CONTINUED)

Outlet 1 - Diversion					Outlet 2 - Crest Gate and Dam Crest							
Trash Rack and Sill					Diversion Weir and Crest Gate				Dam			
Trash Rack Length (FT)	10.0				Weir Top Elev (FT)	1177.82			Dam Top Elev (FT)	1183		
Sill El (FT)	1178.79				Crest Gate Top Elev (FT)	1182.95			Weir Equation			
Intake El (FT)	1177.82				Weir Equation				Q=C L H^3/2			
Head loss as a function of velocity					Q=C L H^3/2				Weir Coeff (C)	3.2		
Trash rack and entrance = k1*V^2/2g		k1	0.6		Weir Coeff (C)	3.2			Weir Width	26		
Sill = k2*V^2/2g		k2	0.15		Weir Width	10						
		Total	0.75									
Assume fraction of trash rack area open			0.85									
Depth (FT)	WSE DS (FT)	V (FPS)	HL	WSE US (FT)	Q (CFS)	H (FT)	WSE (FT)	Gate EL (FT)	WSE (FT)	H (FT)	A (SF)	Q (CFS)
2.82	1181.61	0.05	0.000	1181.61	0.00	0.0000	1181.61	1182.95	1181.61	0.00	0.00	0.00
3.00	1181.79	0.17	0.000	1181.79	0.00	0.0000	1181.79	1182.95	1181.79	0.00	0.00	0.00
3.20	1181.99	0.31	0.001	1181.99	0.00	0.0000	1181.99	1182.95	1181.99	0.00	0.00	0.00
3.37	1182.16	0.45	0.002	1182.16	0.00	0.0000	1182.16	1182.95	1182.16	0.00	0.00	0.00
3.51	1182.30	0.57	0.004	1182.31	0.00	0.0000	1182.31	1182.95	1182.31	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	0.00	0.0000	1182.45	1182.95	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	5.00	0.2901	1182.45	1182.66	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	10.00	0.4605	1182.45	1182.49	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	20.00	0.7310	1182.45	1182.22	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	30.00	0.9579	1182.45	1181.99	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	40.00	1.1604	1182.45	1181.79	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	50.00	1.3465	1182.45	1181.60	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	60.00	1.5206	1182.45	1181.43	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	70.00	1.6851	1182.45	1181.26	1182.45	0.00	0.00	0.00
3.65	1182.44	0.68	0.005	1182.45	75.00	1.7644	1182.45	1181.18	1182.45	0.00	0.00	0.00

Arroyo Seco Diversion
Roughened Channel Assessment

ESM Sizing

CDFW Part XI, 2009 recommends use of USACE eq for shallow steep channels
USACE EM 1110-2-1601

$$D_{30} = \frac{1.95\ S^{0.555}\ q^{2/3}}{g^{1/3}} \qquad (3\text{-}5)$$

2D HEC-RAS modeling results under 100-year flow conditions: unit flows for 24.5 ft/s at 9.5 ft depth

q		235.2	cfs

S		0.04	use bed slope	
D30s=	1.95*S^0.55*(1.25*q)^0.666/32.2^0.333			
D30s=	3.97	ft	min	
other sizes based on D30 calculated				
D84=	1.5*D30s	5.95	ft	min
D50=	0.4*D84	2.38	ft	min
D100=	2.5*D84	14.88	ft	

S		0.026	use energy grade slope	
D30s=	1.95*S^0.55*(1.25*q)^0.666/32.2^0.333			
D30s=	3.11	ft	min	
based on D30 calculated				
D84=	1.5*D30s	4.66	ft	min
D50=	0.4*D84	1.86	ft	min
D100=	2.5*D84	11.66	ft	

Riprap Sizing
Arroyo Seco Intake/Diversion
Rock Sizing for Bank Protection (Road Stabilization)

Corps EM 1110-2-1601
In Bend
D30=Sf*Cs*Cv*Ct*d*[(unit weight of water/(unit weight of stone - unit weight of water))^0.5*v/(K1*g*d)^0.5]^2.5

		Selected Values			
Sf	1.1 min, see 1601 text	1.1			
Cs	0.3 for angular rock, 0.375 for rounded	0.3			
Cv	1.283-0.2log(R/W)	1.2	overall curve	R= 400	W= 100
Ct	based on blanket thickness in relation to D85/D15 ratio	1.0			
d	from RAS	3.00	ft	on left bank terrace	
unit weight of water		62.4	pcf		
unit weight of stone		165.0	pcf		
V	from RAS	9.00	fps	on left bank terrace	
Vss	Vss=Vavg*1.74-0.52log(R/W)	12.8	fps		
K1	use Plate 39, 40	0.71		use K1 from recommended curve, plate 39, cot(theta)=1.5	
g		32.2	ft/sec2		

	ft	in
D30=	1.85	22.21
use USACE 42" gradation		
D30 min =	1.70	20.40
D90 min =	2.47	29.64
D50 min=	2.04	24.49
D100 min	2.57	30.78
D100 max	3.46	41.47

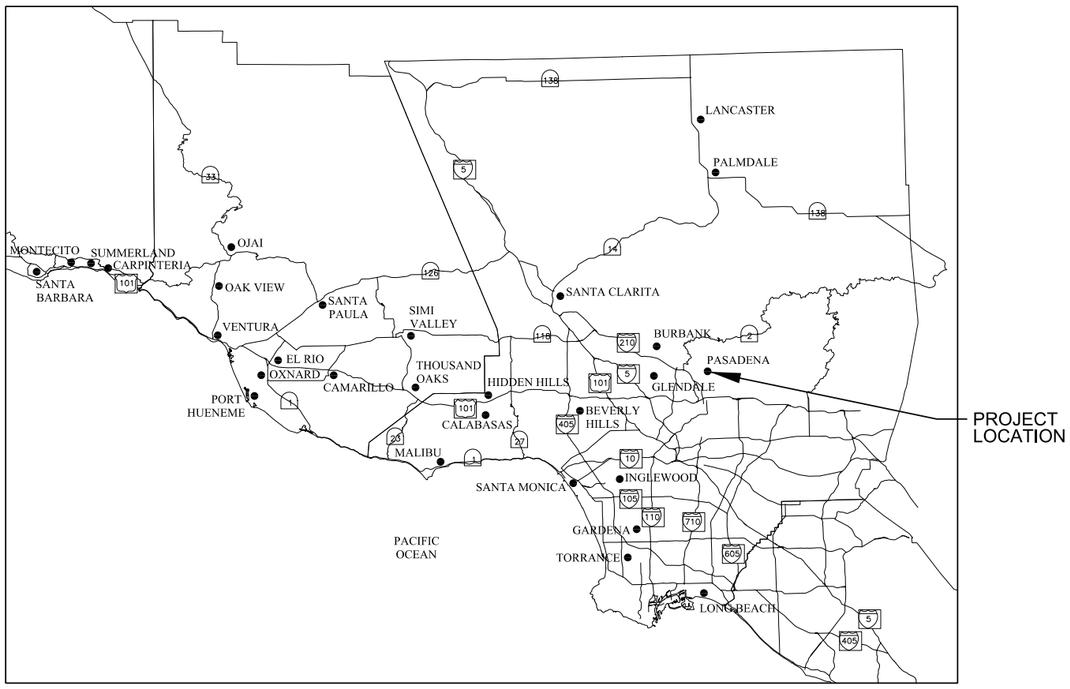
Appendix B-2

Arroyo Seco Canyon Project- 100% Submittal Plans for Area 3 Only, April 2017

Plot Date: 10-APR-2017 9:03:30 AM
User: BBerg
PlotScale: 0.083333:1
DesignScript: Carollo_Std_Pen_v0905.pen
ColorTable: gshade.ctb
Model: Layout1
LAST SAVED BY: trea

PASADENA WATER & POWER
ARROYO SECO CANYON PROJECT

100% SUBMITTAL



LOCATION MAP
NOT TO SCALE



VICINITY MAP
NOT TO SCALE

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
PE #
NAME
APPROVED: DATE
APPROVED: DATE

carollo

D.S.-206 TO 209
DATE: APRIL 2017
SCALE: AS SHOWN
DRAWN BY: SDW
DESIGNED BY: SJS
CHECKED BY: JED
SUBMITTED BY: —
FIELD BOOKS
CALC BOOKS

PASADENA WATER & POWER
CITY OF PASADENA

ARROYO SECO CANYON PROJECT
TLTLE SHEET, VICINITY MAP, AND LOCATION MAP

APPROVED
APPROVED

SHEET NO — OF XX SHEETS
WORK ORDER: 03055
FILE NUMBER: 00G-01 (E-1757)
REVISION

9137A10 9137A10 FILE NAME: 9137A1000G01.dgn

FILE NO./ DWG. NO.	SHEET NO.	
		GENERAL
00G-01	1	TITLE SHEET, VICINITY MAP, AND LOCATION MAP
00G-02	2	LIST OF DRAWINGS AND DESIGN CRITERIA
00G-03	3	ABBREVIATIONS AND GENERAL NOTES
00G-04	4	SYMBOLS 1
00G-05	5	SYMBOLS 2
00G-06	6	EQUIPMENT, PIPE, AND VALVE SCHEDULES
		DEMOLITION
01D-01	7	AREA 1 - DEMOLITION PLAN
02D-01	8	AREA 2 - DEMOLITION PLAN FOR WEIR AND INTAKE
02D-02	9	AREA 2 - DEMOLITION PLAN (CIVIL)
03D-01	10	AREA 3 - DEMOLITION PLAN
03D-02	11	AREA 3 - DEMOLITION PLAN & PHOTOS
03D-03	12	AREA 3 - DEMOLITION PHOTOS
		CIVIL
00TD-01	13	TYPICAL DETAILS - 1
00TD-02	14	TYPICAL DETAILS - 2
00TD-03	15	TYPICAL DETAILS - 3
00TD-04	16	TYPICAL DETAILS - 4
00TD-05	17	TYPICAL DETAILS - 5
00TD-06	18	TYPICAL DETAILS - 6
00TD-07	19	TYPICAL DETAILS - 7
00C-01	20	OVERALL SITE PLAN
02C-01	21	AREA 2 - SITE PLAN
02C-02	22	AREA 2 - SECTION AND DETAILS
02C-03	23	AREA 2 - WEIR GATE SITE PLAN AND SECTION
02C-04	24	AREA 2 - MISCELLANEOUS SITE WORK
03C-01	25	AREA 3A - BASIN SITE & GRADING PLAN
03C-01A	26	AREA 3 - TEMPORARY ACCESS ROAD PLAN
03C-02	27	AREA 3B - BASIN SITE & GRADING PLAN
03C-03	28	AREA 3C - BASIN SITE & GRADING PLAN
03C-04	29	AREA 3D - BASIN SITE & GRADING PLAN
03C-05	30	AREA 3A - PIPING PLAN
03C-06	31	AREA 3B - PIPING PLAN
03C-07	32	AREA 3C - PIPING PLAN
03C-08	33	AREA 3D - PIPING PLAN
03C-09	34	AREA 3 - ROAD PLAN & PROFILE - 1
03C-10	35	AREA 3 - ROAD PLAN & PROFILE - 2
03C-11	36	AREA 3 - ROAD PLAN & PROFILE - 3
03C-12	37	AREA 3 - DETAILS & SECTIONS - 1
03C-13	38	AREA 3 - DETAILS & SECTIONS - 2
03C-14	39	AREA 3 - DETAILS & SECTIONS - 3
03C-15	40	AREA 3 - DETAILS & SECTIONS - 4
03C-16	41	AREA 3 - RESTROOM - PLAN
03C-17	42	AREA 3 - RESTROOM - ELEVATIONS
03C-18	43	AREA 3 - RESTROOM - INTERIOR ELEVATIONS
		MECHANICAL
02GM-01	44	GENERAL MECHANICAL DETAILS
02M-01	45	AREA 2 - WEIR GATE PLAN
02M-02	46	AREA 2 - WEIR GATE SECTIONS AND DETAILS
02M-03	47	AREA 2 - WEIR GATE SERVICE BUILDING
02M-04	48	AREA 2 - WEIR GATE HYDRAULIC SCHEMATIC
02M-05	49	AREA 2 - WEIR GATE INTAKE VAULT PLAN, SECTIONS, AND
		STRUCTURAL
00S-01	50	STRUCTURAL NOTES - SHEET I
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00TS-01	52	TYPICAL STRUCTURAL DETAILS - 1
00TS-02	53	TYPICAL STRUCTURAL DETAILS - 2
02GS-01	54	AREA 2 - GENERAL STRUCTURAL NOTES
02GS-02	55	AREA 2 - GENERAL STRUCTURAL DETAILS
02S-01	56	AREA 2 - WEIR GATE PLAN
02S-02	57	AREA 2 - WEIR GATE SECTIONS AND DETAILS - I
02S-03	58	AREA 2 - WEIR GATE SECTIONS AND DETAILS - II
02S-04	59	AREA 2 - WEIR GATE SECTIONS AND DETAILS - III
02S-05	60	AREA 2 - INTAKE SERVICE BUILDING
02S-06	61	AREA 2 - INTAKE VAULT INTAKE VAULT PLANS
02S-07	62	AREA 2 - INTAKE VAULT INTAKE VAULT SECTIONS AND DETAILS
02S-08	63	AREA 2 - TRASH RACK PLAN, SECTIONS AND DETAILS
03S-01	64	AREA 3 - SEDIMENTATION BASIN - BOTTOM PLAN
03S-02	65	AREA 3 - SEDIMENTATION BASIN - TOP PLAN
03S-03	66	AREA 3 - SEDIMENTATION BASIN - SECTIONS
03S-04	67	AREA 3 - STORMWATER DRAIN CROSSING PLAN & PROFILE
03S-05	68	AREA 3 - STORM DRAIN CROSSING SECTIONS AND DETAILS
		ELECTRICAL
00GE-01	69	LEGENDS
00GE-02	70	ABBREVIATIONS
00ET-01	71	ELECTRICAL TYPICAL DETAILS - I
00ET-02	72	ELECTRICAL TYPICAL DETAILS - II
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02E-01	77	AREA 2 - ELECTRICAL SITE PLAN
02E-02	78	AREA 2 - BASIN SITE PLAN
02E-03	79	INTAKE SERVICE BUILDING ELECTRICAL PLAN
02E-04	80	AREA 2 - DUCT BANK SECTIONS
03DE-01	81	AREA 3 - DEMOLITION PLAN
03E-01	82	AREA 3 - ELECTRICAL SITE PLAN - I
03E-02	83	AREA 3B - BASIN SITE AND GRADING PLAN
03E-03	84	AREA 3 - RESTROOMS PLAN
03E-04	85	AREA 3 - SUMP PUMPS PLANS
04E-01	86	AREA 2 - CONDUIT SCHEDULES
04E-02	87	AREA 3 - CONDUIT SCHEDULES - I
04E-03	88	AREA 3 - CONDUIT SCHEDULES - II
04E-04	89	ELECTRICAL SCHEDULES
00NG-01	90	**INSTRUMENTATION** SYMBOLS AND ABBREVIATIONS - I
00NG-02	91	SYMBOLS AND ABBREVIATIONS - II
00NG-03	92	SYMBOLS AND ABBREVIATIONS - III
00NG-04	93	SYMBOLS AND ABBREVIATIONS - IV
00NG-05	94	TYPICAL PCM POWER DISTRIBUTION
00NG-06	95	PCM-300 PANEL LAYOUT
00NG-07	96	SAMPLE LOOP DRAWING
00NT-01	97	INSTRUMENTATION TYPICAL DETAILS - I
02N-01	98	AREA 2 - FLOW CONTROL - I
02N-02	99	AREA 2 - FLOW CONTROL - II
03N-01	100	AREA 3 - RESTROOM PUMPS - I
03N-02	101	AREA 3 - RESTROOM PUMPS - II
03N-03	102	AREA 3 - RAW WATER
		LANDSCAPING
01L-01	103	AREA 1 EXISTING CONDITIONS & NOTES
01L-02	104	AREA 1 SITE PROTECTION AND DEWATERING
01L-03	105	AREA 1 GRADING PLAN
01L-04	106	AREA 1 RESTORATION AND LANDSCAPE OVERVIEW
01L-05	107	PICNIC AREA FEATURES
01L-06	108	POOL AND UPPER FOODPLAIN FEATURES
01L-07	109	AREA 1 CHANNEL PROFILE
01L-08	110	CROSS SECTIONS
01L-09	111	AREA 1 PLANTING PLAN
01L-10	112	PICNIC AREA IRRIGATION AND TREE PLANTING
01L-11	113	DETAILS - LARGE WOOD STRUCTURES
01L-12	114	DETAILS - CHANNEL AND BANK FEATURES
01L-13	115	DETAILS - PLANTING & HITCHING RAIL
01L-14	116	DETAILS - IRRIGATION
01L-15	117	DETAILS - PICNIC TABLE
01L-16	118	DETAILS - PICNIC TABLE
03L-01	119	AREA 3 PLANTING PLAN
03L-02	120	AREA 3 IRRIGATION PLAN
03L-03	121	AREA 3 PLANTING DETAILS
03L-04	122	AREA 3 IRRIGATION DETAILS

DESIGN CRITERIA

DESCRIPTION	UNITS	CRITERIA
SPREADING BASINS		
RECHARGE CAPACITY	CFS	25
PERCOLATION RATE [1]	FT/DAY	2.75
NUMBER OF NEW BASINS	NO.	6

	AREA (AC) [2]	STORAGE DEPTH (FT)	STORAGE VOL (AC-FT)
BASIN E	0.8	1.7	1.4
BASIN F	0.4	1	0.4
BASIN G	1.1	1	1.1
BASIN H	0.9	1	0.9
BASIN I	0.7	1	0.7
BASIN J	0.4	1	0.4
TOTAL	4.3		4.9

SEDIMENTATION BASINS		
TYPE		RECTANGULAR
NUMBER OF BASINS	NO.	1
DIMENSIONS (EA)	FT x FT	160 x 20
WATER DEPTH (MAX)	FT	9
SURFACE LOADING RATE	GPM / FT^2	4.5
DETENTION TIME	MIN	15

NOTES
(1) BASED ON FIELD OBSERVATIONS IN 2013 BY CITY STAFF
(2) BASED ON FOOTPRINT @ MAXIMUM OPERATING DEPTH

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
PE #
NAME
APPROVED: DATE
APPROVED: DATE

carollo®

CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE APRIL 2017	SCALE AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
DRAWN BY SDW DESIGNED BY SJS CHECKED BY JED SUBMITTED BY —		ARROYO SECO CANYON PROJECT LIST OF DRAWINGS AND DESIGN CRITERIA	WORK ORDER 03055 / FILE NUMBER 00G-02 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1000G02.dgn

Plot Date: 14-APR-2017 10:23:04 AM
User: TRea
Model: Layout1 ColorTable: gshade.ctb DesignScript: Carollo_Std_Pen_v0905.pen PlotScale: 0.083333:1
LAST SAVED BY: trea

Plot Date: 10-APR-2017 9:43:05 AM
User: BBerg
Model: Layout1 ColorTable: gshade.ctb DesignScript: Carollo_Std_Pen_v0905.pen PlotScale: 0.083333:1
LAST SAVED BY: SFields

GENERAL NOTES

1. THESE PLANS AND SPECIFICATIONS REPRESENT THE DESIGN INTENT OF THE ENGINEER, AS APPROVED BY THE OWNER, CITY OF PASADENA. THE CONTRACTOR IS RESPONSIBLE FOR ALL ITEMS SHOWN ON THESE PLANS AND SPECIFICATIONS AND SHALL BE RESPONSIBLE FOR ANY DEVIATIONS FROM THESE PLANS AND ASSOCIATED RISK AND EXPENSE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING A COPY OF THE APPROVED PLANS AND SPECIFICATIONS AND ANY ADDENDA AT THE JOB SITE AT ALL TIMES. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY CITY OF PASADENA OF ANY UNFORESEEN CIRCUMSTANCES OR CONDITIONS THAT WOULD ALTER THESE PLANS AND SPECIFICATIONS FOR APPROVAL OF MODIFICATIONS TO THE INTENDED DESIGN.
2. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES NECESSARY TO PROTECT EXISTING FACILITIES AND UTILITIES SHOWN OR NOT SHOWN WHICH ARE TO REMAIN IN PLACE FROM DAMAGE. ALL FACILITIES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE EXPEDITIOUSLY REPAIRED OR RECONSTRUCTED TO THE CITY'S SATISFACTION AT THE CONTRACTOR'S EXPENSE WITHOUT ADDITIONAL COMPENSATION.
3. PROVIDE A MINIMUM OF 42 INCHES COVER ON ALL PIPELINES UNLESS OTHERWISE NOTED OR DIRECTED. INSTALL ALL PIPING AND PAVEMENT PER CITY OF PASADENA STD. PLAN S-407.
4. STRAIGHT ALIGNMENT AND UNIFORM SLOPES OF PIPES SHALL BE MAINTAINED BETWEEN INVERTS SHOWN. EXISTING UTILITIES SHALL BE VERIFIED IN ADVANCE OF PIPELINE PLACEMENT. CITY SHALL BE NOTIFIED IMMEDIATELY OF ANY EXISTING UTILITIES AFFECTING PIPELINE ALIGNMENT OR SLOPE.
5. ADJUST ALL VALVE BOXES, VAULTS, PULL BOXES AND MANHOLES TO FINISHED GRADE UNLESS OTHERWISE SHOWN OR DIRECTED.
6. ALL DEBRIS FROM DEMOLITION TO BE DISPOSED OF PROPERLY OFFSITE. ANY SALVAGEABLE MATERIALS OR EQUIPMENTS SHALL BE THE PROPERTY OF THE CITY AND MOVED TO THE CITY OF PASADENA WATER AND POWER MAINTENANCE YARD.
7. CONTRACTOR SHALL PROVIDE A STORM WATER POLLUTION CONTROL PLAN (PREPARED BY A CALIFORNIA REGISTERED CIVIL ENGINEER) FOR WORK DURING CONSTRUCTION CONFORMING TO THE NPDES PERMIT REQUIREMENTS.
8. THE CONTRACTOR SHALL SHORE, SUPPORT AND PROTECT EXISTING STRUCTURES AND FACILITIES IN ACCORDANCE WITH SECTION 02260.
9. WHERE REPLACING EXISTING PAVEMENT, MATCH EXIST GRADE AT EXISTING STRUCTURES AND BUILDINGS, EXCEPT WHERE NOTED OTHERWISE.
10. CONTRACTOR SHALL USE MECHANICAL RESTRAINT SYSTEMS, NOT THRUST BLOCKS, UNLESS NOTED OTHERWISE.
11. ALL EXISTING VALVES TO BE OPERATED BY CITY PERSONNEL ONLY. NOTIFY CITY 24 HOURS PRIOR TO NEED FOR VALVE OPERATION.
12. FOR CONNECTIONS TO EXISTING PIPES, CUT EXISTING PIPES SQUARE AND REPAIR ANY DAMAGE TO THE EXISTING LINING AND COATING.
13. ALL PIPE DIAMETERS ARE NOMINAL ID.
14. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL CONSTRUCTION SURVEYING AND STAKING. VERIFY ALL EXISTING HORIZONTAL AND VERTICAL INFORMATION PRIOR TO DOING ANY WORK.
15. CONTRACTOR SHALL WORK WITHIN LIMITS OF WORK.
16. ALL TRENCHING AND BACKFILL SHALL BE IN ACCORDANCE WITH CONTRACT DOCUMENTS.
17. ALL ABOVE GROUND PIPING SHALL BE SUPPORTED WHETHER EXPLICITLY NOTED OR NOT. PROVIDE PIPE SUPPORTS EVERY 2 FT UNLESS EXPLICITLY NOTED OTHERWISE ON THE PLANS.
18. ANY CONTRACTOR PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE HIMSELF WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM HIS OPERATIONS, WHETHER OR NOT SUCH FACILITIES ARE SHOWN ON THESE PLANS.
19. THE CONTRACTOR'S ATTENTION IS EXPRESSLY DIRECTED TO ALL THE REQUIREMENTS AND PROVISIONS OF THE STATE OF CALIFORNIA SAFETY REGULATIONS. CONFORMANCE SHALL BE STRICTLY ENFORCED DURING THE ENTIRE LIFE OF THE CONTRACT AND/OR PROJECT. AN EXCAVATION PERMIT WILL BE REQUIRED FOR TRENCHES IN EXCESS OF 5.0 FEET IN DEPTH FROM CAL-OSHA.
20. THE CONTRACTOR SHALL DISPOSE OF ALL SURPLUS EXCAVATION AND DEMOLITION DEBRIS CONFORMING TO LOCAL CODES AND REGULATION.
21. THE CONTRACTOR SHALL REPLACE IN KIND, TO THE SATISFACTION OF THE CITY, ANY PAVING, OR OTHER IMPROVEMENTS CUT, REMOVED OR DAMAGED IN CONJUNCTION WITH THIS PROJECT.
22. PIPE DELIVERED TO THE SITE SHALL BE PROTECTED BY THE CONTRACTOR FROM DUST OR CONTAMINATION PRIOR TO PLACING IN TRENCH, DURING INSTALLATION AND TESTING. PIPE IS TO BE STORED TO PREVENT DAMAGE IN ACCORDANCE WITH MANUFACTURING RECOMMENDATIONS AND PROCEDURES. RECEIVING, STORAGE, AND HANDLING OF ALL POTABLE WATER PIPE AND APPURTENANCES SHALL BE IN ACCORDANCE WITH AWWA STANDARDS AND PROCEDURES.
23. THE CONTRACTOR SHALL ENSURE THAT ALL OPENINGS INTO ALL PIPELINES ARE PROTECTED AND AT THE END OF EACH WORK DAY SECURELY PLUGGED AND STOPPED SO THAT NO ANIMAL, FOWL OR RODENT CAN ENTER THE PIPELINE.
24. NO PIPELINE SHALL BE INSTALLED ON FILL MATERIAL WITHOUT FIRST MEETING IN-PLACE DENSITY TESTS REQUIRED.
25. ALL PERMITS REQUIRED BY LAW SHALL BE ACQUIRED BY CONTRACTOR BEFORE COMMENCING WORK. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE RULES AND REGULATIONS. SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
26. PRIOR TO START OF CONSTRUCTION, THE CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES IN AND AROUND THE AREAS OF NEW CONSTRUCTION. THE CONTRACTOR SHALL SUBMIT POTHOLE LOCATION DRAWINGS TO THE CITY FOR REVIEW PRIOR TO SUBMITTAL OF SHOP DRAWINGS. SUBMITTAL OF PROPOSED POTHOLE LOCATIONS TO THE CITY SHALL NOT RELIEVE CONTRACTOR OF ITS DUTY AND RESPONSIBILITY FOR REPAIRING DAMAGE TO UTILITIES FROM CONTRACTOR'S WORK OR MAKING FIELD ADJUSTMENTS TO PROPOSED PIPELINE ALIGNMENTS AND CONNECTIONS PENDING WRITTEN APPROVAL BY THE CITY.
27. THE CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF THE PRESENCE AND LOCATION OF ALL EXISTING SURFACE FEATURES, WHETHER SHOWN OR NOT HEREIN.
28. PRIOR TO SUBMITTAL OF PIPE SHOP DRAWINGS, THE CONTRACTOR SHALL FIELD POTHOLE TO VERIFY THE INVERT ELEVATION, OUTSIDE DIAMETER, LOCATION AND MATERIAL OF ALL EXISTING PIPELINES TO WHICH NEW PIPELINES WILL BE CONNECTED, AND SUBMIT THE INFORMATION WITH THE PIPE SUBMITTAL.

GENERAL NOTES

29. PROVIDE CONCRETE ENCASEMENT FOR ALL PIPING BENEATH STRUCTURES, PADS, VAULTS, AND ANY OTHER FACILITIES PER TYPICAL DETAIL P040.
30. ALL BUILDING COORDINATES ARE TO OUTSIDE CORNER OF COLUMN OR BUILDING WALL, UNLESS OTHERWISE INDICATED.
31. SMALL YARD PIPING (10 INCHES AND LESS INSIDE DIAMETER) IS SHOWN AS A CENTERLINE ON THE PLANS TO SCALE BUT IS NOT DIMENSIONED. THE CONTRACTOR SHALL FIELD INSTALL THE SMALL YARD PIPING ON LINE AND GRADE WITH MINIMUM COVER UNLESS OTHERWISE INDICATED CONFLICTS BETWEEN PIPES SHALL BE RESOLVED AS FOLLOWS: GRAVITY LINES HAVE PRIORITY. PRESSURE PIPELINES SHALL BE ROUTED UNDER OR OVER GRAVITY LINES AS NECESSARY WITH SETBACKS AND INSTALLATION PER CDPH STANDARDS AND GUIDELINES.
32. PRIOR TO PAVING, ALL UNDERGROUND FACILITIES INCLUDING, BUT NOT LIMITED TO SEWER, WATER, TELEPHONE, CABLE, POWER, INSTRUMENTATION, AND GAS SHALL BE IN PLACE AND TESTED.
33. OVER EXCAVATE 5 FT (MIN) HORIZONTALLY FROM FOUNDATION FOR ALL NEW STRUCTURES. OVER EXCAVATE 3 FT (MIN) VERTICALLY BENEATH FOUNDATION FOR ALL NEW STRUCTURES.
34. PROVIDE CONCRETE EQUIPMENT BASE PAD UNDER ALL EQUIPMENT. REFER TO STRUCTURAL TYPICAL DETAILS.
35. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTROLLING GROUNDWATER ENCOUNTERED AND SECURING APPROPRIATE DISCHARGE PERMITS. CONTRACTOR SHALL SUBMIT DEWATERING PLAN TO ENGINEER FOR APPROVAL. DEWATERING SHALL BE IN ACCORDANCE WITH SECTION 02240.
36. THE CONTRACTOR SHALL NOT SHUT OFF ANY WATER OR ELECTRICAL SERVICE AT THE CURB AT ANY TIME, SHOULD THE CONTRACTOR REQUIRE THE WATER OR ELECTRICAL SERVICE TO BE SHUT OFF TO THE PRIVATE PROPERTY, ARRANGEMENTS SHALL BE MADE SOLELY BY THE CONTRACTOR WITH THE PROPERTY OWNER AND THE CONTRACTOR SHALL PROVIDE THE PROPERTY OWNER WITH AT LEAST 48 HOURS PRIOR NOTICE.
37. USE CURRENT REVISIONS AND VERSIONS FOR ALL REFERENCED APWA STANDARD PLANS.
38. IF THE CONTRACTOR PROPOSES TO TRIM TREES OR SHRUBS THAT FACILITATE HIS CONSTRUCTION ACCESS, SUCH PROPOSALS SHALL BE SUBMITTED TO THE CITY FOR REVIEW AND WRITTEN APPROVAL TWO WEEKS IN ADVANCE OF THE WORK. TRIMMING WORK SHALL BE DESIGNED AND SUPERVISED BY A LICENSED ARBORIST. THE CONTRACTOR SHALL NOTIFY AND RECEIVE WRITTEN APPROVAL PRIOR TO REMOVING ANY TREES WITHIN THE PROJECT AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE TO EXISTING TREES OR SHRUBS AND SHALL REPLACE ANY DAMAGED LANDSCAPE IN ACCORDANCE WITH CITY OF PASADENA REQUIREMENTS.
39. THE CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF THE PROJECT, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND SHALL NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE CITY AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE CITY OR THE ENGINEER.
40. THE CONTRACTOR SHALL MAINTAIN A CLEAN WORK SITE FOR THE DURATION OF THE CONTRACT.
41. CONTRACTOR IS RESPONSIBLE FOR DESIGN AND APPROVAL OF TRAFFIC CONTROL BY CITY OF PASADENA TRANSPORTATION DEPARTMENT.
42. A COPY OF ALL PERMITS MUST BE KEPT ON-SITE DURING ALL PERIODS OF OPERATION.
43. THE FOLLOWING NOTES APPLY TO THE STRUCTURAL AND/OR GRADING PERMITS:
    A. CONTRACTOR MUST SUBMIT FINAL EXCAVATION DETAILS OF AREA AND CROSS SECTION OF EXCAVATION INCLUDING CALCULATED AMOUNTS OF CUT, FILL, AND EXPORT IN CUBIC YARDS FOR APPROVAL BY CITY OF PASADENA, DEPARTMENT OF BUILDING AND SAFETY.
    B. CONTRACTOR MUST FULFILL ANY OTHER CONDITIONS THAT ARE REQUIRED FOR PERMIT APPROVAL BY THE CITY OF PASADENA.
44. FURNISH AND INSTALL TRACER WIRE AND WARNING TAPE FOR ALL BURIED PIPE.
45. CONTRACTOR SHALL COORDINATE WITH CITY OF PASADENA WATER AND POWER DURING THE DEMOLITION PHASE OF THIS PROJECT AND SALVAGE ALL MATERIALS AND EQUIPMENT AS REQUIRED. SALVAGED EQUIPMENT WILL BE DELIVERED TO THE OWNERS SPECIFIED LOCATION.
46. PROVIDE A MINIMUM OF 10-FEET HORIZONTAL SEPARATION BETWEEN POTABLE AND NON-POTABLE PIPELINES IN ACCORDANCE WITH CDPH REQUIREMENTS.
47. PRIOR TO BACK FILLING PIPE TRENCHES, CONTRACTOR SHALL FIELD SURVEY AND PROVIDE AS BUILT COORDINATES FOR ALL NEW STRUCTURES, PIPELINES, AND APPURTENANCES.
48. ALL PAVEMENT REPLACEMENT SHALL BE DONE IN ACCORDANCE WITH CITY OF PASADENA PUBLIC WORKS DEPARTMENT STANDARDS. REFER TO CITY OF PASADENA STD. PLANS S-415, S-416, AND S-417.
49. CONTRACTOR SHALL BE RESPONSIBLE TO POT HOLE AND FIELD VERIFY THE LOCATION AND DEPTH OF ALL EXISTING UTILITIES REMAINING IN SERVICE THAT WILL BE CROSSED, OR WITHIN 4-FEET HORIZONTALLY, OF THE PROPOSED PIPELINES.
50. CONTRACTOR SHALL PROVIDE AND MAINTAIN ACCESS FOR PEDESTRIANS AND TRAFFIC THROUGH AREAS 2 AND 3. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL DELINEATION'S, BARRICADES, TEMPORARY SIGNAGE, FLAGGERS, ETC. AS REQUIRED IN ACCORDANCE WITH CITY AND MUTCD STANDARDS.
51. CONTRACTOR IS REQUIRED TO OBTAIN ALL PERMITS WITH THE CITY, COUNTY, AND STATE PRIOR TO STARTING CONSTRUCTION. THIS INCLUDES, BUT IS NOT LIMITED TO DEMOLITION, GRADING, PAVING, BUILDING, ELECTRICAL, AND MECHANICAL.
52. THE CONTRACTOR MUST RECEIVE APPROVAL FROM THE CITY OF PASADENA ARBORIST PRIOR TO TRIMMING ANY TREES WITHIN THE CONSTRUCTION AREA. CONTRACTOR SHALL ALLOW 3 TO 4 WEEKS FOR CITY APPROVAL. ALL WORK MUST BE IN ACCORDANCE WITH THE TREE PROTECTION PLAN APPROVED BY THE CITY FORESTRY ADVISORY COMMITTEE. ALL EXCAVATION WITHIN TREE DRIP LINES MUST BE DONE BY HAND.
53. IT IS ANTICIPATED THAT A SIGNIFICANT AMOUNT OF LARGE ROCKS "BOULDERS" MAY BE ENCOUNTERED DURING THE EXCAVATION AND CONSTRUCTION OF THIS PROJECT. CONTRACTOR SHALL MAKE SPECIAL PROVISIONS REUSING, STOCK PILING, OR DISPOSING AT AN OFF-SITE LOCATION.
54. SOME OF THE HILLSIDE SLOPES WITHIN THE PROJECT AREA ARE PRONE TO ROCK SLIDES. CONTRACTOR SHALL TAKE CAUTION AND PROVIDE SPECIAL PROTECTION WHEN WORKING IN THESE AREAS.
55. THERE ARE SPECIAL PROVISIONS AND WORK RESTRICTIONS TO PROTECT NESTING BIRD HABITATS WITHIN THE PROJECT AREA. REFER TO TECHNICAL SPECIFICATIONS SECTION 01140 FOR ADDITIONAL REQUIREMENTS.
56. CONTRACTOR SHALL PROVIDE BRIDGE PROTECTION AND TEMPORARY ACCESS PLAN FOR ALL BRIDGES WHICH MAY BE IMPACTED BY CONSTRUCTION EQUIPMENT.
57. CONTRACTOR MAY REUSE ALL COBBLE AND ROCK BOULDERS GREATER THAN 18" OD FOR RIP RAP IF APPROVED BY ENGINEER.
58. THE PROPOSED IMPROVEMENTS SHOWN ON THESE DRAWINGS ARE SUPERIMPOSED ON A BASE MAP. THIS BASE MAP IS COMPILED FROM AERIAL AND GROUND SURVEYS, AND OTHER DATA AS MADE AVAILABLE TO THE ENGINEER, WHO SHALL NOT BE HELD LIABLE FOR CHANGES, INACCURACIES, OMISSIONS OR OTHER ERRORS ON THESE DOCUMENTS. THE COMPOSITE BASE MAP IS PROVIDED AS AN AID ONLY AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING THESE DOCUMENTS AND INCORPORATING/INTEGRATING ALL CONSTRUCTION AS REQUIRED TO ACCOMMODATE IT IN THE SAME. NONE OF THE INCLUDED DRAWINGS DEPICT A BOUNDARY SURVEY ALTHOUGH A PARTIAL ALTA SURVEY WAS PERFORMED ALONG A PORTION OF THE UP ROW. BOUNDARY LINES SHOWN ARE APPROXIMATE AND FOR INFORMATIONAL PURPOSES ONLY.
59. IN THE EVENT THAT SUBGRADE OBSTRUCTIONS ARE ENCOUNTERED OR DISCREPANCIES ARE FOUND BETWEEN THE DRAWINGS AND FIELD CONDITIONS, NOTIFY ENGINEER OR CITY OF PASADENA FOR DIRECTIONS. DO NOT PROCEED WITH THE WORK WITHOUT DIRECTION FROM THE ENGINEER.
60. CONTRACTOR SHALL NOTIFY ALL PUBLIC AND PRIVATE UTILITY COMPANIES IN THE PROJECT AREA A MINIMUM OF THREE (3 WORKING DAYS PRIOR TO COMMENCEMENT OF WORK. CONTRACTOR MUST INVESTIGATE AND VERIFY THE LOCATION OF ANY EXISTING UTILITIES WITHIN THE PROJECT AREA. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO IDENTIFY, LOCATE, AND PROTECT ALL UNDERGROUND UTILITIES, ANY UNDERGROUND UTILITIES SHOWN ON THE PLANS ARE CONSIDERED TENTATIVE AND APPROXIMATIONS AND THEREFORE, NO WARRANTY EXPRESSED OR IMPLIED IS MADE AS TO THE COMPLETENESS OR CORRECTNESS OF THEIR LOCATION. THE UTILITY COMPANIES ARE THOUGHT TO BE MEMBERS OF UNDERGROUND SERVICE ALERT (U.S.A.) ON-CALL PROGRAM. THE CONTRACTOR SHALL NOTIFY U.S.A. 72-HOURS IN ADVANCE OF PERFORMING EXCAVATION WORK AT 811 FROM 7:00 AM TO 5:00 PM, MONDAY THROUGH FRIDAY. EXISTING PUBLIC UTILITIES SHALL BE KEPT IN SERVICE AT ALL TIMES. UTILITIES THAT INTERFERE WITH THE WORK TO BE PERFORMED SHALL BE PROTECTED AS REQUIRED BY CITY OF PASADENA AND ALL OTHER AFFECTED ENTITIES. DAMAGE TO UTILITIES SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL COST TO CITY TO THE SATISFACTION OF THE ENGINEER AND OWNER. POTHOLING IS REQUIRED FOR ANY EXCAVATION WITHIN FIVE (5) FEET OF THE EXISTING GAS TRANSMISSION PIPE SHALL BE DUG BY HAND IN THE PRESENCE OF UTILITY INSPECTOR.
61. CITY OF PASADENA WILL PROVIDE A QUALIFIED BIOLOGICAL/ARCHEOLOGICAL MONITOR THAT WILL INITIALLY REVIEW SITE CONSTRUCTION PROTOCOLS WITH ALL CONSTRUCTION CONTRACTOR EMPLOYEES AT A PRE-CONSTRUCTION MEETING THAT WILL BE SPECIFICALLY HELD ON RESOURCE PROTECTION. EACH EMPLOYEE ASSIGNED TO THIS PROJECT MUST PARTICIPATE IN THIS PRE-CONSTRUCTION MEETING AND DISCUSSION OF ADJACENT SENSITIVE RESOURCES, AND SIGN A STATEMENT INDICATING THAT THEY HAVE READ AND UNDERSTOOD THE PROTOCOLS AND AGREE TO ADHERE TO THEM. SIGNIFICANT BREACHES OF PROTOCOL AND FAILURE TO ADEQUATELY PROVIDE THE DEGREE OF RESOURCE PROTECTION REQUIRED BY THIS PROJECT WILL RESULT IN THE ISSUANCE OF A STOP WORK ORDER BY THE ENGINEER OR BY THE MONITOR. CITY OF PASADENA PROVIDED MONITOR WILL CAREFULLY INSPECT ALL WORK AREAS FOR THE PRESENCE OF WILDLIFE OR CULTURAL RESOURCES PRIOR TO INSTALLATION OF PROTECTIVE BARRIER FENCING AND FIELD FENCING, AND PRIOR TO INITIATION OF CONSTRUCTION EACH DAY. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY PENALTIES AND ALL REPAIRS AND MITIGATIONS IMPOSED DUE TO BREACH OF PROTOCOL.
62. BY ENTERING INTO THIS CONTRACT WITH CITY OF PASADENA, THE CONTRACTOR AGREES TO HAVING EXAMINED THE SITE, COMPARING THE SITE CONDITIONS WITH THE DRAWINGS AND SPECIFICATIONS AND HAS CAREFULLY EXAMINED ALL OF THE CONTRACT DOCUMENTS AND IS SATISFIED AS TO THE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED. NO ALLOWANCE SHALL BE MADE SUBSEQUENTLY ON BEHALF OF THE CONTRACTOR DUE TO FAILURE TO BE ACQUAINTED WITH THE CONDITIONS OF THE SITE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH SUBCONTRACTORS AS REQUIRED TO ACCOMPLISH ALL CONSTRUCTION OPERATIONS. CONTRACTOR SHALL PROTECT ALL EXISTING ON-SITE AND OFF-SITE IMPROVEMENTS AGAINST DAMAGE RESULTING FROM OPERATIONS. RESPONSIBILITY EXTENDS TO THE CONTRACTOR'S WORKERS, SUBCONTRACTORS AND OTHERS PROVIDING SERVICES. CONTRACTOR SHALL REPAIR AND/OR REPLACE DAMAGE AT THEIR OWN EXPENSE AND TO THE SATISFACTION OF THE ENGINEER AND CITY OF PASADENA. THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD CITY OF PASADENA AND THE ENGINEER (QUESTA ENGINEERING CORPORATION) HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT, EXCEPT FROM LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF CITY OF PASADENA OR THE ENGINEER. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS.
63. CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION, INCLUDING THE SAFETY OF ALL PERSONS AND PROPERTY. TRAFFIC CONTROL, ACCESS TO AND FROM ADJOINING DRIVEWAYS AND STREETS, AND ANY LANE CLOSURES. TRASH GENERATED BY THIS WORK (CONSTRUCTION DEBRIS, PAPER, BOTTLES, CIGARETTES, ETC) SHALL BE REMOVED ON A DAILY BASIS. CONTRACTOR SHALL CONTROL DUST AT ALL TIMES WITH WATER.
64. ALL WORK SHALL BE IN COMPLIANCE WITH APPLICABLE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) STANDARDS AS SET FORTH BY THE FEDERAL DEPARTMENT OF LABOR AND/OR THE STATE OF CALIFORNIA AND CITY OF PASADENA. ALL TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE CALTRANS MANUAL OF TRAFFIC CONTROLS FOR CONSTRUCTION AND MAINTENANCE OF WORK ZONES. ALL SIGNS SHALL BE APPROPRIATELY CONSTRUCTED WITH REFLECTIVE MATERIAL ON A BACKING OF METAL OR FABRIC (NO WOOD OR PLASTIC ALLOWED) AND SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION TO PROVIDE PROPER VISIBILITY, PER SECTION 12 OF THE CALTRANS SPECIAL PROVISIONS. THE CONTRACTOR SHALL MAINTAIN REASONABLE ACCESS TO ALL ROADWAYS DURING CONSTRUCTION.
65. REFER TO THE SPECIFICATIONS THAT ARE A PART OF THESE CONTRACT DOCUMENTS, COMPLY WITH ALL REGULATIONS AND CODES GOVERNING WORK PERFORMED UNDER THIS CONTRACT. REFER TO CALTRANS STANDARD PLANS AND SPECIFICATIONS AS REQUIRED.
66. WRITTEN DIMENSIONS ALWAYS TAKE PRECEDENCE OVER SCALED DIMENSIONS IF THERE IS A CONFLICT, THE CONTRACTOR SHALL CONTACT CITY OF PASADENA TO OBTAIN ADDITIONAL CLARIFICATION. NO DEVIATION OR SUBSTITUTION SHALL BE ALLOWED WITHOUT OBTAINING PRIOR WRITTEN APPROVAL FROM CITY OF PASADENA AND THE ENGINEER.

ABBREVIATIONS

AB	ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
AC	ASPHALTIC CONCRETE OR ASBESTOS CEMENT
ADD'L	ADDITIONAL
ALT	ALTERNATE
ALUM	ALUMINUM
APWA	AMERICAN PUBLIC WORKS ASSOCIATION (SOUTHERN CALIFORNIA CHAPTER)
AVAR	AIR VACUUM AIR RELEASE
AVE	AVENUE
BC	BEGINNING OF CURVE
BF	BLIND FLANGE
BLDG	BUILDING
B.O.P.	BEGINNING OF PAVEMENT
CA	CALIFORNIA
CB	CATCH BASIN
CDPH	CALIFORNIA DEPT. OF PUBLIC HEALTH
CFS	CUBIC FEET PER SECOND
CJ	CONSTRUCTION JOINT
CL	CENTER LINE
CLR	CLEAR
CML&C	CEMENT MORTAR LINED AND COATED
CMU	CONCRETE MASONRY UNIT
CO	CLEANOUT
COL	COLUMN
CONC	CONCRETE
CONT.	CONTINUED
COR	CORNER
CPLG	COUPLING
CY	CUBIC YARDS
DEG	DEGREE
DET	DETAIL
DI	DUCTILE IRON
DIA	DIAMETER
DIP	DUCTILE IRON PIPE
DOT	DEPARTMENT OF TRANSPORTATION
DWLS	DOWELS
DWG(S)	DRAWING(S)
E	EAST OR ELECTRICAL
EA	EACH
ECC	ECCENTRIC
EDB	ELECTRICAL DUCT BANK
EF	EACH FACE
EL OR ELEV	ELEVATION
ELEC	ELECTRICAL
EMH	ELECTRICAL MANHOLE
EOP	EDGE OF PAVEMENT
EP	EDGE OF POND
EQUIP	EQUIPMENT
EVC	END VERTICAL CURVE
EW	EACH WAY
EXIST	EXISTING
EXT	EXTERIOR
FC	FLEXIBLE COUPLING
FCA	FLANGED COUPLING ADAPTER
FF	FINISHED FLOOR
FG	FINISHED GRADE
FH	FIRE HYDRANT
FIN	FINISHED
FL	FLOW LINE
FLG	FLANGE
FPS	FEET PER SECOND
FPT	FEMALE PIPE THREAD
FS	FORGED STEEL
FT	FEET
FTG	FOOTING
G/B OR GB	GRADE BREAK
GR	GRADE
HDPE	HIGH DENSITY POLYETHYLENE
HP	HIGH POINT
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
INV	INVERT
INSTR	INSTRUMENTATION
INT	INTERIOR
IRR	IRRIGATION
JS	JUNCTION STRUCTURE
LACFCD	LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
LDG	LANDING
LEV	LEVEL
LF	LINEAR FEET
LG	LIP OF GUTTER
LH	LAMP HOLE
LLV	LONG LEG VERTICAL
LP	LIGHT POLE OR LIQUID PROPANE
LS	LUMP SUM
LT	LEFT

ABBREVIATIONS

MAX	MAXIMUM
ME	MATCH EXISTING
MFRS	MANUFACTURER'S
MH	MANHOLE
MI	MALLEABLE IRON
MIN	MINIMUM
MJ	MECHANICAL JOINT
MPT	MALE PIPE THREAD
N	NORTH
NB	NORTH BOUND
NG	NATURAL GAS
NIC	NOT IN CONTRACT
OC	ON CENTER
OD	OUTSIDE DIAMETER
OPP	OPPOSITE
P	POLE
PC	POINT OF CURVATURE (BEGIN CURVE)
PE	PLAIN END
PL	PROPERTY LINE, PLATE
POC	POINT OF COMMENCEMENT
PP	POWER POLE
PT	POINT OF TANGENCY (END CURVE)
PVC	POLYVINYL CHLORIDE
PVDF	POLYVINYLIDENE FLUORIDE
PVMT	PAVEMENT
PWP	PASADENA WATER AND POWER
R	RADIUS
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
RDCR	REDUCER
REINF	REINFORCEMENT
REQMTS	REQUIREMENTS
RES	RESERVOIR
RP	RADIUS POINT
RSD	REGIONAL STANDARD DRAWING
R/W	RIGHT-OF-WAY
RT	RIGHT
S	SOUTH, SLOPE OR SEWAGE
SB	SOUTH BOUND
SCE	SOUTHERN CALIFORNIA EDISON
SD	STORM DRAIN
SIM	SIMILAR
SPEC	SPECIFICATION
SQ	SQUARE
SST	STAINLESS STEEL
ST	STREET
STL	STEEL
STA	STATION
SY	SQUARE YARDS
T	TELEPHONE
TBC	TOP BACK OF CURB
TC	TOP OF CURB
TBM	TEMPORARY BENCH MARK
TEL	TELEPHONE
TOC	TOP OF CONCRETE
TOE	TOE OF SLOPE (BOTTOM)
TOG	TOP OF GRATE / GRATING TOP
TOP	TOP OF PIPE
TOS	TOP OF SLOPE (GRADE BREAK), TOP OF STEEL DECK
TOW	TOP OF WALL
TPOB	TRUE POINT OF BEGINNING
TYP	TYPICAL
UE	UNDERGROUND ELECTRICAL (DUCT BANK)
UNO	UNLESS NOTED OTHERWISE
VC	VICTUAL COUPLING / VERTICAL CURB
VERT	VERTICAL
W	WEST
WP	WATER PROOF
WSE	WATER SURFACE ELEVATION
WSTP	WATERSTOP
W/	WITH

SURVEY DATA

BASIS OF BEARING:
CALIFORNIA STATE PLANE COORDINATE SYSTEM, ZONE 5, NAD83 USING THE CAL TECH REAL TINE STATION IN PASADENA, EPOCH DATE OF 2011.

BENCHMARK:
BM NUMBER Y 7717 (NAVD 88 DATUM).
L&BN IN E CB 600MM (2FT) S/O C.B. @ NE COR VENTURA ST & STERLING PL MKD (BM)

X-XX

REVISION

NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
PE #
NAME
APPROVED: DATE
APPROVED: DATE

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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE APRIL 2017	SCALE AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
DRAWN BY SDW DESIGNED BY SJS CHECKED BY JED SUBMITTED BY —		ARROYO SECO CANYON PROJECT ABBREVIATIONS AND GENERAL NOTES	WORK ORDER 03055 / FILE NUMBER 00G-03 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1000G03.dgn

CIVIL SYMBOLS

- HORIZONTAL AND VERTICAL CONTROL POINT
- NEW STRUCTURE OR FACILITY
- EXISTING STRUCTURE OR FACILITY
- FUTURE STRUCTURE OR FACILITY
- CONTRACTOR STAGING OR EXCAVATION SPOILS AREA
- DEMOLITION
- NEW AC PAVEMENT
- NEW SIDEWALK, CONCRETE FLATWORK
- 5100 — INDEX CONTOUR LINE, FINISHED GRADE
- 5101 — INTERMEDIATE CONTOUR LINE, FINISHED GRADE
- 5100 — INDEX CONTOUR LINE, EXISTING GROUND
- 5101 — INTERMEDIATE CONTOUR LINE, EXISTING GROUND
- 5100.00 — FINISHED ELEVATION
- OR — DRAINAGE FLOW OR PIPE FLOW DIRECTION
- X — NEW CHAIN LINK FENCE
- X — EXISTING FENCE
- NEW PRECAST MASONRY FENCE
- 4:1 OR (TOP / TOE) — CUT OR FILL SLOPE
- FH — NEW FIRE HYDRANT
- CO — NEW CLEANOUT
- EXISTING MANHOLE
- NEW MANHOLE
- NEW GUARD POST (BOLLARD)
- NEW WATER VALVE
- EXISTING VALVE
- PP — EXISTING POWER POLE
- EXISTING LIGHT POLE
- EXISTING UNDERGROUND VALVE
- EXISTING HYDRANT
- EXISTING GUARD POST
- NEW SIGN

- EXISTING PIPE (SINGLE LINE)
- EXISTING PIPE (TRIPLE LINE)
- NEW PIPELINE (TRIPLE LINE)
- NEW PIPELINE (SINGLE LINE)
- CENTERLINE
- PROPERTY LINE
- 36" BW — NEW PIPE CALLOUT
- EX 36" BW — EXISTING PIPE CALLOUT

NOTE:
ALL SYMBOLS SHOWN MAY NOT BE INCLUDED WITHIN THIS PROJECT OR SHOWN ON THE PLANS OR DRAWINGS. ALL SCREENED SYMBOLS SHOWN ON THE DRAWINGS REPRESENT EXISTING OR DISCIPLINE BACKGROUND (TYP).

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REVISION

NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
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APPROVED: DATE

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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.–206 TO 209

DATE MARCH 2014	SCALE AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO – OF XX SHEETS
DRAWN BY SDW DESIGNED BY SJS CHECKED BY JED SUBMITTED BY –		ARROYO SECO CANYON PROJECT SYMBOLS 1	WORK ORDER 03055 / FILE NUMBER 00G–04 (E–1757)
FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

9137A10 9137A10 FILE NAME: 9137A1000G04.dgn

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User: SDWhite
Model: Layout1 CdorTable: gshade.ctb DesignScript: Carollo_Std_Pen_v0905.pen PlotScale: 2.18176:1
LAST SAVED BY: sdwhite

GENERAL MATERIAL IN CROSS SECTION

- STEEL
- CAST IRON OR FIBERGLASS
- BRONZE OR ALUMINUM
- MASONRY
- INSULATION
- PLASTIC, RUBBER OR NEOPRENE
- GRAVEL
- CONCRETE
- SOIL
- SAND
- WOOD (FINISH)

GENERAL MATERIAL IN PLAN

- ALUMINUM OR METAL DECKING
- CHECKERED PLATE
- SPAN — GRATING

GENERAL PLUMBING - SINGLE LINE PIPING

- WCO — WALL CLEANOUT
- FCO — FLOOR CLEANOUT
- BLOW OFF ASSEMBLY
- HUB DRAIN
- FLOOR DRAIN
- FLOOR SINK
- DRAIN TRAP

MISCELLANEOUS

- CHANGE IN PIPING MATERIAL
- ROUND OR DIAMETER
- SQUARE
- AT
- ANGLE
- DRAIN - SCHEMATIC
- (1) NEW STRUCTURAL COLUMN LINE NUMBER
- SLG-1500 — EQUIPMENT CALLOUT (SEE EQUIPMENT SCHEDULE)
- 30" SW — PIPE CALLOUT (SEE PIPE SCHEDULE)

GENERAL EQUIPMENT - SINGLE LINE

- STOP GATE
- SLIDE GATE
- SLUICE GATE
- AIR VACUUM AND AIR RELEASE ASSEMBLY
- THERMOMETER
- INJECTOR OR EDUCTOR
- FA — FLAME ARRESTER
- CENTRIFUGAL PUMP OR FAN
- VERTICAL TURBINE PUMP (PLAN)
- METERING PUMP
- PROGRESSING CAVITY, POSITIVE DISPLACEMENT PUMP
- BLOWER OR COMPRESSOR
- FLOW TUBE
- M — MAGNETIC METER
- ORIFICE PLATE AND FLANGES
- ROTAMETER
- T — CONDENSATE TRAP
- PIPE SUPPORT (IN PLAN ONLY)
- PIPE ANCHOR
- PULSATION DAMPENER
- EXPANSION CHAMBER WITH RUPTURE DISC
- RUPTURE DISC
- (X) GAUGE: x = G - GENERIC; x = P - PRESSURE; x = V - VACUUM; x = C - COMBINATION; x = S - PRESSURE SWITCH
- (X) GAUGE WITH DIAPHRAGM SEAL: x = G - GENERIC; x = P - PRESSURE; x = V - VACUUM; x = C - COMBINATION; x = S - PRESSURE SWITCH

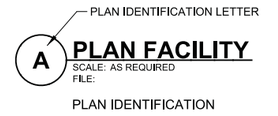
GENERAL PIPING

DOUBLE LINE		SINGLE LINE
	FLANGED JOINT	
R R R R	MECHANICAL JOINT (MJ) (R=RESTRAINED)	R R
	WELDED JOINT (STANDARD)	
	FABRICATED JOINT	
	PUSH ON JOINT (BELL AND SPIGOT)	
	THREADED JOINT	
	SOCKET JOINT (PVC SOLVENT WELD)	
	FLEXIBLE TYPE COUPLING	
	FLANGED COUPLING ADAPTER	
	GROOVED TYPE COUPLING (RIGID)	
	HARNESS ASSEMBLY (RESTRAINED JOINT)	
	CUT PIPE	
	FLEXIBLE CONNECTION	
	QUICK DISCONNECT	
	UNION	
	CONCENTRIC REDUCER	
	ECCENTRIC REDUCER	
	CAPPED END OR PLUGGED END	
	BLIND FLANGE	
	STRAINER	
	BUBBLER LEVEL CONTROL	B
	HOSE BIBB (HB)	FG
	FLOW SIGHT GLASS	X

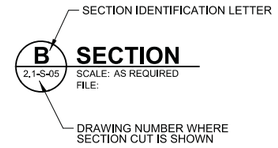
GENERAL VALVES

DOUBLE LINE		SINGLE LINE
	GATE VALVE	
	GATE VALVE, BURIED W/ VALVE BOX	
	BUTTERFLY VALVE	
	BUTTERFLY VALVE, BURIED W/ VALVE BOX	
	ECENTRIC PLUG VALVE	
	ECENTRIC PLUG VALVE, BURIED W/ VALVE BOX	
	LUBRICATED PLUG VALVE	
	LUBRICATED PLUG VALVE, BURIED W/ VALVE BOX	
	GLOBE VALVE	
	BALL VALVE	
	ANGLE VALVE	
	DIAPHRAGM VALVE	
	SWING CHECK VALVE	
	FLAP CHECK VALVE	
	DOUBLE FLAP CHECK VALVE	
	BALL CHECK VALVE	
	PINCH VALVE	
	FLOAT OPERATED VALVE	
	NEEDLE VALVE	
	MUD VALVE	
	4-WAY VALVE	
	3-WAY VALVE	
	PRESSURE REGULATING VALVE	
	BACK-PRESSURE VALVE	
	REDUCED PRESSURE BACKFLOW PREVENTER	
	PRESSURE RELIEF VALVE	
	MOTOR OPERATOR FOR VALVES (M = ELECTRIC, P = PNEUMATIC)	M P
	SOLENOID VALVE	S
	TEMPERATURE CONTROL VALVE	T

DRAWING CROSS REFERENCE DETAIL



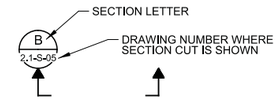
PLAN IDENTIFICATION



SECTION IDENTIFICATION



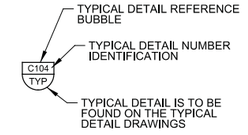
DETAIL IDENTIFICATION



SECTION CUT DESIGNATION



PHOTOGRAPH DESIGNATION



TYPICAL DETAIL IDENTIFICATION

IF PLAN AND SECTION (OR DETAIL CALL-OUT AND DETAIL) ARE SHOWN ON SAME DRAWING, DRAWING NUMBER IS REPLACED BY A HORIZ. LINE.

PREFIX LETTER INDICATES THE FOLLOWING: C-CIVIL, T-TYPICALS, A-ARCHITECTURAL, S-STRUCTURAL, M-MECHANICAL, E-ELECTRICAL, I-INSTRUMENTATION, D-CORROSION PROTECTION AND P-PIPING

ALL PLAN, SECTION AND DETAIL CALLOUTS WHICH REPRESENT EXTERNAL REFERENCE FILES LIST XREF FILENAME WITH EXTENSION JUST BELOW THE SCALE DESIGNATION.

NOTES:

1. THE SYMBOLS DRAWING IS A STANDARD DRAWING, THEREFORE, ALL SYMBOLS AND ABBREVIATIONS SHOWN MAY NOT BE INCLUDED WITHIN THIS PROJECT OR SHOWN ON THE PLANS OR DRAWINGS.
2. ALL SCREENED SYMBOLS SHOWN ON THE DRAWINGS REPRESENT EXISTING OR DISCIPLINE BACKGROUND (TYP)
3. SEE GENERAL DISCIPLINE DRAWINGS FOR DISCIPLINE SPECIFIC NOTES AND SYMBOLS.
4. FOR WELDING SYMBOLS USE AMERICAN WELDING SOCIETY STANDARD SYMBOLS, SEE AMERICAN INSTITUTE OF STEEL CONSTRUCTION MANUAL

X-XX

REVISION

NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
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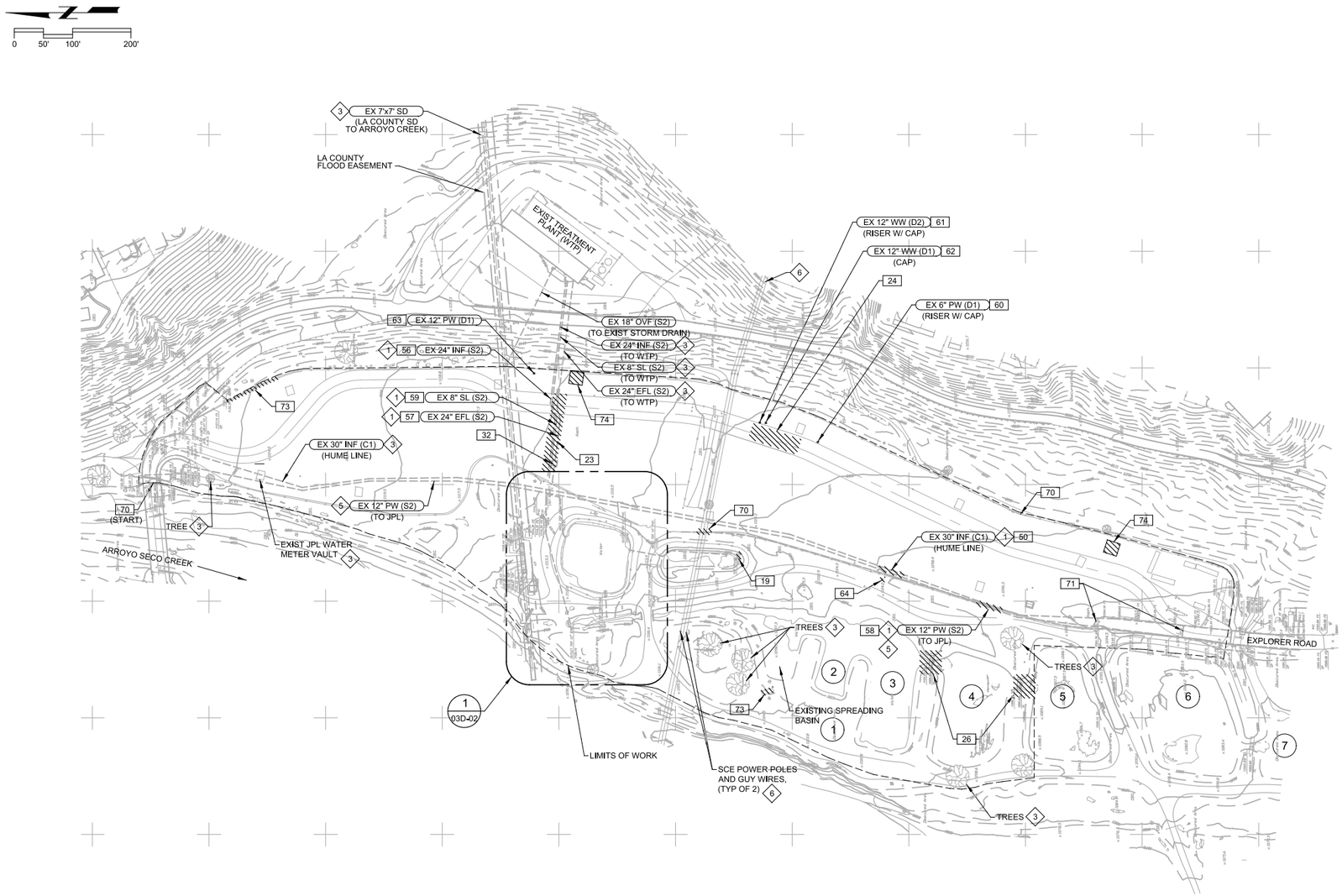
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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE: MARCH 2014	SCALE: AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
DRAWN BY: SDW; DESIGNED BY: SJS; CHECKED BY: JED; SUBMITTED BY: —		ARROYO SECO CANYON PROJECT SYMBOLS 2	WORK ORDER: 03055; FILE NUMBER: 00G-05 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

9137A10 9137A10 FILE NAME: 9137A1000G05.dgn



A AREA 3 - DEMOLITION PLAN

SCALE: 1" = 100'
FILE: FILE

GENERAL NOTES:

1. ALL KEY NOTES AND DEMO MARK ID TAGS MAY NOT BE APPLICABLE TO THIS DRAWING. REFER TO OTHER DEMO SHEETS
2. CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY ACCESS FOR RECREATIONAL USERS DURING CONSTRUCTION. REFER TO SPEC SECTION 01140 FOR ADDTIONAL DETAIL.
3. ALL DEMOLITION QUANTITIES LISTED ON THIS PLAN ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS.
4. ALL EXISTING CONCRETE HAS REINFORCING STEEL.
5. (NOT USED)
6. TO PROVIDE CLARITY, NOT ALL AREAS TO BE DEMOLISHED ARE HATCHED IN EVERY VIEW, PHOTO, OR PLAN.

KEY NOTES:

1. SEE DRAWING 03C-05, 06, 07, AND 08 FOR ADDITIONAL DETAIL ON EXISTING PIPES.
2. NOT USED.
3. RETAIN AND PROTECT.
4. CONTRACTOR SHALL POTHOLE/TRENCH TO VERIFY LOCATION OF EXISTING 12" JPL POTABLE LINE, BEFORE DEMOLITION WORK.
5. CONTRACTOR SHALL PROTECT EXISTING 12" JPL POTABLE MAIN UNTIL NEW 12" JPL LINE IS INSTALLED, PRESSURE TESTED, DISINFECTED, BACTERIA TESTED, AND PWP VERIFIES THAT NEW MAIN IS READY FOE SERVICE, AFTER NEW JPL POTABLE MAIN IS IN SERVICE, CONTRACTOR SHALL REMOVE AND DISCARD EXISTING.
6. RETAIN AND PROTECT EXISTING OVERHEAD SCE POWER LINES. COORDINATE WITH SCE FOR ALL WORK AROUND AND UNDER POWER LINES. WORK SHALL NOT BE ALLOWED WITHIN 20 FT OF EXISTING POWER POLES AND GUY WIRES.

DEMOLITION KEY TABLE

MARK	ITEM	DESCRIPTION	ACTION
19	DRYING BED OUTLET	30 CY CONCRETE	B
20	DRYING BED INLET	30 CY CONCRETE	B
21	CONCRETE DRY VAULTS	3' X 3' X 3'	B
22	WOOD SHED / STRUCTURE	11' X 13' X 11'	B
23	EQUIPMENT	FLOW METER AND CABINET	A
24	AC ROAD	QTY=150,000 SF (4 INCH DEPTH)	B
25	WOOD SHED / STRUCTURE	4' X 8' X 11'	B
26	SPREADING BASIN OUTLET	TIMBERS (450 SF), HANDRAIL (80 LF), DECK (120 SF) AND CMP (30 LF, 12" DIA)	B
27	GAUGING STATION	MISC STEEL & CMP	B
28	WOOD SHED / STRUCTURE	11' X 13' X 11'	B
30	POWER POLE	POLE (HEIGHT = 30 FT) W/ UTILITY METER & DISCONNECT	B
31	TANK	ALUMINUM PIPE (H=7 FT, DIA = 4 FT) AND CONCRETE PAD (2 CY)	B
32	CONCRETE DRY VAULTS	8' X 8' X 7'	B
50	PIPE	1200 LF	B
51	PIPE AND VALVES	300 LF	B
52	ANCHOR / THRUST BLOCS	2 CY CONCRETE	B
53	PIPE AND VALVES	170 LF	B
54	PIPE AND VALVES	100 LF	B
55	PIPE AND VALVES	500 LF	B
56	PIPE AND VALVES	150 LF	B
57	PIPE AND VALVES	150 LF	B
58	PIPE	1200 LF	B
59	PIPE AND VALVES	240 LF	B
60	PIPE	5 LF	B
61	PIPE	5 LF	B
62	PIPE	1 LF	B
63	PIPE	25 LF	B
64	LIGHT POLE	HEIGHT = 25 FT W/ CONC PEDESTAL (0.3 CY)	B
70	CHAIN LINK FENCE	HEIGHT = 6 FT LENGTH = 3,800 LF	B
71	GATE	WIDTH = 12 FT QTY = 2	B
72	CONCRETE CURB	1000 LF	B
73	CORRUGATED METAL PIPE	50 LF (12" DIA)	B
74	DEBRIS PILE (ROCK, AC PAVEMENT)	300 CY	B

NOTES:
1. DIMENSIONS LISTED AS WIDTH x LENGTH x DEPTH
2. ACTION DESIGNATIONS
   - A REMOVE AND DELIVER TO OWNER AS DIRECTED.
   - B REMOVE AND DISCARD.
   - C REMOVE AND REUSE AS INDICATED ON DWGS.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
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PE #
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APPROVED: DATE

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CITY OF PASADENA INCORPORATED JUNE 1886

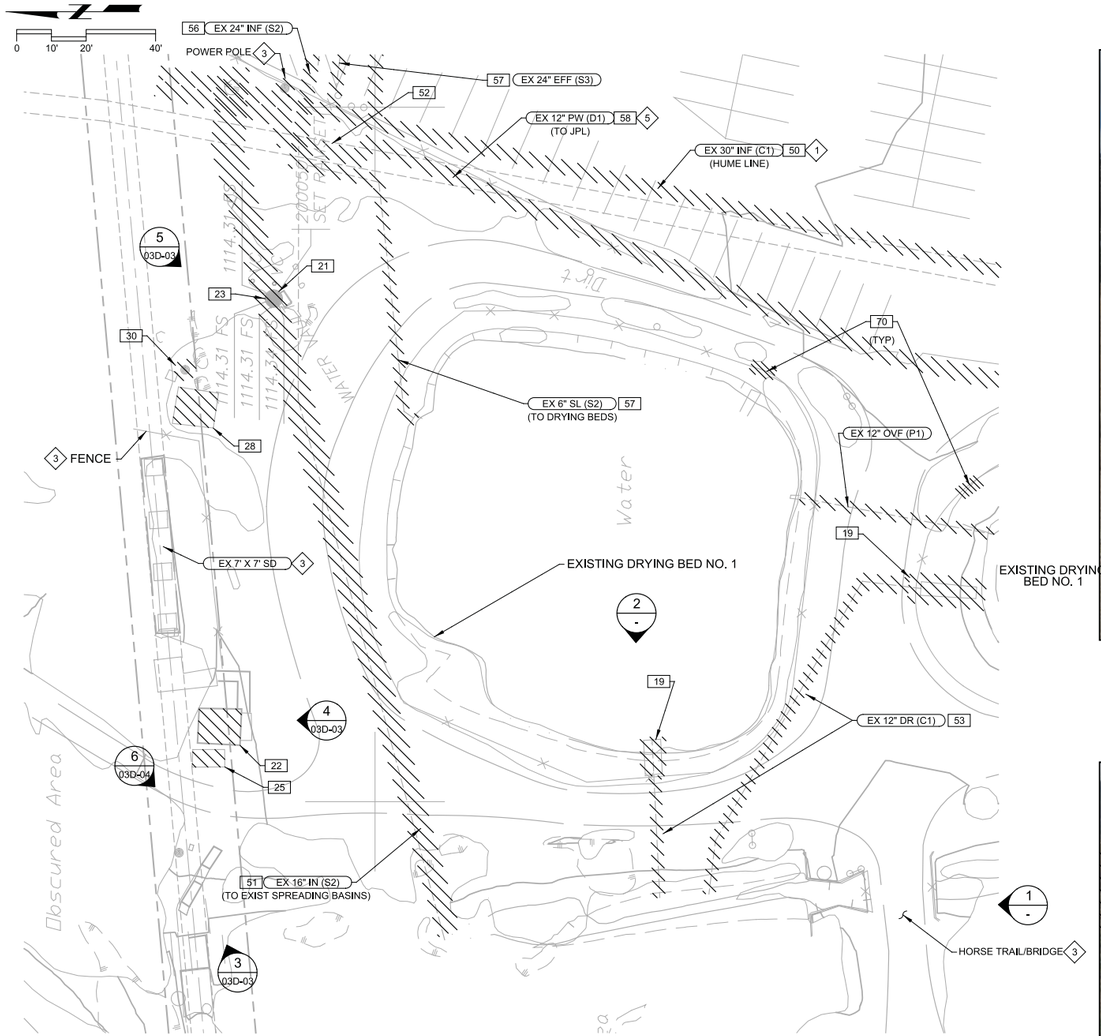
D.S.-206 TO 209

DATE	SCALE	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
APRIL 2017	AS SHOWN	ARROYO SECO CANYON PROJECT AREA 3 – DEMOLITION PLAN	WORK ORDER 03055 / FILE NUMBER 03D-01 (E-1757)

DRAWN BY SDW
DESIGNED BY SJS
CHECKED BY JED
SUBMITTED BY SUB
FIELD BOOKS | CALC BOOKS | APPROVED | APPROVED | REVISION

Plot Date: 01-MAY-2017 8:14:49 AM
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LAST SAVED BY: bhawes

9137A10 9137A10 FILE NAME: 9137A1003D01.dgn



1 03D-01 DETAIL

SCALE: 1" = 20'
FILE: FILE



1 - DEMOLITION PHOTO 1

SCALE: NO SCALE
FILE: FILE



2 - DEMOLITION PHOTO 2

SCALE: NO SCALE
FILE: FILE

DEMOLITION KEY TABLE

MARK	ITEM	DESCRIPTION	ACTION
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24	AC ROAD	QTY=150,000 SF (4 INCH DEPTH)	B
25	WOOD SHED / STRUCTURE	4' X 8' X 11'	B
26	SPREADING BASIN OUTLET	TIMBERS (450 SF), HANDRAIL (80 LF), DECK (120 SF) AND CMP (30 LF, 12" DIA)	B
27	GAUGING STATION	MISC STEEL & CMP	B
28	WOOD SHED / STRUCTURE	11' X 13' X 11'	B
30	POWER POLE	POLE (HEIGHT = 30 FT) W/ UTILITY METER & DISCONNECT	B
31	TANK	ALUMINUM PIPE (H=7 FT, DIA = 4 FT) AND CONCRETE PAD (2 CY)	B
32	CONCRETE DRY VAULTS	8' X 8' X 7'	B
50	PIPE	1200 LF	B
51	PIPE AND VALVES	300 LF	B
52	ANCHOR / THRUST BLOCS	2 CY CONCRETE	B
53	PIPE AND VALVES	170 LF	B
54	PIPE AND VALVES	100 LF	B
55	PIPE AND VALVES	500 LF	B
56	PIPE AND VALVES	150 LF	B
57	PIPE AND VALVES	150 LF	B
58	PIPE	1200 LF	B
59	PIPE AND VALVES	240 LF	B
60	PIPE	5 LF	B
61	PIPE	5 LF	B
62	PIPE	1 LF	B
63	PIPE	25 LF	B
64	LIGHT POLE	HEIGHT = 25 FT W/ CONC PEDESTAL (0.3 CY)	B
70	CHAIN LINK FENCE	HEIGHT = 6 FT LENGTH = 3,800 LF	B
71	GATE	WIDTH = 12 FT QTY = 2	B
72	CONCRETE CURB	1000 LF	B
73	CORRUGATED METAL PIPE	50 LF (12" DIA)	B
74	DEBRIS PILE (ROCK, AC PAVEMENT)	300 CY	B

NOTES:
1. DIMENSIONS LISTED AS WIDTH x LENGTH x DEPTH
2. ACTION DESIGNATIONS
   - A REMOVE AND DELIVER TO OWNER AS DIRECTED.
   - B REMOVE AND DISCARD.
   - C REMOVE AND REUSE AS INDICATED ON DWGS.

GENERAL NOTES:

1. ALL KEY NOTES AND DEMO MARK ID TAGS MAY NOT BE APPLICABLE TO THIS DRAWING. REFER TO OTHER DEMO SHEETS
2. CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY ACCESS FOR RECREATIONAL USERS DURING CONSTRUCTION. REFER TO SPEC SECTION 01140 FOR ADDTIONAL DETAIL.
3. ALL DEMOLITION QUANTITIES LISTED ON THIS PLAN ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS.
4. ALL EXISTING CONCRETE HAS REINFORCING STEEL.
5. (NOT USED)
6. TO PROVIDE CLARITY, NOT ALL AREAS TO BE DEMOLISHED ARE HATCHED IN EVERY VIEW, PHOTO, OR PLAN.

KEY NOTES:

1. SEE DRAWING 03C-05, 06, 07, AND 08 FOR ADDITIONAL DETAIL ON EXISTING PIPES.
2. NOT USED.
3. RETAIN AND PROTECT.
4. CONTRACTOR SHALL POTHOLE/TRENCH TO VERIFY LOCATION OF EXISTING 12" JPL POTABLE LINE, BEFORE DEMOLITION WORK.
5. CONTRACTOR SHALL PROTECT EXISTING 12" JPL POTABLE MAIN UNTIL NEW 12" JPL LINE IS INSTALLED, PRESSURE TESTED, DISINFECTED, BACTERIA TESTED, AND PWP VERIFIES THAT NEW MAIN IS READY FOE SERVICE. AFTER NEW JPL POTABLE MAIN IS IN SERVICE, CONTRACTOR SHALL REMOVE AND DISCARD EXISTING.
6. RETAIN AND PROTECT EXISTING OVERHEAD SCE POWER LINES. COORDINATE WITH SCE FOR ALL WORK AROUND AND UNDER POWER LINES. WORK SHALL NOT BE ALLOWED WITHIN 20 FT OF EXISTING POWER POLES AND GUY WIRES.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

carollo

CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE APRIL 2017	SCALE AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO – OF XX SHEETS
DRAWN BY SDW DESIGNED BY JED CHECKED BY – SUBMITTED BY –		ARROYO SECO CANYON PROJECT AREA 3 – DEMOLITION PLAN & PHOTOS	WORK ORDER 03055 / FILE NUMBER 03D-02 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

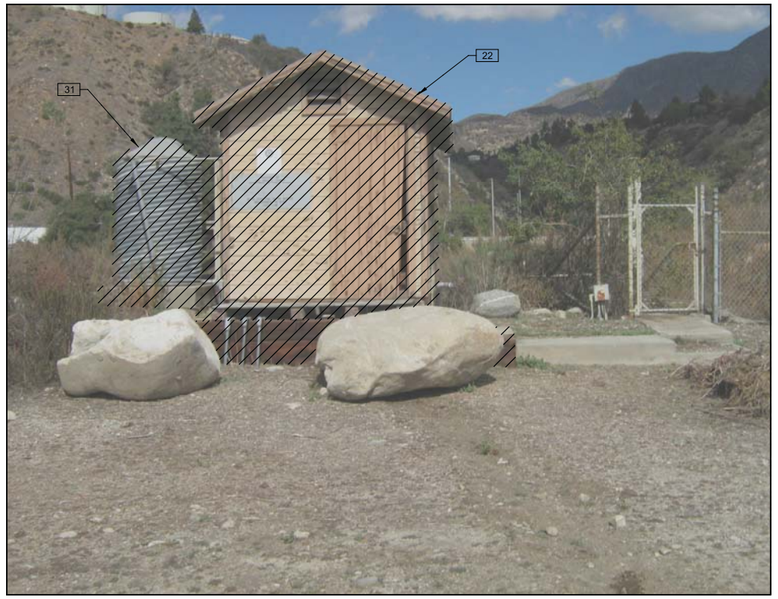
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3 03D-02 **DEMOLITION PHOTO 3**
SCALE: NO SCALE
FILE: FILE



4 03D-02 **DEMOLITION PHOTO 4**
SCALE: NO SCALE
FILE: FILE



5 03D-02 **DEMOLITION PHOTO 5**
SCALE: NO SCALE
FILE: FILE

GENERAL NOTES:

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2. CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY ACCESS FOR RECREATIONAL USERS DURING CONSTRUCTION. REFER TO SPEC SECTION 01140 FOR ADDTIONAL DETAIL.
3. ALL DEMOLITION QUANTITIES LISTED ON THIS PLAN ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS.
4. ALL EXISTING CONCRETE HAS REINFORCING STEEL.
5. (NOT USED)
6. TO PROVIDE CLARITY, NOT ALL AREAS TO BE DEMOLISHED ARE HATCHED IN EVERY VIEW, PHOTO, OR PLAN.

KEY NOTES:

1. SEE DRAWING 03C-05, 06, 07, AND 08 FOR ADDITIONAL DETAIL ON EXISTING PIPES.
2. NOT USED.
3. RETAIN AND PROTECT.
4. CONTRACTOR SHALL POTHOLE/TRENCH TO VERIFY LOCATION OF EXISTING 12" JPL POTABLE LINE, BEFORE DEMOLITION WORK.
5. CONTRACTOR SHALL PROTECT EXISTING 12" JPL POTABLE MAIN UNTIL NEW 12" JPL LINE IS INSTALLED, PRESSURE TESTED, DISINFECTED, BACTERIA TESTED, AND PWP VERIFIES THAT NEW MAIN IS READY FOE SERVICE. AFTER NEW JPL POTABLE MAIN IS IN SERVICE, CONTRACTOR SHALL REMOVE AND DISCARD EXISTING.
6. RETAIN AND PROTECT EXISTING OVERHEAD SCE POWER LINES. COORDINATE WITH SCE FOR ALL WORK AROUND AND UNDER POWER LINES. WORK SHALL NOT BE ALLOWED WITHIN 20 FT OF EXISTING POWER POLES AND GUY WIRES.

DEMOLITION KEY TABLE

MARK	ITEM	DESCRIPTION	ACTION
19	DRYING BED OUTLET	30 CY CONCRETE	B
20	DRYING BED INLET	30 CY CONCRETE	B
21	CONCRETE DRY VAULTS	3' X 3' X 3'	B
22	WOOD SHED / STRUCTURE	11' X 13' X 11'	B
23	EQUIPMENT	FLOW METER AND CABINET	A
24	AC ROAD	QTY=150,000 SF (4 INCH DEPTH)	B
25	WOOD SHED / STRUCTURE	4' X 8' X 11'	B
26	SPREADING BASIN OUTLET	TIMBERS (450 SF), HANDRAIL (80 LF), DECK (120 SF) AND CMP (30 LF, 12" DIA)	B
27	GAUGING STATION	MISC STEEL & CMP	B
28	WOOD SHED / STRUCTURE	11' X 13' X 11'	B
30	POWER POLE	POLE (HEIGHT = 30 FT) W/ UTILITY METER & DISCONNECT	B
31	TANK	ALUMINUM PIPE (H=7 FT, DIA = 4 FT) AND CONCRETE PAD (2 CY)	B
32	CONCRETE DRY VAULTS	8' X 8' X 7'	B
50	PIPE	1200 LF	B
51	PIPE AND VALVES	300 LF	B
52	ANCHOR / THRUST BLOCS	2 CY CONCRETE	B
53	PIPE AND VALVES	170 LF	B
54	PIPE AND VALVES	100 LF	B
55	PIPE AND VALVES	500 LF	B
56	PIPE AND VALVES	150 LF	B
57	PIPE AND VALVES	150 LF	B
58	PIPE	1200 LF	B
59	PIPE AND VALVES	240 LF	B
60	PIPE	5 LF	B
61	PIPE	5 LF	B
62	PIPE	1 LF	B
63	PIPE	25 LF	B
64	LIGHT POLE	HEIGHT = 25 FT W/ CONC PEDESTAL (0.3 CY)	B
70	CHAIN LINK FENCE	HEIGHT = 6 FT LENGTH = 3,800 LF	B
71	GATE	WIDTH = 12 FT QTY = 2	B
72	CONCRETE CURB	1000 LF	B
73	CORRUGATED METAL PIPE	50 LF (12" DIA)	B
74	DEBRIS PILE (ROCK, AC PAVEMENT)	300 CY	B

NOTES:
1. DIMENSIONS LISTED AS WIDTH x LENGTH x DEPTH
2. ACTION DESIGNATIONS
   - A REMOVE AND DELIVER TO OWNER AS DIRECTED.
   - B REMOVE AND DISCARD.
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X-XX

REVISION

NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
PE # ____
NAME
APPROVED: ____ DATE
APPROVED: ____ DATE

carollo

CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE	SCALE
APRIL 2017	AS SHOWN

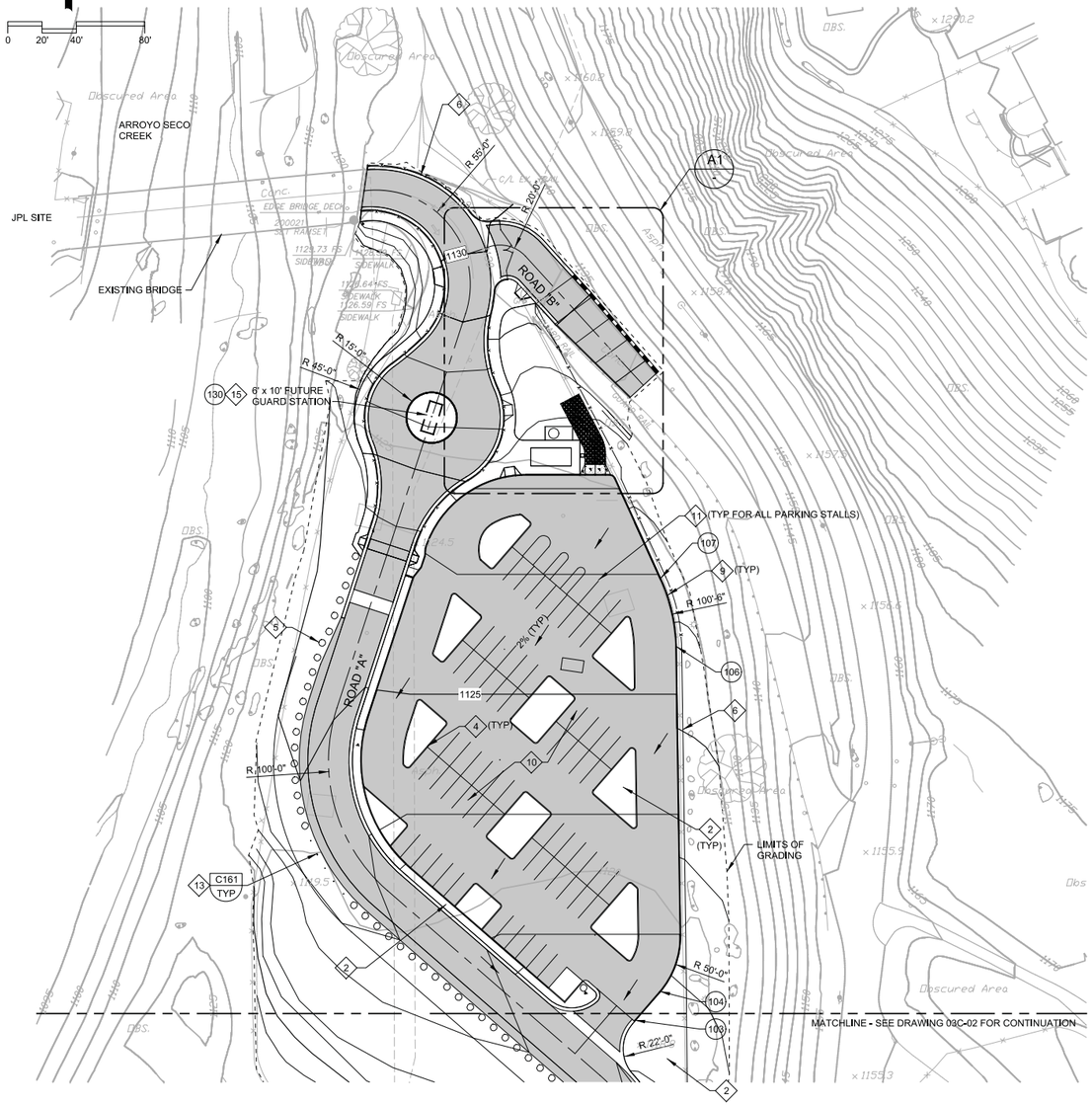
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DESIGNED BY JED
CHECKED BY —
SUBMITTED BY —
FIELD BOOKS | CALC BOOKS | APPROVED | APPROVED

PASADENA WATER & POWER
CITY OF PASADENA

ARROYO SECO CANYON PROJECT
AREA 3 – DEMOLITION PHOTOS

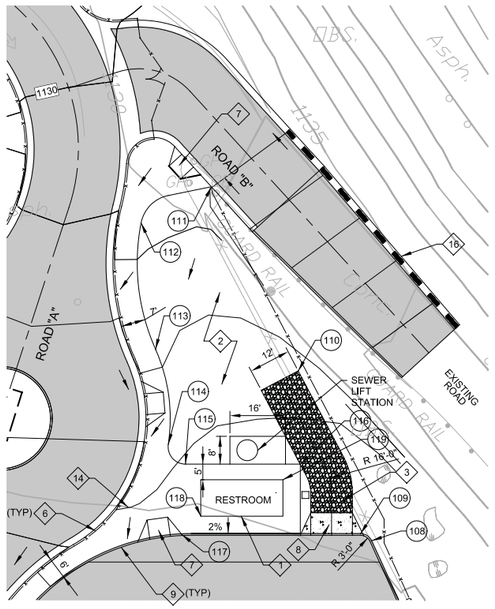
SHEET NO — OF XX SHEETS
WORK ORDER 03055
FILE NUMBER 03D-03 (E-1757)
REVISION

9137A10 9137A10 FILE NAME: 9137A1003D03.dgn



A AREA 3A - BASIN SITE AND GRADING PLAN

SCALE: 1" = 40'
FILE: FILE



A1 RESTROOM ENLARGED GRADING PLAN

SCALE: 1" = 20'
FILE: -

COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
104	1895833.93	6511585.09	1123.00	TBC
105	1895867.46	6511597.35	1123.60	TBC
106	1896035.00	6511594.89	1126.00	TBC
107	1896075.19	6511585.86	1126.50	TBC
108	1896134.09	6511559.03	1127.70	TBC
109	1896136.14	6511555.84	1127.70	TBC
110	1896182.97	6511537.89	1129.00	FG
111	1896236.01	6511512.89	1131.50	TBC
112	1896225.59	6511492.64	1130.36	TOC
113	1896189.22	6511496.80	1129.30	TOC
114	1896161.90	6511500.48	1128.00	TOC
116	1896156.14	6511538.49	1127.70	TOC
117	1896136.07	6511504.20	1127.70	TOC
118	1896141.14	6511509.49	1127.80	FF SW CORNER OF RESTROOM
119	1896151.14	6511533.49	1127.80	FF NE CORNER OF RESTROOM
130	1896169.29	6511452.04	1129.00	FG CENTER OF GUARD STATION

GENERAL NOTES:

1. REFER TO ROAD PLAN AND PROFILE DRAWINGS FOR ADDITIONAL FINISHED GRADE ELEVATIONS.
2. REFER TO LANDSCAPE PLANS FOR ALL PLANTING SCHEDULES AND IRRIGATION DESIGN.

KEY NOTES:

1. PREFABRICATED RESTROOM. REFER TO SECTION 13100. CONCRETE FOUNDATION PAD SHALL BE DESIGNED BY RESTROOM MANUFACTURER AND INSTALLED BY CONTRACTOR.
2. LANDSCAPE AREA, REFER TO LANDSCAPE PLANS.
3. CONSTRUCT GRAVEL ACCESS DRIVE. 4" GRAVEL (THICKNESS=2") OVER ABC (THICKNESS=8").
4. PARKING FOR RECREATIONAL USE SIGN, TYP OF 10 IN PARKING AREA. COORDINATE FINAL LOCATION W/ CITY.
5. INSTALL ROCK BOULDER ALONG EDGE OF ROADWAY. EACH BOULDER SHALL BE APPROX 1/2 TON W / 6-FOOT SPACING ON CENTER.
6. NEW FENCING PER APWA 600 (H = 6').
7. INSTALL 6' WIDE RAMP PER CITY STD. PLAN S-414.
8. CONSTRUCT 10' WIDE DRIVEWAY APPROACH PER APWA STD. PLAN 110-1, TYPE B.
9. CONSTRUCT 6" VERTICAL CURB PER APWA STD. PLAN 120-1, TYPE A1.
10. INSTALL AC PAVEMENT OVER ENTIRE PARKING AREA PER THICKNESSES DETAILED IN SECTION J (DWG 03C-12)
11. PAINTED 8'-6" x 18' PARKING STALL.
12. NOT USED
13. INSTALL REMOVABLE GUARD POST. INSTALL 5 @ 4'-0" O.C. FOR 20-FEET.
14. INSTALL AREA SIDEWALK AROUND RESTROOM, LIFT STATION, AND ALONG ROAD PER CITY STD PLAN S-421 AND S-422.
15. FOUNDATION AND UTILITY STUB-UPS TO BE INCLUDED IN THIS CONTRACT.
16. CONSTRUCT RETAINING WALL, (L =) PER——.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600

X-XX

REVISION						
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE	
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION					

APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

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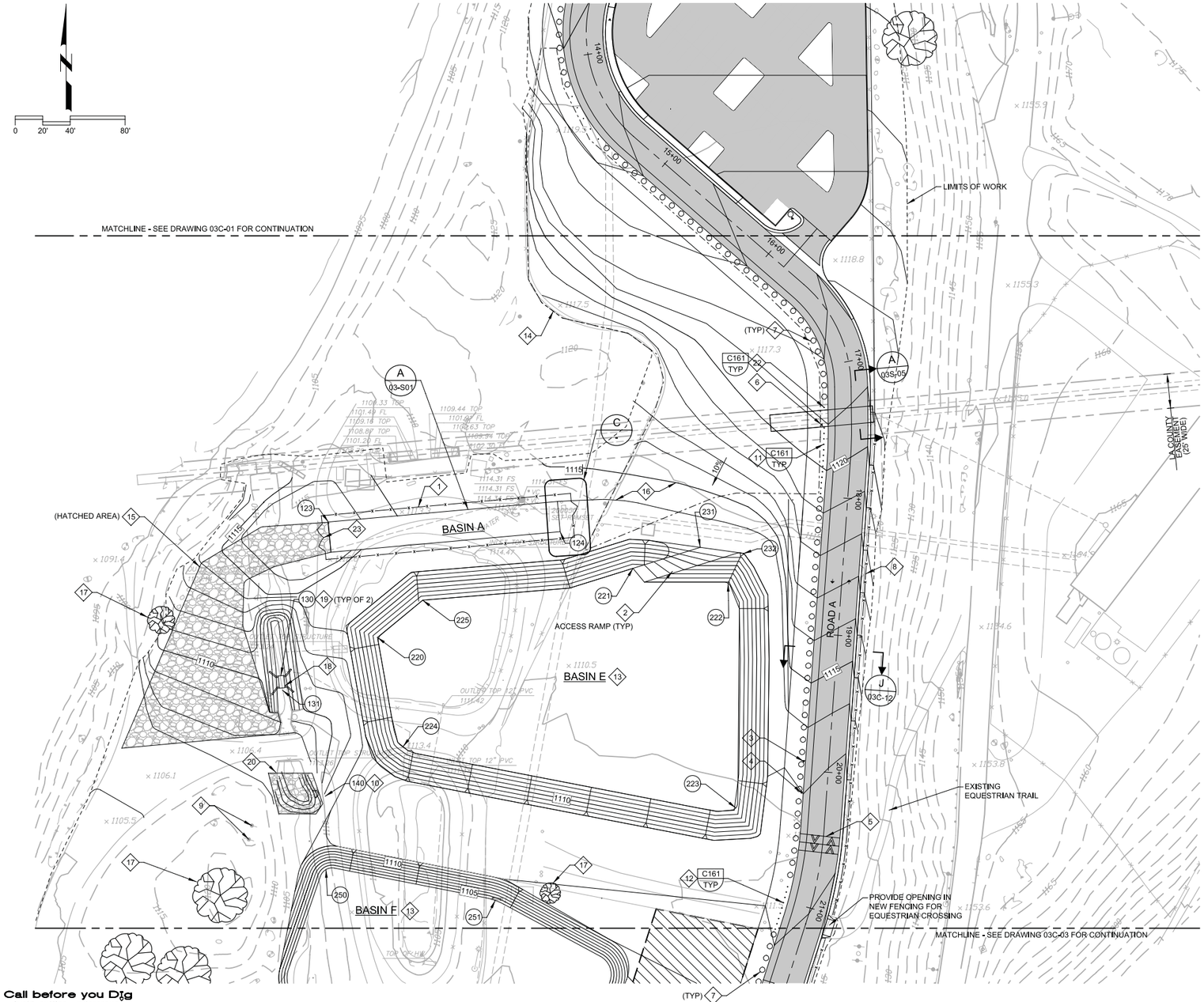
CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE	SCALE	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO – OF XX SHEETS
APRIL 2017	AS SHOWN		
DRAWN BY SDW DESIGNED BY SJS CHECKED BY JED SUBMITTED BY –		ARROYO SECO CANYON PROJECT AREA 3A – BASIN SITE AND GRADING PLAN	WORK ORDER 03055 / FILE NUMBER 03C-01 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

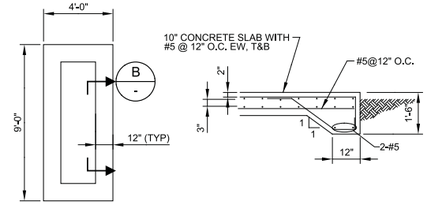
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B AREA 3B - BASIN SITE AND GRADING PLAN
SCALE: 1" = 40'
FILE: FILE

COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
123	1895612.64	6511204.05	1118.00	TOW NW CORNER OF BASIN A
124	1895605.59	6511372.85	1118.00	TOW SE CORNER OF BASIN A
130	1895500.72	6511169.47	1107.00	BOTTOM CENTERLINE OF HEADWALL
131	1895491.77	6511170.45	1107.00	BOTTOM CENTERLINE OF HEADWALL
140	1895412.64	6511201.14	1106.50	BOTTOM CENTERLINE OF HEADWALL
220	1895528.33	6511240.68	1106.00	CORNER, BOTTOM, BASIN E
221	1895578.88	6511425.87	1106.00	BOTTOM OF RAMP
222	1895568.03	6511495.11	1106.00	CORNER, BOTTOM, BASIN E
223	1895404.44	6511500.74	1106.00	CORNER, BOTTOM, BASIN E
224	1895449.09	6511258.48	1106.00	CORNER, BOTTOM, BASIN E
225	1895555.67	6511272.74	1106.00	CORNER, BOTTOM, BASIN E
231	1895594.16	6511474.85	1113.00	TOP OF RAMP
232	1895589.59	6511506.13	1113.00	CORNER, TOP, BASIN E
250	1895359.53	6511202.31	1104.00	CORNER, BOTTOM, BASIN F
251	1895337.08	6511325.20	1104.00	CORNER, BOTTOM, BASIN F



PLAN **B - SECTION**

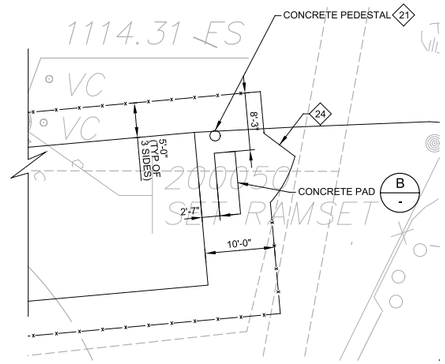
B - CONCRETE SLAB
SCALE: NTS
FILE: 9137A1003C02

GENERAL NOTES:

1. REFER TO ROAD PLAN AND PROFILE DRAWINGS FOR ADDITIONAL FINISHED GRADE ELEVATIONS.
2. REFER TO LANDSCAPE PLANS FOR ALL PLANTING SCHEDULES AND IRRIGATION DESIGN.

KEY NOTES:

1. FURNISH AND INSTALL CHAIN LINK FENCE (H=8') AROUND PERIMETER OF BASIN A PER APWA STANDARD PLAN 600 AND ONE WALK GATE (WIDTH=10'), PROVIDE ONE DOUBLE LEAF DRIVE GATES (WIDTH = 20'). FIELD VERIFY FINAL DIMENSIONS.
2. PROVIDE 8% (APPROX) LONGITUDINAL SLOPE AND 2% CROSS SLOPE.
3. SPEED BUMP SIGN. REFER TO MUTCD W8-1. (QUANTITY 6)
4. EQUESTRIAN CROSSING AHEAD SIGN. REFER TO MUTCD W11-7. (QUANTITY 2)
5. SPEED BUMP PER PWS STANDARD.
6. "NO PARKING" SIGN. REFER TO MUTCD R7-1. (QUANTITY 3)
7. INSTALL ROCK BOULDER ALONG EDGE OF ROADWAY. EACH BOULDER SHALL BE APPROX 1/2 TON W / 6-FOOT SPACING ON CENTER.
8. NEW CHAIN LINK FENCING PER APWA 600 (H = 6').
9. RETAIN AND PROTECT EXISTING POWER POLE, GUY WIRES, AND OVER HEAD POWER LINES. REFER TO ALL SCE SAFETY REQUIREMENTS WHEN OPERATING AROUND SCE EQUIPMENT.
10. CONCRETE WING HEADWALL (SAN DIEGO RSD NO. D-35A, USE DIM FOR 42-INCH PIPE).
11. INSTALL REMOVABLE GUARD POST. INSTALL 13 @ 4'-0" O.C. FOR 72-FEET.
12. INSTALL REMOVABLE GUARD POST. INSTALL 9 @ 4'-0" O.C. FOR 36-FEET.
13. REFER TO PIPING PLANS (DWG 03C-06) FOR DETAIL ON INLET/OUTLET FOR EACH BASIN
14. CONTRACTOR LAY DOWN AND CONSTRUCTION TRAILER AREA. NO EQUIPMENT OR MATERIALS SHALL BE STORED ON TOP OF COUNTY STORM DRAIN BOX.
15. CONSTRUCT ACCESS DRIVE OF GRAVEL (THICKNESS = 2") AND ABC (THICKNESS = 8").
16. ALL BASIN RAMPS AND AREAS OUTSIDE OF BASINS SHALL BE COMPACTED NATIVE MATERIAL, UNLESS OTHERWISE NOTED OR SPECIFIED.
17. PROTECT AND RETAIN EXISTING TREES. FENCE OFF AREA UNDER TREE CANOPIES.
18. FLUME. REFER TO DWG 03C-06.
19. CONCRETE WING HEADWALL SIM TO SDRSD NO. D-35A, USE DIM FOR 42-INCH PIPE. PROVIDE REINFORCED CONCRETE SLAB (4' X 9') BETWEEN HEADWALLS, MATCH SLAB THICKNESS AND REINFORCING FOR HEADWALL SLAB.
20. RIP RAP ENERGY DISSIPATER, 800 SF AS DETAILED IN SAN DIEGO RSD D-40(1/4-TON).
21. FUTURE LOCATION FOR RADIO ANTENNA. REFER TO ELECTRICAL DWGS FOR ADDITIONAL DETAIL.
22. INSTALL REMOVABLE GUARD POST ON EITHER SIDE OF CONCRETE SLAB. HANG CHAIN BETWEEN POST WITH SWIVEL EYE BOLT SNAPS ON EITHER END. HANG "NO PARKING" SIGN IN MIDDLE OF CHAIN
23. DOUBLE-LEAF GATE
24. WALK GATE



C - DETAIL
SCALE: 1" = 10'
FILE: FILE

X-XX

Call before you Dig
Avoid cutting underground utility lines. it's costly.
Call 811 OR 1-800-227-2600

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

carollo

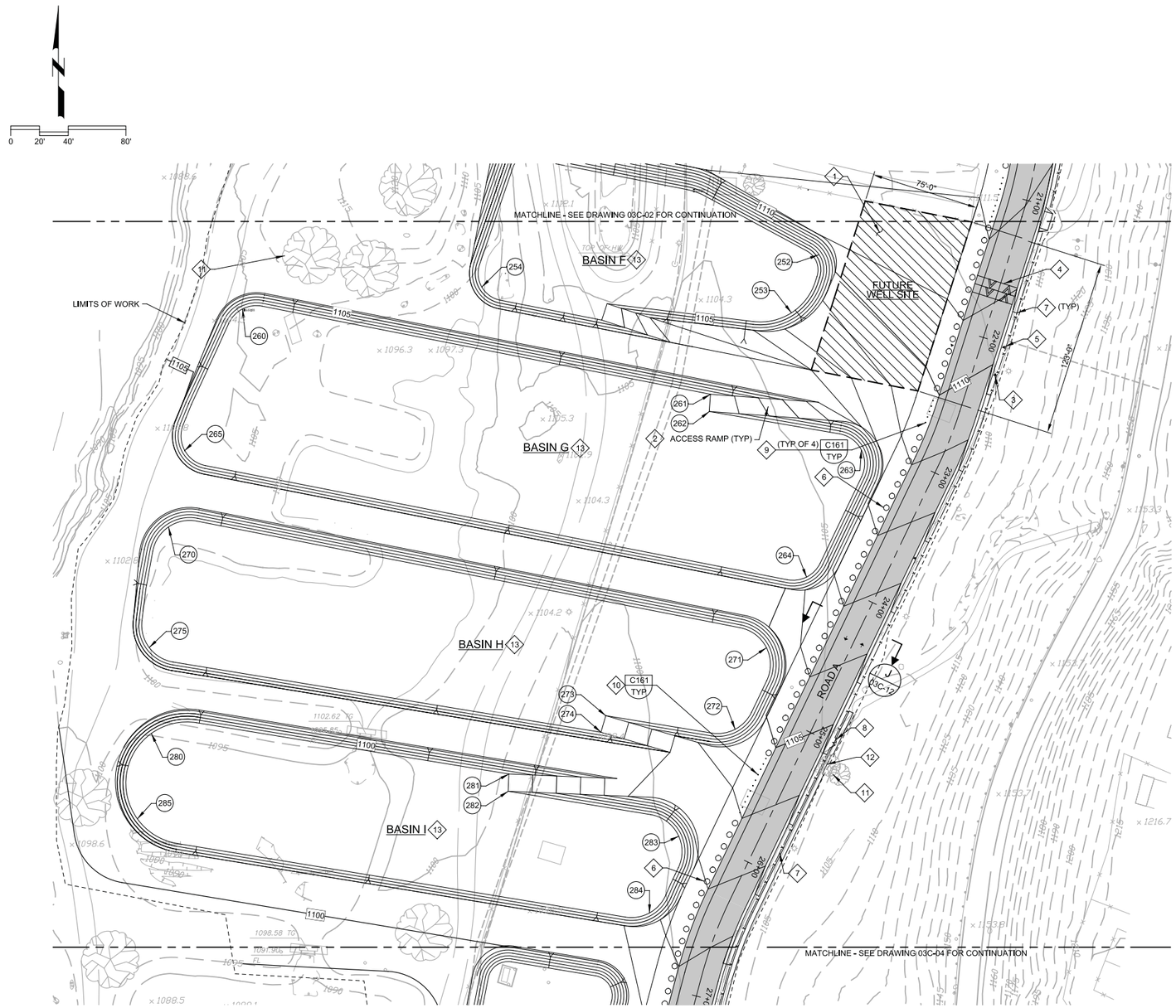
CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE	SCALE	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO – OF XX SHEETS
APRIL 2017	AS SHOWN		
DRAWN BY SDW DESIGNED BY SJS CHECKED BY JED SUBMITTED BY –		ARROYO SECO CANYON PROJECT AREA 3B – BASIN SITE AND GRADING PLAN	WORK ORDER 03055 / FILE NUMBER 03C-02 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

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User: BHawes
Model: Layout1 ColorTable: gshade.ctb DesignScript: carollo_std_pen_v0905 - dx12.pen PlotScale: 0.083333:1
LAST SAVED BY: trea



COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
252	1895288.74	6511408.94	1104.00	CORNER, BOTTOM, BASIN F
253	1895253.24	6511391.59	1104.00	CORNER, BOTTOM, BASIN F
254	1895271.19	6511176.50	1104.00	CORNER, BOTTOM, BASIN F
260	1895255.94	6511010.29	1102.00	CORNER, BOTTOM, BASIN G
261	1895196.66	6511335.34	1102.00	RAMP, BOTTOM, BASIN G
262	1895184.69	6511334.50	1102.00	RAMP, BOTTOM, BASIN G
263	1895158.08	6511440.09	1102.00	CORNER, BOTTOM, BASIN G
264	1895069.62	6511402.05	1102.00	CORNER, BOTTOM, BASIN G
265	1895157.70	6510970.12	1102.00	CORNER, BOTTOM, BASIN G
270	1895104.48	6510958.93	1100.00	CORNER, BOTTOM, BASIN H
271	1895020.57	6511374.21	1100.00	CORNER, BOTTOM, BASIN H
272	1894963.84	6511352.43	1100.00	CORNER, BOTTOM, BASIN H
273	1894973.32	6511262.63	1100.00	RAMP, BOTTOM, BASIN H
274	1894961.81	6511259.26	1100.00	RAMP, BOTTOM, BASIN H
275	1895020.68	6510945.49	1100.00	CORNER, BOTTOM, BASIN H
280	1894960.98	6510946.99	1098.00	CORNER, BOTTOM, BASIN I
281	1894932.81	6511195.31	1098.00	RAMP, BOTTOM, BASIN I
282	1894920.82	6511194.84	1098.00	RAMP, BOTTOM, BASIN I
283	1894889.57	6511313.34	1098.00	CORNER, BOTTOM, BASIN I
284	1894836.26	6511292.99	1098.00	CORNER, BOTTOM, BASIN I
285	1894901.67	6510937.25	1098.00	CORNER, BOTTOM, BASIN I

GENERAL NOTES:

1. REFER TO ROAD PLAN AND PROFILE DRAWINGS FOR ADDITIONAL FINISHED GRADE ELEVATIONS.
2. REFER TO LANDSCAPE PLANS FOR ALL PLANTING SCHEDULES AND IRRIGATION DESIGN.

KEY NOTES:

1. AREA RESERVED FOR FUTURE GROUND WATER WELL.
2. PROVIDE 8% (APPROX) LONGITUDINAL SLOPE AND 2% CROSS SLOPE. COMPACTED NATIVE MATERIAL SHALL BE USED.
3. SPEED BUMP SIGN. REFER TO MUTCD W8-1. (QUANTITY 6)
4. SPEED BUMP PER CITY STANDARD (S-707).
5. EQUESTRIAN CROSSING AHEAD SIGN. REFER TO MUTCD W11-7. (QUANTITY 2)
6. INSTALL ROCK BOULDER ALONG EDGE OF ROADWAY. EACH BOULDER SHALL BE APPROX 1/2 TON W / 6-FOOT SPACING ON CENTER.
7. NEW CHAIN LINK FENCING PER APWA 600 (H = 6' L = 4' PER LEAF).
8. MAINTENANCE ACCESS GATE (APWA 600, DOUBLE LEAF, H=6')
9. INSTALL 15-FOOT WIDE ACCESS INTO BASIN AREA. INSTALL 5 REMOVABLE GUARD POSTS. SPACE EVENLY ACROSS OPENING.
10. INSTALL REMOVABLE GUARD POST. SPACE EVENLY ACROSS OPENING.
11. RETAIN AND PROTECT EXISTING TREES. FENCE OFF AREA UNDER TREE CANOPIES.
12. ROUTE DITCH BETWEEN FENCE AND TREE. HAND DIG ALL ESCAVATION WITHIN DRIPLINE OF TREES. REDUCE DITCH TO 2 FT WIDTH IF NEEDED TO AVOID TREE TRUNK.
13. REFER TO PIPING PLAN (DWG 03C-07) FOR ADDITIONAL DETAIL ON INLET/OUTLET FOR EACH BASIN.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
1-800-227-2600

C AREA 3C - BASIN SITE AND GRADING PLAN

SCALE: 1" = 40'
FILE: FILE

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

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CITY OF PASADENA INCORPORATED JUNE 1886

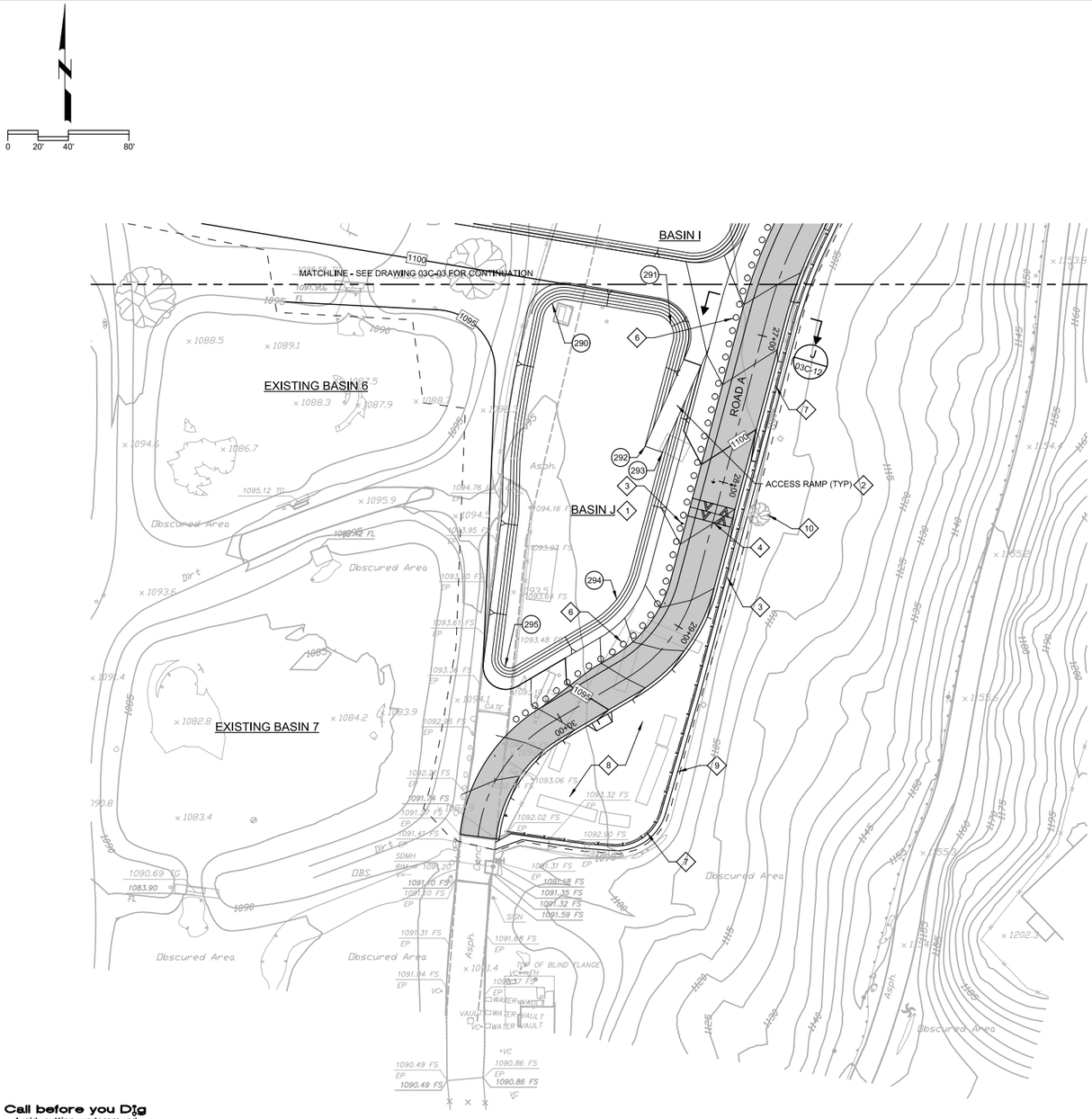
D.S.-206 TO 209

DATE	SCALE		
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DRAWN BY SDW			
DESIGNED BY SJS		ARROYO SECO CANYON PROJECT	WORK ORDER 03055 / FILE NUMBER 03C-03 (E-1757)
CHECKED BY JED		AREA 3C - BASIN SITE AND GRADING PLAN	
SUBMITTED BY —			
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1003C03.dgn

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COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
290	1894799.99	6511186.78	1095.00	CORNER, BOTTOM, BASIN J
291	1894786.37	6511264.94	1095.00	CORNER, BOTTOM, BASIN J
292	1894705.63	6511248.21	1095.00	RAMP, BOTTOM, BASIN J
293	1894701.61	6511259.56	1095.00	RAMP, BOTTOM, BASIN J
294	1894604.69	6511229.44	1095.00	CORNER, BOTTOM, BASIN J
295	1894560.29	6511155.72	1095.00	CORNER, BOTTOM, BASIN J

GENERAL NOTES:

1. REFER TO ROAD PLAN AND PROFILE DRAWINGS FOR ADDITIONAL FINISHED GRADE ELEVATIONS.
2. REFER TO LANDSCAPE PLANS FOR ALL PLANTING SCHEDULES AND IRRIGATION DESIGN.

KEY NOTES:

1. REFER TO PIPING PLAN (DWG 03C-08) FOR ADDITIONAL DETAIL ON INLET/OUTLET FORE EACH BASIN
2. PROVIDE 8% (APPROX) LONGITUDINAL SLOPE AND 2% CROSS SLOPE, COMPACTED NATIVE MATERIAL SHALL BE USED.
3. SPEED BUMP SIGN. REFER TO MUTCD W8-1. (QUANTITY 6)
4. SPEED BUMP PER CITY STANDARD (S-707).
6. INSTALL ROCK BOULDER ALONG EDGE OF ROADWAY. EACH BOULDER SHALL BE APPROX 1/2 TON W / 6-FOOT SPACING ON CENTER.
7. NEW CHAIN LINK FENCING PER APWA 600 (H = 6').
8. INSTALL 6" DECOMPOSED GRANITE OVER COMPACTED BASE. APPROX. 8,700 S.F.
9. REMOVE AND RECONSTRUCT CONCRETE DRAINAGE GUTTER PER DETAIL J, SHEET 03C-12.
10. RETAIN AND PROTECT EXISTING TREES.

Call before you Dig
Avoid cutting underground utility lines. It's costly.
Call 811
OR
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D AREA 3D - BASIN SITE AND GRADING PLAN

SCALE: 1" = 40'
FILE: FILE

X-XX

REVISION						
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
PE #
NAME
APPROVED:
DATE
APPROVED:
DATE

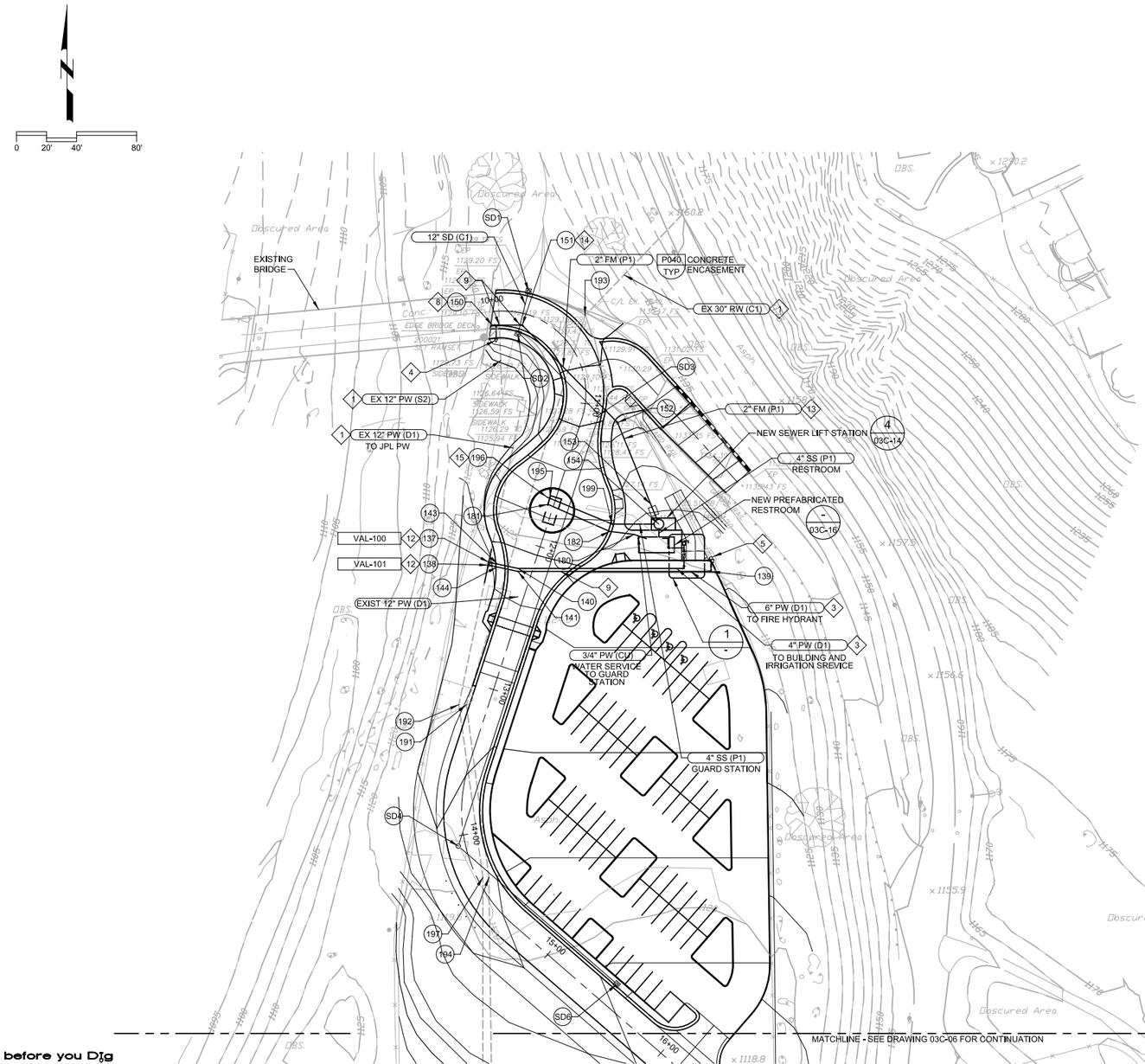
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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE: APRIL 2017	SCALE: AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
DRAWN BY: SDW DESIGNED BY: SJS CHECKED BY: JED SUBMITTED BY: —		ARROYO SECO CANYON PROJECT AREA 3D — BASIN SITE AND GRADING PLAN	WORK ORDER: 03055 FILE NUMBER: 03C-04 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

9137A10 9137A10 FILE NAME: 9137A1003C04.dgn



COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	ELEV	DESCRIPTION
137	1896134.73	6511409.94	1119,5±	CL, 12"x12"x4" TEE
138	1896132.89	6511409.55	1120,5±	CL, 12"x12"x6" TEE
139	1896128.64	6511558.00	1121,0	CL, 6" 90° ELBOW
140	1896130.64	6511429.37	1120,6	CL, 4" 11.25° ELBOW
141	1896128.64	6511429.37	1120,8	CL, 6" 11.25° ELBOW
142	1896130.64	6511539.97	1121,0	CL, 4" 90° ELBOW
143	1896133.50	6511415.81	1119,5 1120,6	CL, 4" TWO 90° ELBOW
144	1896131.63	6511415.41	1119,5 1120,8	CL, 6" TWO 90° ELBOW
150	1896292.65	6511412.33	1127,9	CL CAP, 2" SS
151	1896292.65	6511432.20	1127.5	CL, 2" 45° ELL W/ WYE & CLEANOUT
152	1896227.74	6511495.70	1125,5	CL, 2" 22.5° ELBOW
153	1896173.50	6511517.79	1124.0	CL, 2" SS TIE IN
154	1896160.14	6511523.22	1125,7	CENTER LIFT STATION, RIM = 1127.70
180	1896153.29	6511506.75	1124,5	CL 3/4" HOR BEND
181	1896173.33	6511449,31	1124,5	CL 3/4" CAP
182	1896173,33	6511449,31	1124.5	CL 3/4" HOR BEND
190	1896239	6511432	1123,0±	TOP, 12", POTHOLED
191	1896040	6511395	1119,5±	TOP, 30", POTHOLED
192	1896040	6511390	1117,9±	TOP, 12", POTHOLED
193	1896299	6511474	1124,8±	TOP, 30", POTHOLED
194	1895925	6511410	1118,5±	TOP, 30", POTHOLED
195	1896177,37	6511450.55	1125.00	CL, 4" CAP
196	1896178.13	6511448.70	1124.96	CL, 4" CLEAN OUT
197	1895925	6511406	1116,9±	TOP, 12", POTHOLED
199	1896160.14	6511492.13	1123,87	CL, 4" 22.5° ELBOW

NOTES:
1. ELEVATIONS SHOWN FOR PIPE ARE AT PIPE INVERT, UNLESS NOTED OTHERWISE.
2. POTHOLED DATA HAS ACCURACY IN HORIZONTAL DATA OF ± 4.0'. CONTRACOTR TO FIELD VERIFY.
3. ± USED TO INDICATE APPROXIMATE DEPTH. CONTRACTOR TO FIELD VERIFY.
4. REFER TO ROAD/PIPE CROSS SECTION ON DWG 03C-13.
5. REFER TO BASIN PROFILE ON DWG 03C-12.

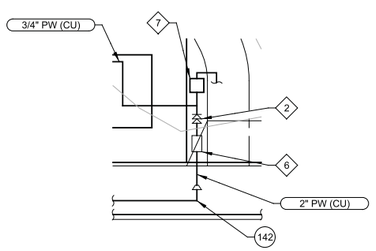
STORM DRAIN COORDINATE LOCATION TABLE				
MARK	NORTHING	EASTING	RIM/GRATE ELEV	PIPE INV EL
SD1	1896315.22	6511436.30	GRATE 1128.67	INV IN = 1124.67
SD2	1896287.05	6511429.26	GRATE 1128.67	INV IN = 1124.53 INV OUT = 1124.45
SD3	1896232.95	6511483.34	RIM 1129.90	INV IN = 1124.16 INV OUT = 1124.08
SD4	1895945.79	6511389.60	RIM 1124.70	INV IN = 1121.93 INV OUT = 1121.85
SD5	NOT USED			
SD6	1895853.75	6511495.10	GRATE 1122.89	INV OUT = 1120.89

GENERAL NOTES:

1. CONTRACTOR TO FIELD VERIFY EXISTING UTILITY LOCATIONS AND TIE-IN CONNECTION POINTS. SUBMIT FIELD DATA TO ENGINEER.
2. CONTRACTOR SHALL NOT DISRUPT WATER SERVICE TO JPL AND PROTECT MAIN WHILE WORK OCCURS.
3. CONTRACTOR SHALL SUBMIT 2 WEEKS IN ADVANCE A SCHEDULE TO PWP WHEN THE NEW JPL POTABLE LINE IS READY FOR CONNECTION TO THE EXISTING JPL METER. CONNECTION TO THE METER SHALL BE PERMITTED FOLLOWING PASSING OF THE MAIN PRESSURE TEST, DISINFECTION, AND PASSING OF THE BACTERIOLOGICAL TESTING.
4. CONTRACTOR SHALL PROVIDE AT ALL TIMES NORTH BOUND AND SOUTH BOUND VEHICLE ACCESS IN AREA 3. CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN FOR APPROVAL THAT CONFORMS TO MUTCD AND THE CITY'S DEPARTMENT OF TRANSPORTATION.

KEY NOTES:

1. RETAIN AND PROTECT EXISTING PIPING.
2. INSTALL BACKFLOW PREVENTOR (ABOVE GROUND) PER PWP STD PLAN G-1209.
3. USE RESTRAINED JOINTS FROM TIE-IN TO END OF LINE.
4. INSTALL 1" COMBINATION AIR RELEASE AND VACUUM VALVE ASSEMBLY.
5. INSTALL FIRE HYDRANT PER PWP STD PLAN C-1327 WITH GUARD POST PER TYP DETAIL C160.
6. INSTALL 2" WATER SERVICE CONNECTION PER PWP STD PLAN W-102.
7. INSTALL IRRIGATION CONTROL BOX. REFER TO LANDSCAPING PLANS FOR ADDITIONAL DETAIL.
8. ROUTE 2" FORCE MAIN TO EDGE OF EXIST. BRIDGE. PROVIDE CAP AND MARK AT GROUND SURFACE FOR FUTURE CONNECTION TO CITY SEWER EXTENSION.
9. POTABLE AND NON-POTABLE PIPE CROSSING, PROVIDE AS REQUIRED PER CITY AND CDPH REQUIREMENTS.
10. (NOT USED).
11. (NOT USED).
12. HOT TAP EXISTING 12" WATER MAIN WITH SST TAPPING SLEEVE, INSTALL GATE VALVE W/ VALVE FIX PER PWP STD PLAN G-1224.
13. PROVIDE CONCRETE ENCASEMENT PER TYPICAL DETAIL P040 FROM MARK (152) TO (150).
14. INSTALL SEWER CLEANOUT PER TYPICAL DETAIL (TYPE 2). CLEANOUT LATERAL SHALL BE 6-INCH. PROVIDE REDUCER COUPLINGS AND SPOOL PIECES TO CONNECT 6-INCH CLENOUT W/ 2-INCH FORCE MAIN.
15. INSTALL SEWER CLEANOUT PER TYPICAL DETAIL P004 (TYPE 1).



1 - DETAIL
SCALE: 1" = 10'
FILE: 9137A1003C05

E AREA 3A - PIPING PLAN
SCALE: 1" = 40'
FILE: FILE

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REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

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PE #
NAME
APPROVED: DATE
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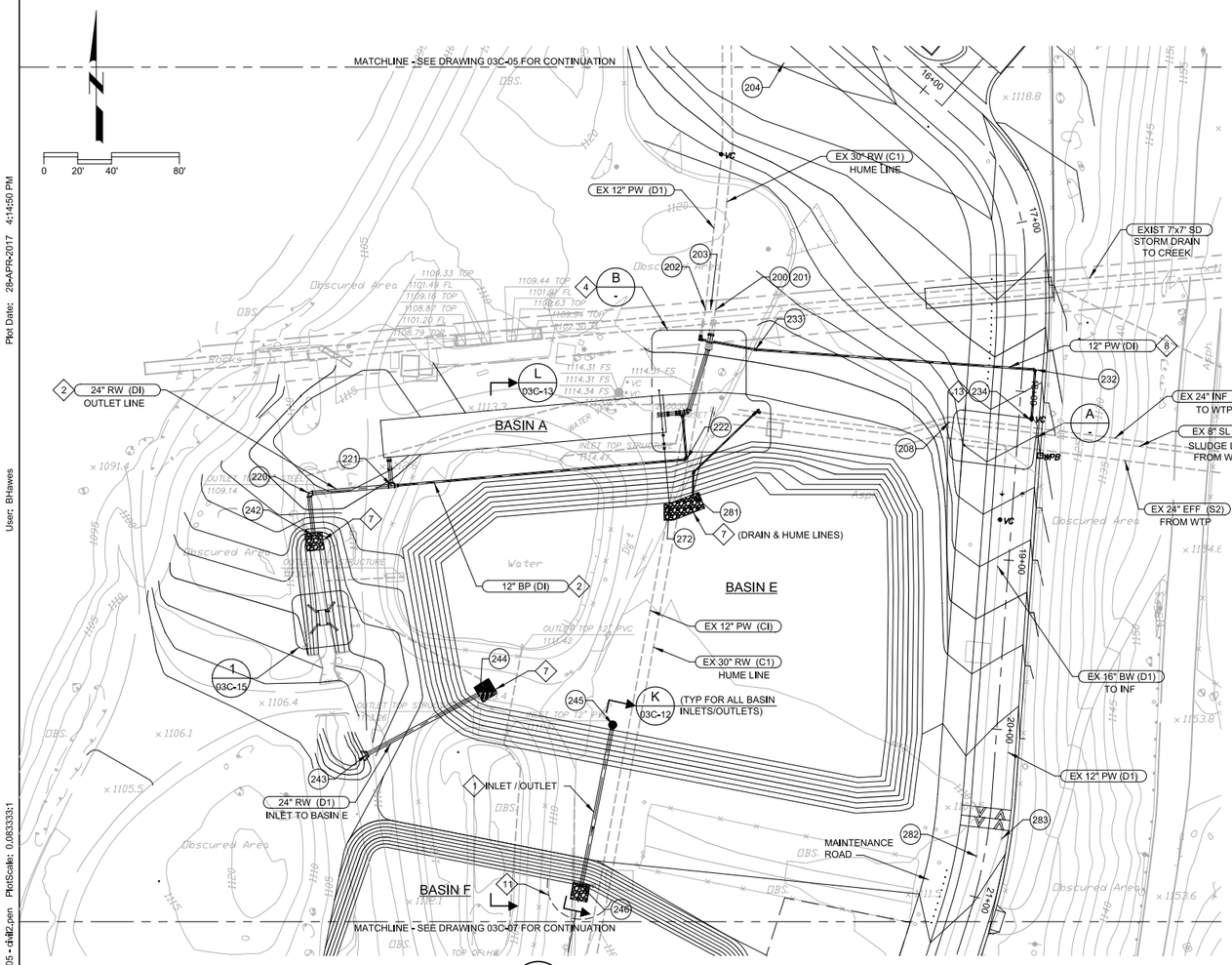
CITY OF PASADENA INCORPORATED JUNE 1886

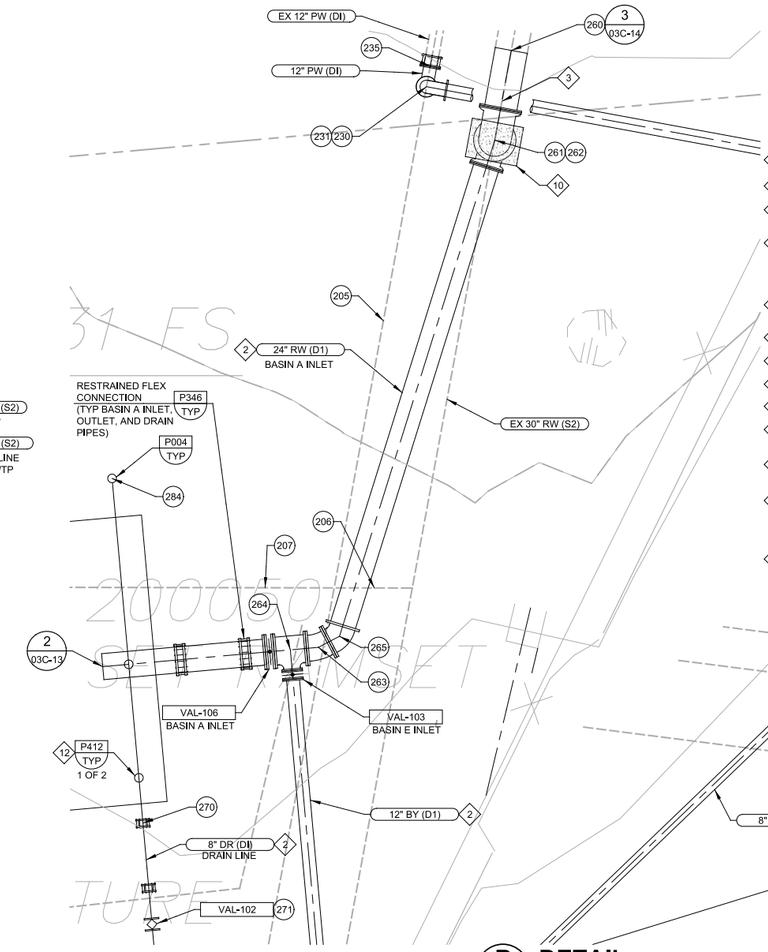
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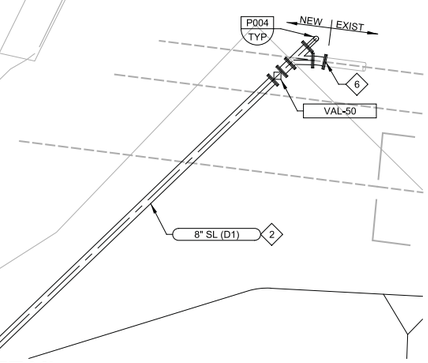
DATE: APRIL 2017	SCALE: AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
DRAWN BY: SDW DESIGNED BY: JED CHECKED BY: JED SUBMITTED BY: —		ARROYO SECO CANYON PROJECT AREA 3A — PIPING PLAN	WORK ORDER: 03055 FILE NUMBER: 03C-05 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

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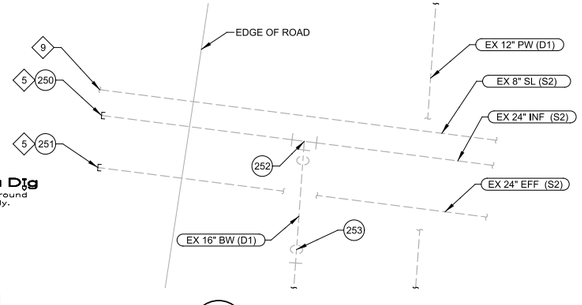


F AREA 3B - PIPING PLAN

SCALE: 1" = 40'
FILE: FILE

B DETAIL

SCALE: 3/16" = 1'-0"
FILE: 9137A1003C12



A DETAIL

SCALE: 1/8" = 1'-0"
FILE: 9137A1003C11

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OR
1-800-227-2600

COORDINATE LOCATION TABLE NOTES:

1. ELEVATIONS SHOWN FOR PIPE ARE AT PIPE INVERT, UNLESS NOTED OTHERWISE.
2. POTHOLED DATA HAS ACCURACY IN HORIZONTAL DATA OF ±3.3', CONTRACOTR TO FIELD VERIFY.
3. ± USED TO INDICATE APPROXIMATE DEPTH. CONTRACTOR TO FIELD VERIFY.
4. REFER TO ROAD/PIPE CROSS SECTION ON DWG 03C-12.
5. REFER TO BASIN PROFILE ON DWG 03C-13.
6. ALL BENDS ARE MADE BY DEFLECTION JOINTS ALONG LINE.
7. RESTRAINED LENGTHS DESIGNATED BY "R" AND CORRESPONDING DISTANCES FROM IDENTIFIED MARK.
8. DATA FOR EXISTING LINES ARE SCREENED.

GENERAL NOTES:

1. CONTRACTOR TO FIELD VERIFY EXISTING UTILITY LOCATIONS AND TIE-IN CONNECTION POINTS, SUBMIT FIELD DATA TO ENGINEER.
2. CONTRACTOR SHALL NOT DISRUPT WATER SERVICE TO JPL AND PROTECT MAIN WHILE WORK OCCURS.
3. ALL WORK ON THE POTABLE WATER SYSTEM SHALL BE IN ACCORDANCE WITH PWP STANDARDS.
4. CONTRACTOR SHALL PROVIDE AT ALL TIMES NORTH BOUND AND SOUTH BOUND VEHICLE ACCESS IN AREA 3.

KEY NOTES:

1. REFER TO DETAIL K ON DRAWING 03C-12 FOR PIPE SIZING/ MATERIAL.
2. USE RESTRAINED JOINTS FROM TIE-IN TO END OF LINE.
3. PROTECT EX 30" RW LINE IN PLACE WHEN GOING UNDERNEATH W/ 12" PW LINE.
4. CONTRACTOR SHALL BE RESPONSIBLE TO FIELD VERIFY AND CONFIRM LOCATION OF EXISTING JPL POTABLE WATER MAIN IN THIS AREA PRIOR TO REMOVING EXISTING DRAINS. THE CONTRACTOR SHALL CAREFULLY EXPOSE THE MAIN FOR PWP TO VISUALLY INSPECT. PWP WILL INITIALLY IDENTIFY AND MARK THE APPROXIMATE LOCATION OF THE JPL MAIN DURING THE UTILITY ALERT.
5. CUT AND CAP EXISTING 24" INFLUENT AND 24" EFFLUENT PIPELINE W / BLIND FLANGE AT WEST EDGE OF NEW MAINTENANCE ROAD.
6. CONNECT W/ EXISTING LINE USING FLANGES.
7. CONSTRUCT OUTLET SIMILAR TO DETAIL K ON SHEET 03C-12.
8. USE RESTRAINED JOINTS FOR 50 FT OF PIPE AT EACH TIE-IN.
9. PROTECT IN PLACE EXISTING LINE MAKE TIE-IN & ROUTE TO BASIN E.
10. CONCRETE ENCASE BOTH 90° ELBOWS PER TYP DETAIL P040. ENCASEMENT SHALL BE 10' MIN DEPTH.
11. PROVIDE 6" DEPRESSED AREA A MIN. OF 20' AROUND PIPE INLET. GRADE SHALL NOT EXCEED 5% MAX SLOPE FROM INISHED GRADE OF BASIN.
12. FURNISH AND INSTALL 8-INCH DRAIN (JOSAM SERIES 32300 OR EQUAL) W/ 15FT OF SST CHAIN TO ELEVATED DECK, SECURE CHAIN TO HOOK MOUNTED AT END OF DECK. PROVIDE FOUR-1/2" DIA SST HOOKS EQUALLY SPACED ACROSS THE END OF DECK.
13. REMOVE RISER/ CAP/ PIPING. EXTEND SIZE AS SHOWN.

COORDINATE LOCATION TABLE

MARK	NORTHING	EASTING	ELEV	MIN COVER REL TO EXIST GRADE	DESCRIPTION
200	1895678	6511402	1116.5±	-	MH, 30", POTHOLED
201	1895678	6511402	1116.2±	-	TOP, 30", POTHOLED
202	1895678	6511396	1114.7±	-	TOP, 12", POTHOLED
203	1895678	6511399	1113.3±	-	TOP, 7'X7' SD, POTHOLED
204	1895774	6511406	1114.8±	-	TOP, 12", POTHOLED
205	1895642	6511389	1108.3±	-	TOP, 12", POTHOLED
206	1895622	6511389	1112.5±	-	TOP, 16", POTHOLED
207	1895622	6511380	1112.3±	-	TOP, 24" (BF), POTHOLED
208	1895612	6511540	1111.1±	-	TOP, 24" (INF), POTHOLED
220	1895569.62	6511161.91	1107.32	36"	INV, 24" 90° ELBOW
221	1895573.99	6511210.61	1107.10	36"	INV, 24" TEE, 24"x12" REDUCER
222	1895589.59	6511384.79	1109.10	36"	INV, 12" 90° ELBOW
230	1895660.47	6511392.77	1112.20	36"	CL, 12" 90° ELBOW
231	1895660.47	6511392.77	1114.20	36"	CL, 12" 90° ELBOW

COORDINATE LOCATION TABLE

MARK	NORTHING	EASTING	ELEV	MIN COVER REL TO EXIST GRADE	DESCRIPTION
232	1895642.65	6511590.69	1113.00	36"	CL, 12" 90° ELBOW
233	1895654.45	6511425.51	1112.20	36"	CL, 12" 11.25° ELBOW
234	1895612.29	6511588.52	1112.20	36"	CL, 12" CAP W/ RISER
235	1895662.03	6511393.06	1114.20	36"	CL, 12" , 90° ELBOW, 12" SPOOL
242	1895544.60	6511164.66	1107.00	-	INV, FLUME INLET
243	1895415.80	6511196.55	1106.5	-	INV, FLUME OUTLET
244	1895451.48	6511262.93	1106.00	-	INV, BASIN E INLET
245	1895432.95	6511341.21	1104.00	-	INV, BASIN E OUTLET
246	1895338.17	6511322.63	1103.00	-	INV, BASIN F INLET
250	1895600.85	6511550.10	1109.0	36"	24" CAP
251	1895597.99	6511548.72	1109.0	36"	24" CAP
252	1895597.87	6511573.45	1110.5	36"	CL, 16", TEE
253	1895589.38	6511572.85	1110.5	36"	CL, 16", VERT BEND, R±80'
260	1895432.95	6511341.21	1113.7	36"	INV, 30", TIE IN

COORDINATE LOCATION TABLE

MARK	NORTHING	EASTING	ELEV	MIN COVER REL TO EXIST GRADE	DESCRIPTION
261	1895656.38	6511398.02	1113.7	-	INV, 30", 90° ELBOW
262	1895656.38	6511398.02	1110.53	-	INV, 30", 90° ELBOW
263	1895617.42	6511384.47	1109.30	36"	INV, 24", 22.5° ELBOW
264	1895617.23	6511382.31	1109.30	36"	INV, 24"x24"x12" TEE
265	1895618.27	6511386.09	1109.30	36"	INV, 24", 45° ELBOW
270	1895603.92	6511370.99	1108.5	36"	INV, 8" CPLG
271	1895596.15	6511371.69	1108.00	36"	CL, 8" VALVE
272	1895563.84	6511374.58	1106.00	36"	INV, 8"
281	1895568.93	6511388.55	1106.00	36"	INV, 8"
282	1895355.42	6511556.14	1108.2	36"	CL, 16" 11.25° HOR BEND, R±6'
283	1895365.68	6511570.90	1108.1	36"	CL, 12" 11.25° HOR BEND, R±6'
284	1895630.39	6511368.62	1108.1	-	CLEAN OUT

X-XX

REVISION						
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE	
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION					

APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE	SCALE
APRIL 2017	AS SHOWN

DRAWN BY SDW
DESIGNED BY JED
CHECKED BY JED
SUBMITTED BY SUB
FIELD BOOKS | CALC BOOKS | APPROVED | APPROVED

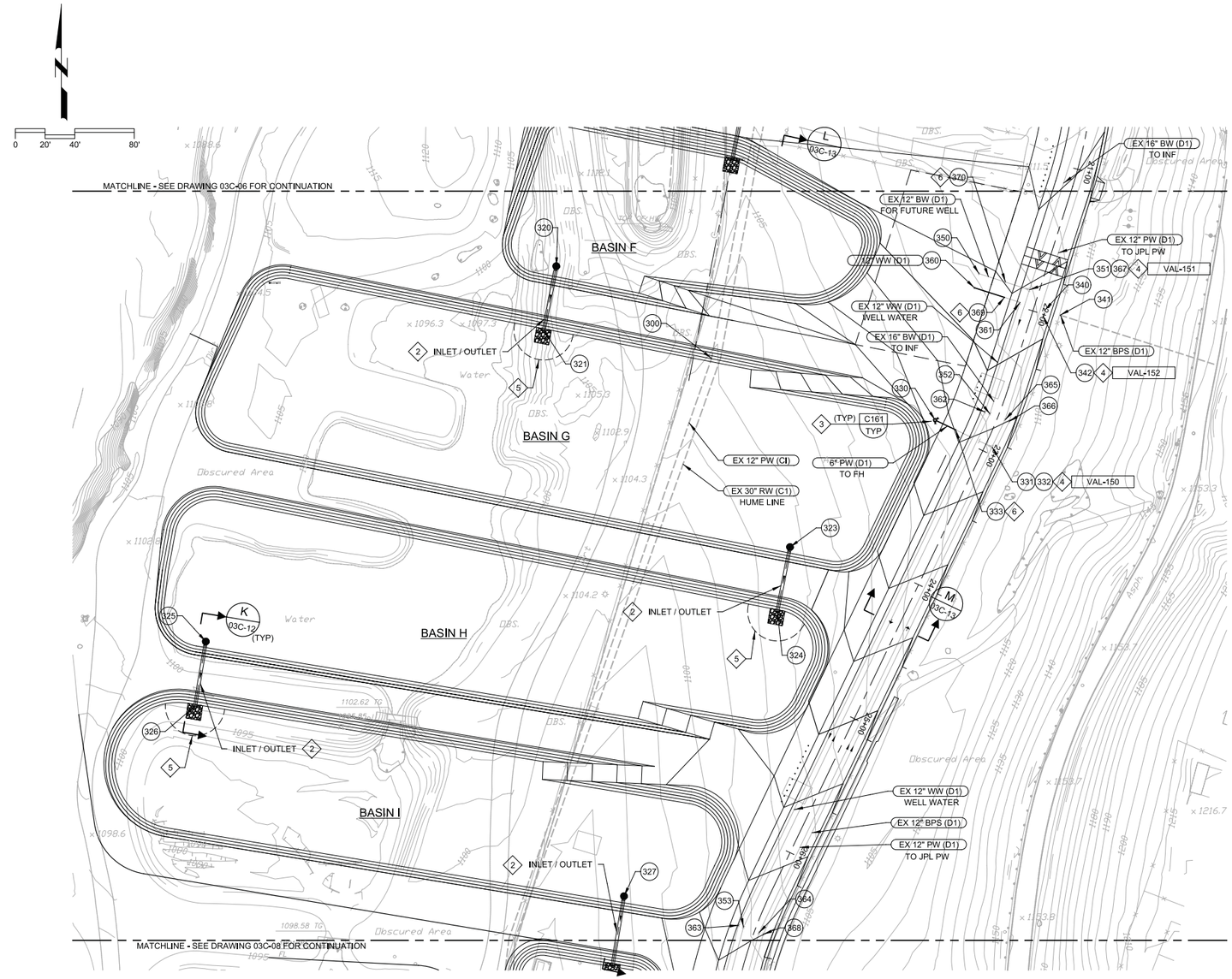
PASADENA WATER & POWER
CITY OF PASADENA

ARROYO SECO CANYON PROJECT
AREA 3B – PIPING PLAN

SHEET NO – OF XX SHEETS
WORK ORDER 03055
FILE NUMBER 03C-06 (E-1757)
REVISION

9137A10 9137A10 FILE NAME: 9137A1003C06.dgn

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User: BHawes
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LAST SAVED BY: bhawes



COORDINATE LOCATION TABLE					
MARK	NORTHING	EASTING	ELEV	MIN COVER REL TO EXIST GRADE	DESCRIPTION
300	1895204	6511309	1100.2±	36"	TOP, 12" PW, POTHOLED
320	1895266.24	6511204.21	1102.00	-	CL, BASIN F OUTLET
321	1895223.08	6511195.76	1101.50	-	CL, BASIN G INLET
323	1895077.19	6511361.44	1100.00	-	CL, BASIN G OUTLET
324	1895034.00	6511352.96	1099.50	-	CL, BASIN H INLET
325	1895013.62	6510968.40	1098.00	-	CL, BASIN H OUTLET
326	1894970.24	6510961.22	1097.50	-	CL, BASIN I INLET
327	1894842.25	6511249.77	1096.00	-	CL, BASIN I OUTLET
330	1895162.67	6511459.02	1104.00	36"	FH, R±151'
331	1895144.50	6511497.37	1104.00	36"	CL, 12"x12"x6" TEE, R±5'
332	1895144.50	6511497.37	1104.00	36"	CL, GATE VALVE
333	1895144.50	6511497.37	1104.00	36"	CL, 6" RISER W/ CAP, R±151'
340	1895236.58	6511532.85	1105.9	36"	CL, 12" 90° ELBOW
341	1895233.28	6511543.19	1105.9	36"	CL, TIE-IN
342	1895232.77	6511531.63	1105.9	36"	CL, GATE VALVE
350	1895261.21	6511488.54	1104.0	36"	CL, 16" BLIND FLANGE
351	1895250.34	6511522.60	1106.2	36"	CL, 16"x16"x12" TEE, R±5'
352	1895166.83	6511495.94	1104.5	36"	CL, 11.25° HOR BEND, R±6'
353	1894821.34	6511330.14	1097.0	36"	CL, 12" 11.25° HOR BEND, R±6'
360	1895251.69	6511485.50	1103.5	36"	12" BLIND FLANGE
361	1895241.88	6511516.22	1106.2	36"	CL, 12" 90° ELBOW, R±41' @ EL
362	1895168.12	6511492.68	1104.7	36"	CL, 12" 11.25° HOR BEND, R±5'
363	1894822.56	6511326.84	1097.2	36"	CL, 12" 11.25° HOR BEND, R±5'
364	1894817.55	6511340.54	1096.9	36"	CL, 12" 11.25° HOR BEND, R±6'
365	1895162.84	6511506.17	1104.4	36"	CL, 12" 11.25° HOR BEND, R±6'
366	1895161.73	6511508.96	1104.4	36"	CL, 12" 11.25° HOR BEND, R±6'
367	1895250.34	6511522.60	1106.2	36"	CL, GATE VALVE
368	1894816.51	6511343.37	1096.9	36"	CL, 12" 11.25° HOR BEND, R±6'
369	1895245.23	6511505.75	1096.9	36"	CL, 12" CAP, R±151'
370	1895255.51	6511506.40	1096.9	36"	CL, 12"x2" CAP W/ RISER, R±193'

NOTES:
1. ELEVATIONS SHOWN FOR PIPE ARE AT PIPE INVERT, UNLESS NOTED OTHERWISE.
2. POTHOLED DATA HAS ACCURACY IN HORIZONTAL DATA OF P3.3'. CONTRACTOR TO FIELD VERIFY.
3. ± USED TO INDICATE APPROXIMATE DEPTH. CONTRACTOR TO FIELD VERIFY.
4. REFER TO ROAD/PIPE CROSS SECTION ON DWG 03C-13.
5. REFER TO BASIN PROFILE ON DWG 03C-13.
6. ALL BENDS ARE MADE BY DEFLECTION JOINTS ALONG LINE.
7. RESTRAINED LENGTHS DESIGNATED BY "R" AND CORRESPONDING DISTANCES FROM IDENTIFIED MARK.
8. DATA FOR EXISTING LINES ARE SCREENED.

GENERAL NOTES:
1. CONTRACTOR TO FIELD VERIFY EXISTING UTILITY LOCATIONS AND TIE-IN CONNECTION POINTS. SUBMIT FIELD DATA TO ENGINEER.
2. CONTRACTOR SHALL NOT DISRUPT WATER SERVICE TO JPL AND PROTECT MAIN WHILE WORK OCCURS.
3. ALL WORK ON THE POTABLE WATER SYSTEM SHALL BE IN ACCORDANCE WITH PWP STANDARDS.
4. CONTRACTOR SHALL PROVIDE AT ALL TIMES NORTH BOUND AND SOUTH BOUND VEHICLE ACCESS IN AREA 3.

KEY NOTES:
1. (NOT USED).
2. REFER TO DETAIL K ON DRAWING 03C-12 FOR PIPE SIZING/ MATERIAL.
3. INSTALL FIRE HYDRANT WITH GUARD POST PER PWP STD PLAN C-1327.
4. LENGTHEN EXISTING VALVE STEM AND CAN TO NEW FINISHED GRADE.
5. PROVIDE 6" DEPRESSED AREA A MIN. OF 20' AROUND PIPE INLET. GRADE SHALL NOT EXCEED 5% MAX SLOPE FROM FINISHED GRADE OF BASIN.
6. REMOVE RISER/CAP/PIPING. EXTEND PIPE AS SHOWN.

G AREA 3C - PIPING PLAN
SCALE: 1" = 40'
FILE: FILE

Call before you Dig
Avoid cutting underground utility lines. It's costly.
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OR
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REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
PE #
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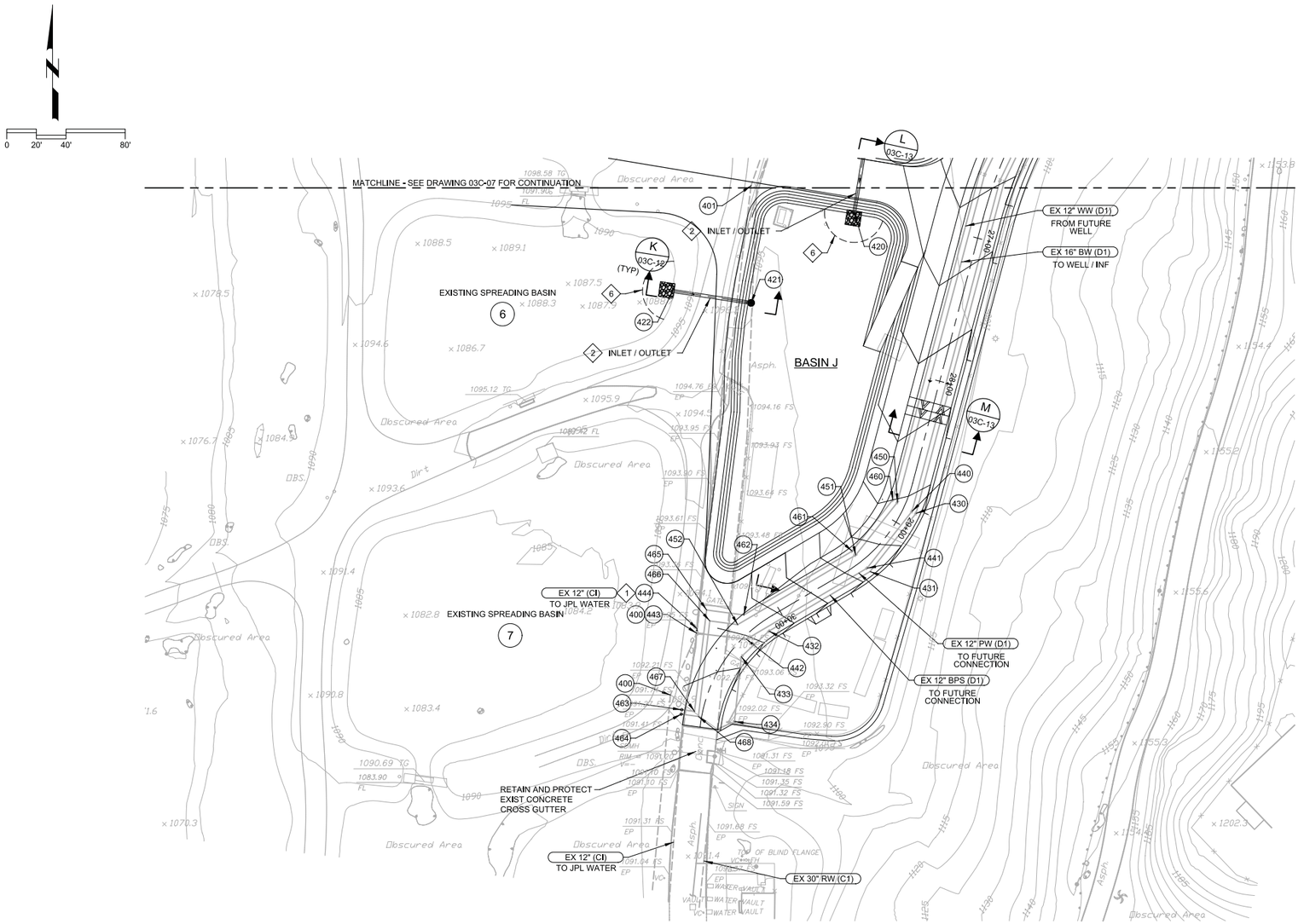
CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE	SCALE	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO – OF XX SHEETS
APRIL 2017	AS SHOWN		
DRAWN BY SDW DESIGNED BY JED CHECKED BY JED SUBMITTED BY –		ARROYO SECO CANYON PROJECT AREA 3C – PIPING PLAN	WORK ORDER 03055 / FILE NUMBER 03C-07 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

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LAST SAVED BY: BBerg



H AREA 3D - PIPING PLAN

SCALE: 1" = 40'
FILE: FILE

COORDINATE LOCATION TABLE					
MARK	NORTHING	EASTING	ELEV	MIN COVER REL TO EXIST GRADE	DESCRIPTION
400	1894470	6511118	1089.0±	48"	TOP, 12" PW, POTHOLED
401	1894814	6511172	1093.0±	54"	TOP, 12" PW, POTHOLED
420	1894795.96	6511242.11	1094.50	-	BASIN J INLET
421	1894734.78	6511172.44	1094.10	-	BASIN J OUTLET
422	1894742.84	6511119.45	1089.50	-	EXISTING BASIN (6) INLET
430	1894592.57	6511283.86	1093.9	42"	CL, 12" 22.5° ELBOW, R±11'
431	1894553.23	6511252.79	1092.3	42"	CL, 12" 22.5° ELBOW, R±11'
432	1894513.01	6511184.51	1090.3	42"	CL, 12" 11.25° ELBOW, R±6'
433	1894495.76	6511165.86	1089.2	42"	CL, 12" 45° ELBOW, R±23'
434	1894451.89	6511161.24	1088.0	42"	CL, 12" CAP W/ CHLORINE RISER
440	1894593.94	6511281.12	1093.9	42"	CL, 12" 22.5° ELBOW, R±11'
441	1894555.53	6511250.78	1092.3	42"	CL, 12" 22.5° ELBOW, R±11'
442	1894507.53	6511169.30	1089.5	42"	CL, 12" 45° ELBOW, R±23'
443	1894511.55	6511135.68	1089.0	48"	CL, 12"x12"x12" SST TAPPING SLEEVE
444	1894514.52	6511136.04	1094.0	42"	CL, 12" CAP
450	1894600.04	6511271.28	1094.0	42"	CL, 16" 22.5° ELBOW, R±11'
451	1894564.35	6511243.09	1092.4	42"	CL, 16" 22.5° ELBOW, R±11'
452	1894517.38	6511163.37	1089.7	44"	CL, 16" 11.25° ELBOW, R±6'
460	1894601.64	6511268.09	1094.2	42"	CL, 12" 22.5° ELBOW, R±9'
461	1894567.03	6511240.75	1092.6	42"	CL, 12" 22.5° ELBOW, R±9'
462	1894523.89	6511167.52	1090.4	44"	CL, 12" 11.25° ELBOW, R±5'
463	1894459.86	6511125.61	1087.5	36"	CL, 12" BLIND FLANGE
464	1894456.89	6511125.21	1087.1	42"	CL, 16" GATE VALVE / BLIND FLANGE
465	1894527.23	6511142.41	1089.0	42"	CL, 12" 90° ELBOW, R±41'
466	1894519.89	6511144.55	1088.6	42"	CL, 16" 90° ELBOW, R±52'
467	1894458.71	6511134.22	1087.8	42"	CL, 12" 90° ELBOW, R±41'
468	1894455.34	6511136.84	1087.6	42"	CL, 16" 90° ELBOW, R±52'

GENERAL NOTES:

1. CONTRACTOR TO FIELD VERIFY EXISTING UTILITY LOCATIONS AND TIE-IN CONNECTION POINTS. SUBMIT FIELD DATA TO ENGINEER.
2. CONTRACTOR SHALL NOT DISRUPT WATER SERVICE TO JPL AND PROTECT MAIN WHILE WORK OCCURS.
3. CONTRACTOR SHALL SUBMIT 2 WEEKS IN ADVANCE A SCHEDULE TO PWP WHEN THE NEW JPL POTABLE LINE IS READY FOR CONNECTION TO THE EXISTING JPL METER. CONNECTION TO THE METER SHALL BE PERMITTED FOLLOWING PASSING OF THE MAIN PRESSURE TEST, DISINFECTION, AND PASSING OF THE BACTERIOLOGICAL TESTING.
4. CONTRACTOR SHALL PROVIDE AT ALL TIMES NORTH BOUND AND SOUTH BOUND VEHICLE ACCESS IN AREA 3. CONTRACTOR SHALL SUBMIT A TRAFFIC CONTROL PLAN FOR APPROVAL THAT CONFORMS TO MUTCD AND THE CITY'S DEPARTMENT OF TRANSPORTATION.

KEY NOTES:

1. INSTALL 12" CAP. DEMOLISH LINE NORTH OF CAP AS SHOWN ON DEMOLITION SHEETS.
2. REFER TO DETAIL K ON DRAWING 03C-12 FOR PIPE SIZING/ MATERIAL.
3. (NOT USED)
4. (NOT USED)
5. (NOT USED)
6. PROVIDE 6" DEPRESSED AREA A MIN. OF 20' AROUND PIPE INLET. GRADE SHALL NOT EXCEED 5% MAX SLOPE FROM FINISHED GRADE OF BASIN.

COORDINATE LOCATION TABLE NOTES:

1. ELEVATIONS SHOWN FOR PIPE ARE AT PIPE INVERT, UNLESS NOTED OTHERWISE.
2. POTHOLED DATA HAS ACCURACY IN HORIZONTAL DATA OF P3,3'. CONTRACOTR TO FIELD VERIFY.
3. ± USED TO INDICATE APPROXIMATE DEPTH. CONTRACTOR TO FIELD VERIFY.
4. NOT USED.
5. REFER TO BASIN PROFILE ON DWG 03C-13.
6. ALL BENDS ARE MADE BY DEFLECTION JOINTS ALONG LINE.
7. RESTRAINED LENGTHS DESIGNATED BY "R" AND CORRESPONDING DISTANCES FROM IDENTIFIED MARK.
8. DATA FOR EXISTING LINES ARE SCREENED.

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APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

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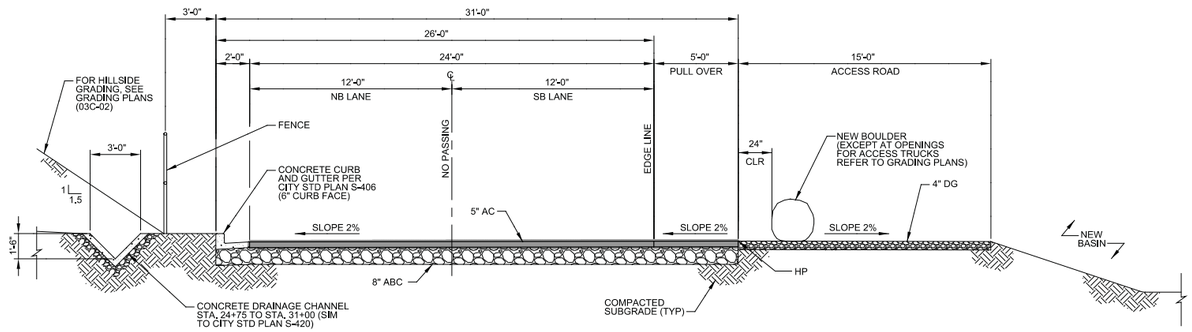
CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE APRIL 2017	SCALE AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO – OF XX SHEETS
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FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

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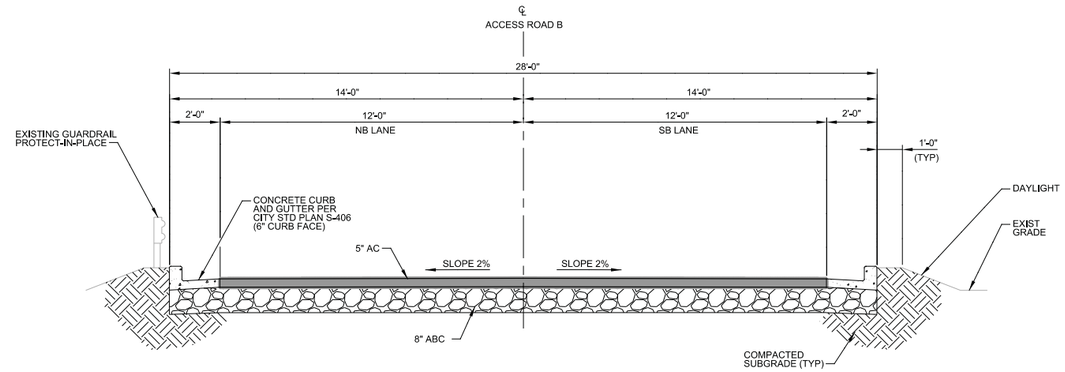
9137A10 9137A10 FILE NAME: 9137A1003C08.dgn



J ROAD A TYPICAL ROAD SECTION STA. 17+50 - STA. 28+50

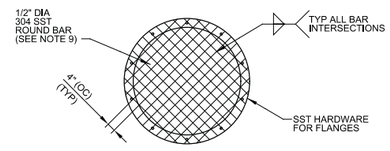
03C-02
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FILE: 9137A1003C301

03C-03
03C-04



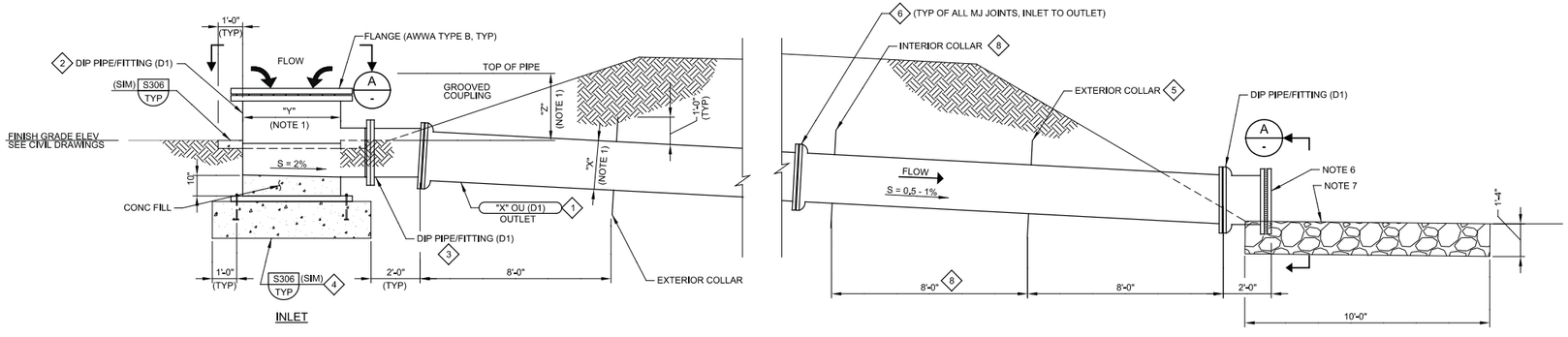
L ROAD B TYPICAL ROAD SECTION STA. 50+00 - STA. 50+79

03C-09
SCALE: 3/8" = 1'-0"
FILE: 9137A1003C301



A SECTION

SCALE: 3/8" = 1'-0"
FILE:



K TYPICAL STANDPIPE DETAIL

03C-06
SCALE: 3/8" = 1'-0"
FILE: 9137A1003C302

03C-07
03C-08

KEY NOTES:

1. DIMENSION VARIES FOR EACH BASIN. REFER TO TABLE 1 IN THIS DETAIL.
2. 40" X 40" X 24" TEE W/ FLANGES.
3. SPOOL (FL X MJ), RESTRAINED.
4. FURNISH AND INSTALL 5/8" Ø BOLTS WITH 9" EMBEDMENT AND 2"x2"x3/8" PLATE WASHERS AT EMBEDDED END OF EACH ANCHOR.
5. WALL COLLAR WELDED FULL CIRCUMFERENCE TO PIPE. BOTH SIDE OF COLLAR. MIN THICKNESS SHALL MATCH PIPE THICKNESS.
6. RESTRAINED MJ ALONG EACH STANDPIPE. MAX DEFLECTION ALLOWED AT EACH JOINT IS 2-DEGREES.
7. RIP RAP SHALL BE QUARRY STONE (COBBLES NOT ACCEPTABLE) WITH THE FOLLOWING GRADATION (NO. 2 BACKING), SHOWN ON TABLE 2. REFER TO GRADING PLAN FOR FINE GRADING.
8. BETWEEN EXTERIOR COLLARS, PROVIDE INTERIOR COLLAR(S) AT SPACING AS SHOWN.
9. GRIND AND ROUND ALL BAR ENDS FLUSH W/ EDGE OF FLANGES. NO PORTIONS OF BARS SHALL PROTRUDE OUTSIDE EDGE OF FLANGES.

TABLE 1			
BASIN	"X" (IN)	"Y" (IN)	"Z" (IN)
E	24	48	12
F	24	48	12
G	24	48	12
H	24	48	12
I	24	48	12
J	24	48	12

TABLE 2	
ROCK SIZES	PERCENTAGE LARGER THAN
75 POUNDS	0 - 5
25 POUNDS	25 - 75
5 POUNDS	90 - 100

X-XX

REVISION					
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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209
DATE: APRIL 2017
SCALE: AS SHOWN
DRAWN BY: SDW
DESIGNED BY: SJS
CHECKED BY: JED
SUBMITTED BY: –
FIELD BOOKS | CALC BOOKS | APPROVED | APPROVED

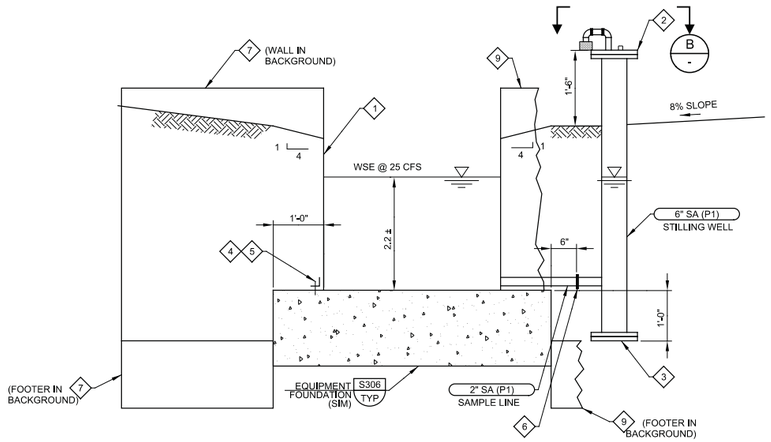
PASADENA WATER & POWER
CITY OF PASADENA

ARROYO SECO CANYON PROJECT
AREA 3 – DETAILS AND SECTIONS 1

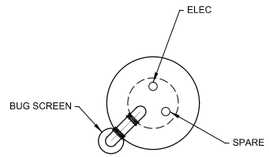
SHEET NO – OF XX SHEETS
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FILE NUMBER: 03C-12 (E-1757)
REVISION

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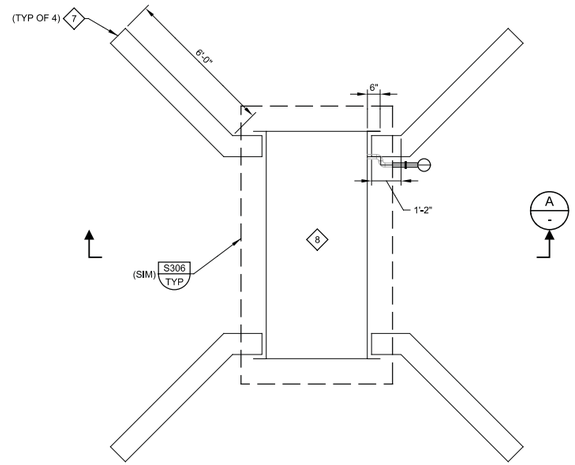
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A - SECTION
SCALE: 1/2" = 1'-0"
FILE: 9137A1003C313



B - SECTION
SCALE: 1 1/2" = 1'-0"
FILE: 9137A1003C313



1 - DETAIL
03C-06
SCALE: 3/8" = 1'-0"
FILE: 9137A1003C313

KEY NOTES

1. FLUME (CUTHROAT, L = 108", W = 24",STAINLESS STEEL). REFER TO SPEC SECTION 13200 FOR ADDITIONAL DETAIL.
2. BLIND FLANGE (PVC, SCH 80) W/ THREADED COUPLINGS EQUALLY SPACED, (1 - ONE INCH ELEC CONDUCT, 1 - ONE INCH BUG SCREEN, 20 MESH, 1 - ONE INCH PLUG/SPARE). PROVIDE SST HARDWARE.
3. BLIND FLANGE (PVC, SCH 80) W/ SST HARDWARE. REFER TO DWG 00NT-01 FOR MODIFICATIONS TO TOP AND BOTTOM FLANGES FOR INSTRUMENT MOUNTING.
4. CONTRACTOR SHALL USE ANCHOR BOLT A TEMPLATE FROM FLUME MANUFACTURER TO LOCATE CAST-IN ANCHORS.
5. SST ANCHOR CHAIRS AND ANCHORS. REFER TO SPEC SECTIONS 05190 AND 13100.
6. FLANGE SET W/ SST HARDWARE.
7. INSTALL RETAINING WALL PER APWA STD PLAN 610. H=6 FT W/ KEYED FOOTING. WALL SHALL ABUT FLUME STRUCTURE.
8. FLUME. REFER TO SPEC SECTION 13100 FOR ADDITIONAL DETAIL.
9. WALL AND FOOTER NOT SHOWN FOR CLARITY.

X-XX

REVISION					
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DATE	SCALE	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO SHTof XX SHEETS
APRIL 2017	AS SHOWN		
DRAWN BY SDW DESIGNED BY JED CHECKED BY JED SUBMITTED BY –		ARROYO SECO CANYON PROJECT AERA 3 – DETAILS AND SECTIONS 4	WORK ORDER 03055 FILE NUMBER 03C-15 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

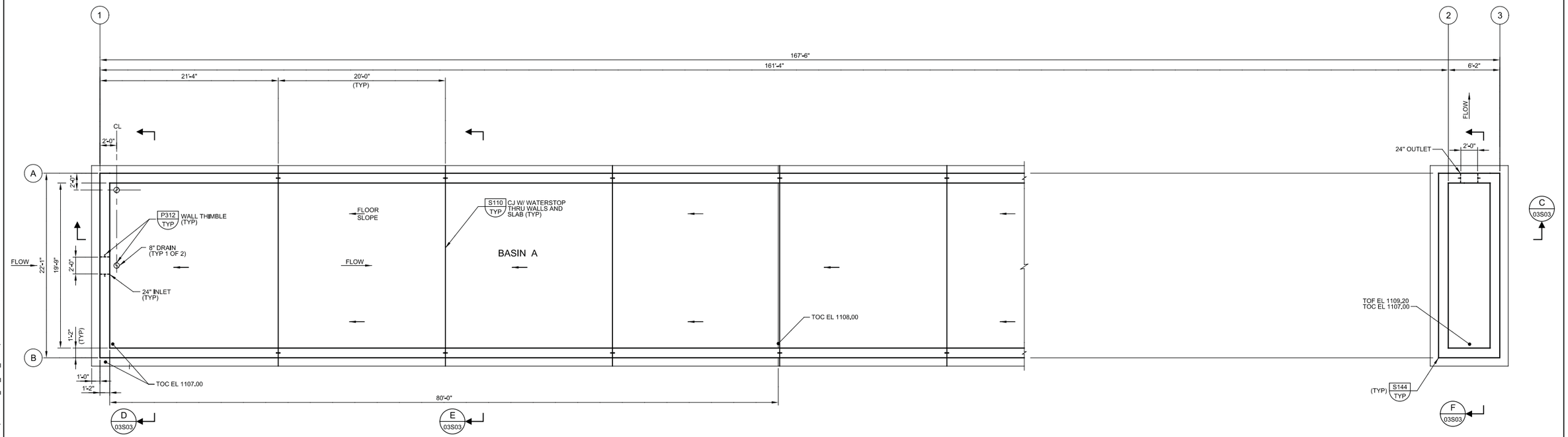
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LAST SAVED BY: RPotestas

GENERAL NOTES:

1. FOR GENERAL NOTES SEE DRAWING NO. 00S-01.
2. TOC: DENOTES TOP OF CONCRETE ELEVATION
   TOF: DENOTES TOP OF CONCRETE FILL ELEVATION.



A BOTTOM PLAN

SCALE: 3/16" = 1'-0"
FILE: 9137A1003S101

X-XX

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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE: APRIL 2017	SCALE: AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
DRAWN BY: TVN DESIGNED BY: ND CHECKED BY: JAD SUBMITTED BY: —		ARROYO SECO CANYON PROJECT AREA 3 — SEDIMENTATION BASIN — BOTTOM PLAN	WORK ORDER: 03055 FILE NUMBER: 03S-01 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

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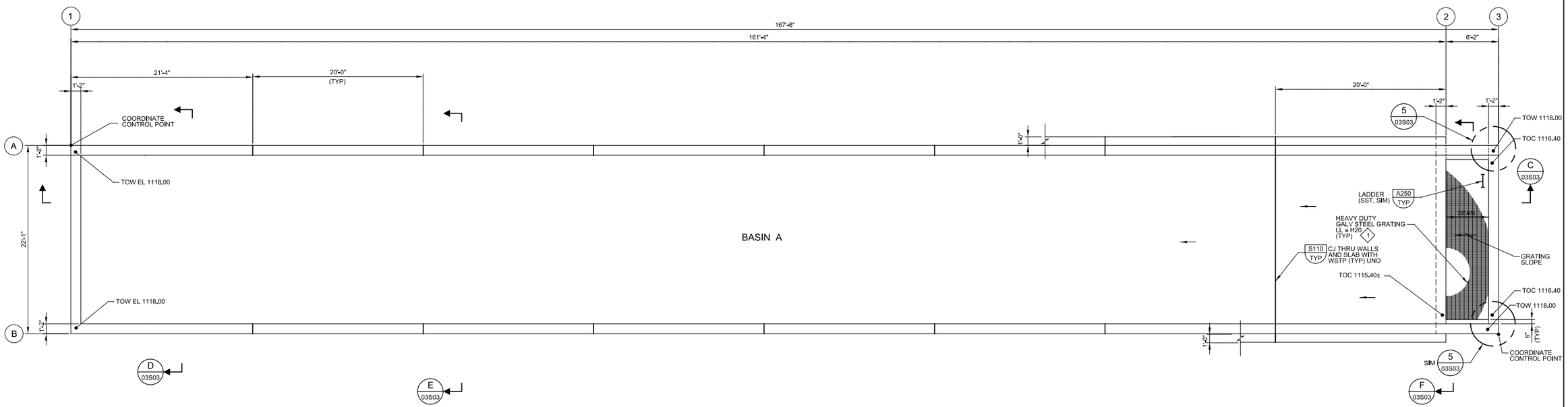
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GENERAL NOTES:

1. FOR GENERAL NOTES SEE DRAWING NO. 00S-01.
2. TOC: DENOTES TOP OF CONCRETE ELEVATION
   TOW: DENOTES TOP OF WALL ELEVATION.
3. REFER TO CIVIL DWGS FOR COORDINATE CONTROL POINT DATA.

KEY NOTES:

1. GRATING SHALL BE IN SEPARATED SECTIONS. SECTION WIDTH = 4'-0" MAX.
2. TERMINATE LADDER BELOW GRATING WITH LADDER - UP SAFETY POST. REFER TO SPEC SECTION 05500 FOR ADDITIONAL DETAIL.



B TOP PLAN

SCALE: 3/16" = 1'-0"
FILE: 9137A1003S102

X-XX

REVISION						
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D.S.-206 TO 209

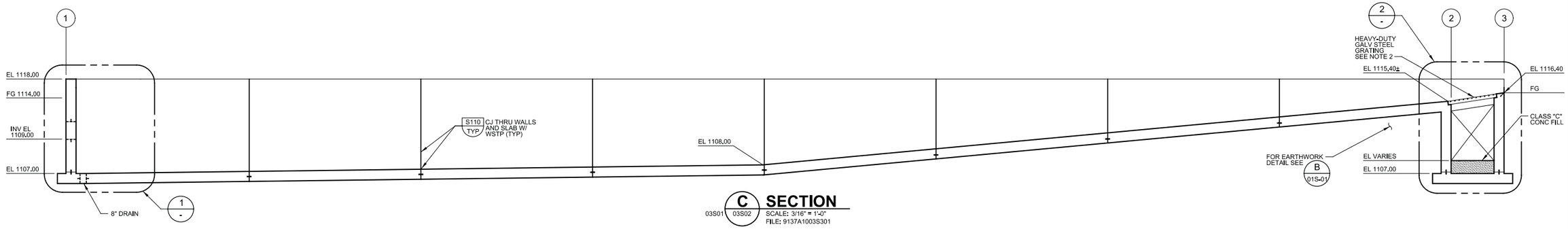
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FIELD BOOKS	CALC BOOKS	APPROVED	APPROVED / REVISION

9137A10 9137A10 FILE NAME: 9137A1003S02.dgn

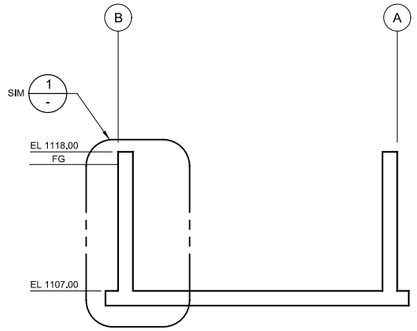
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LAST SAVED BY: RPotestas

GENERAL NOTES:

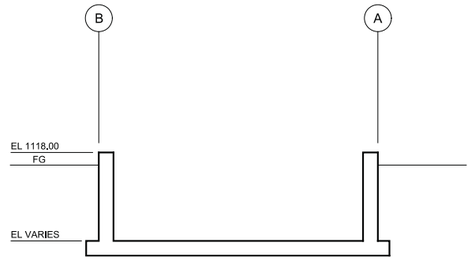
1. FOR GENERAL NOTES SEE DRAWING 00S-01.
2. HEAVY DUTY GRATING H-20 LOADING, BEARING BAR SIZE 3x5/16 MANUFACTURED BY GRATING PACIFIC.
3. WALL LINES A, B USE: #6 @ 6" DOWELS EF FOR WALL HEIGHT MORE THAN 5'-0", #6 @ 12" FOR WALL HEIGHT LESS THAN 5'-0".



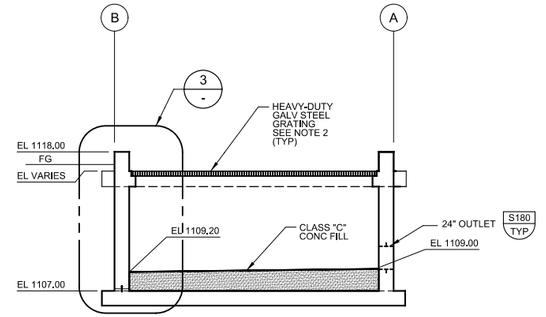
C SECTION
03S01 03S02 SCALE: 3/16" = 1'-0"
FILE: 9137A1003S301



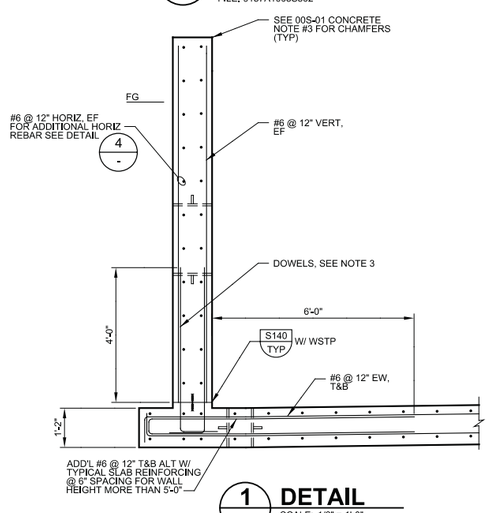
D SECTION
03S01 03S02 SCALE: 3/16" = 1'-0"
FILE: 9137A1003S302



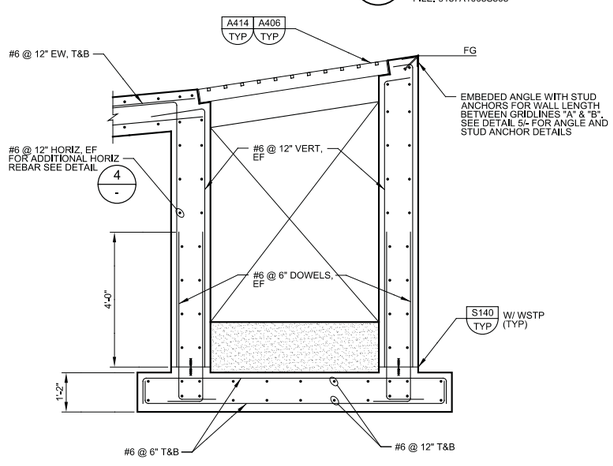
E SECTION
03S01 03S02 SCALE: 3/16" = 1'-0"
FILE: 9137A1003S303



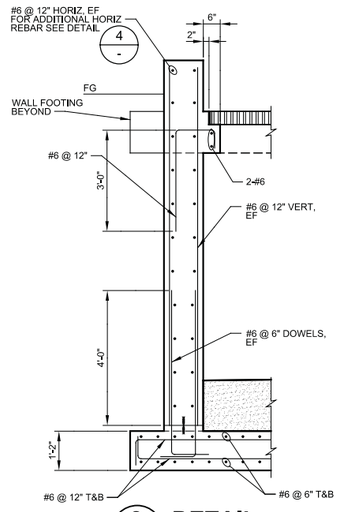
F SECTION
03S01 03S02 SCALE: 3/16" = 1'-0"
FILE: 9137A1003S304



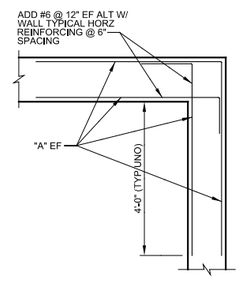
1 DETAIL
SCALE: 1/2" = 1'-0"
FILE: 9137A1003S301



2 DETAIL
SCALE: 1/2" = 1'-0"
FILE: 9137A1003S301

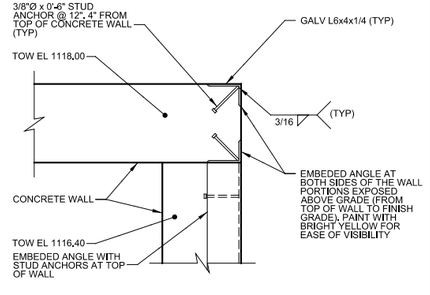


3 DETAIL
SCALE: 1/2" = 1'-0"
FILE: 9137A1003S304



BAR-TYPE	GRIDS
"A"	A-1, B-1, A-2, A-3, B-2, B-3

4 DETAIL
SCALE: 3/8" = 1'-0"
FILE: 9137A1003S401



5 DETAIL
03S02 SCALE: 3/8" = 1'-0"
FILE: 9137A1003S402

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

carollo

CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE	SCALE	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO — OF XX SHEETS
APRIL 2017	AS SHOWN		
DRAWN BY TVN		ARROYO SECO CANYON PROJECT	WORK ORDER 03055 / FILE NUMBER 03S-03 (E-1757)
DESIGNED BY ND		AREA 3 – SEDIMENTATION BASIN – SECTIONS	
CHECKED BY JAD			
SUBMITTED BY —			
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1003S03.dgn

ELECTRICAL PLAN SYMBOLS

IDENTIFICATION SYMBOLS

EQUIP # — EQUIPMENT AND INSTRUMENT IDENTIFICATION

EQUIPMENT/INSTRUMENT LOCATOR

LUMINAIRE IDENTIFICATION
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED FROM
c = MOUNTING HEIGHT IN FEET TO BOTTOM OF FIXTURE

XXXX — CONDUIT IDENTIFICATION
XXXX = CONDUIT NUMBER,
REFER TO CONDUIT SCHEDULE
UNLESS OTHERWISE NOTED, GROUPED CONDUITS ARE LABELED LEFT TO RIGHT OR TOP TO BOTTOM.

X — INDICATES KEYNOTE X
(PERTAINS ONLY TO SHEET WHERE NOTE IS FOUND)

EQUIPMENT ENCLOSURE

A — DISCONNECT SWITCH
a = TYPE, REFER TO DISCONNECT SCHEDULE

GROUNDING

UNDERGROUND GROUND CABLE
#4/0 SDBC UNLESS OTHERWISE NOTED

GROUND ROD

GROUND ROD AND GROUND WELL

GROUND CONNECTION

LUMINAIRES

2', 4', OR 8' STRIP

2' X 2' LAY-IN TROFFER

2' X 4' LAY-IN TROFFER

LUMINAIRE POLE MOUNTED

STROBE
a = COLOR
R = RED
G = GREEN
A = AMBER

LUMINAIRE, EMERGENCY BATTERY-POWERED

LUMINAIRE, EMERGENCY/EXIT BATTERY-POWERED

LUMINAIRE, EMERGENCY BATTERY-POWERED REMOTE

LUMINAIRE, SURFACE OR PENDANT MOUNTED

LUMINAIRE, WALL MOUNTED

LUMINAIRE, FLOOD/SPOT

LUMINAIRE, EXIT ONE OR TWO FACES AS INDICATED.
ARROW POINTS IN DIRECTION OF EGRESS.

LUMINAIRE, WALL WASHER

PE — PHOTOCELL

SWITCHES/RECEPTACLES

SINGLE POLE SWITCH
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATION

c = TYPE
2 = DOUBLE POLE SWITCH
3 = THREE-WAY SWITCH
4 = FOUR-WAY SWITCH
K = KEY OPERATED SWITCH
F = SWITCH AND FUSESTAT HOLDER
P = SWITCH AND PILOT LIGHT
T = THERMOSTAT
D = DIMMER SWITCH
L = LOW VOLTAGE LIGHT SWITCH
M = MANUAL MOTOR STARTER

OCCUPANCY SENSOR
a = CIRCUIT DESIGNATION
b = DEVICE SWITCHED DESIGNATION

SWITCH AND SINGLE RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

DUPLEX RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

QUADRUPLEX RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

IN FLOOR DUPLEX RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

IN FLOOR QUADRUPLEX RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

DUPLEX RECEPTACLE w/SPLIT WIRE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

APPLIANCE RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

WELDING RECEPTACLE
a = CIRCUIT DESIGNATION
b = DISCONNECT TYPE

SPECIAL PURPOSE RECEPTACLE
a = CIRCUIT DESIGNATION
b = DEVICE TYPE DESIGNATION

TWIST LOCK RECEPTACLE
a = AMP RATING

TELEPHONE OUTLET
a = CIRCUIT DESIGNATION
b = MOUNTING HEIGHT

DATA COMMUNICATIONS OUTLET
a = CIRCUIT DESIGNATION
b = MOUNTING HEIGHT

FIRE ALARM

SMOKE DETECTOR
a = TYPE
I = IONIZATION
P = PHOTOELECTRIC
d = DUCT DETECTOR

FACP — FIRE ALARM CONTROL PANEL

F — FIRE ALARM PULL STATION

FH — FIRE ALARM HORN/STROBE COMBINATION

FS — FIRE ALARM STROBE

F — FIRE SPRINKLER
F = FLOW SWITCH
T = TAMPER SWITCH

RACEWAY

EXPOSED CONDUIT

BREAK AND CONTINUATION IN CONDUIT RUN

EXPOSED CONDUIT HIDDEN BEHIND WALLS, FLOORS OR OTHER STRUCTURES

UNDERGROUND CONDUIT, DIRECT BURIED OR IN DUCTBANK

CONDUIT IN SLAB

CONDUIT VERTICAL CHANGE IN DIRECTION

CONDUIT CAP

J — JUNCTION BOX

CONDUIT SEAL

CONDUIT TEE

DUCTBANK
APPROXIMATE DIMENSIONS
SHOWN ON DUCTBANK SCHEDULE

CONDUIT SIZE AND CONDUCTORS

INDIVIDUAL CONDUCTORS

W"C-(3-X (Ø), 1-Y (N) & 1-Z (G))

W"C (WHERE INDICATED): W = CONDUIT TRADE SIZE

3-X (Ø):
3 = QUANTITY
X = SIZE OF CONDUCTORS
(Ø) = DESIGNATES PHASE CONDUCTORS

1-Y (N)(WHERE INDICATED):
1 = QUANTITY
Y = SIZE OF CONDUCTORS
(N) = DESIGNATES NEUTRAL CONDUCTORS

1-Z (G)(WHERE INDICATED):
1 = QUANTITY
Z = SIZE OF CONDUCTORS
(G) = DESIGNATES GROUND CONDUCTORS

U(3-X (Ø) & 1-X (G))

U = NUMBER OF PARALLEL RUNS

MULTI CONDUCTOR CABLES

K/2/C#16S
K (WHERE INDICATED) = NUMBER OF PAIRS
2/C#16S = TWO CONDUCTOR, 16 GAUGE, TWISTED SHIELDED PAIR

K/3/C#16S
K (WHERE INDICATED) = NUMBER OF TRIPLETS
3/C#16S = THREE CONDUCTOR, 16 GAUGE, TWISTED SHIELDED TRIPLETS

N/CX
N = NUMBER OF CONDUCTORS IN THE CABLE
X = SIZE OF CONDUCTORS

FIBER OPTIC CABLES

FO/N
N = NUMBER OF INDIVIDUAL FIBERS

ELECTRICAL ONE-LINE SYMBOLS

MEDIUM VOLTAGE

52 — CIRCUIT BREAKER, MEDIUM VOLTAGE
a = CIRCUIT BREAKER NUMBER
b = FRAME SIZE

ANSI RELAY DEVICE
a = ANSI DEVICE FUNCTION
b = QUANTITY

MEDIUM VOLTAGE DISCONNECT SWITCH NON-FUSED CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE SINGLE FUSE CUT OUT

MEDIUM VOLTAGE DISCONNECTING FUSE DOUBLE FUSE CUT OUT

MEDIUM VOLTAGE SINGLE FUSE

MEDIUM VOLTAGE DOUBLE FUSE

MEDIUM VOLTAGE LIVE FRONT TERMINATOR

MEDIUM VOLTAGE ELBOW

MEDIUM VOLTAGE TEE

MEDIUM VOLTAGE CONTACTOR

MEDIUM VOLTAGE STARTER

MOV-ELBOW ARRESTER

LOW VOLTAGE

LOW VOLTAGE CIRCUIT BREAKER
a = TYPE
MCP = MOTOR CIRCUIT PROTECTOR
TM = THERMAL MAGNETIC
SS = SOLID STATE
b = FRAME SIZE (MANUFACTURER TO DETERMINE FRAME SIZE UNLESS INDICATED)
c = NUMBER OF POLES
d = TRIP SETTING (AT = AMP TRIP)
(AC = MCP CONTINUOUS RATING)
e = DESIGNATION
f = INTERRUPTING RATING

LOW VOLTAGE CIRCUIT BREAKER
AUXILIARY OPERATOR
* = S = SHUNT TRIP
= G = GROUND FAULT INTERRUPTER
= V = SOLENOID KEY RELEASE

A — DISCONNECT SWITCH
A = TYPE, REFER TO DISCONNECT SCHEDULE

B — FUSED DISCONNECT SWITCH
B = TYPE, REFER TO DISCONNECT SCHEDULE
b = FUSE RATING

FUSE

COMBINATION STARTER
WITH CONTROL POWER TRANSFORMER
a = CIRCUIT BREAKER DISCONNECT, TYPE AS NOTED
b = STARTER TYPE
c = NEMA STARTER SIZE
d = OVERLOAD HEATERS

VARIABLE FREQUENCY DRIVE
WITH FEATURES AS SHOWN
a = INPUT CONTACTOR
b = OUTPUT CONTACTOR
c = BYPASS STARTER
d = INPUT CIRCUIT BREAKER
LR — LINE REACTOR
LL — LOAD REACTOR

REDUCED VOLTAGE SOLID STATE STARTER
WITH FEATURES AS SHOWN
BS = BYPASS STARTER

MISCELLANEOUS

HP — MOTOR
HP = HORSEPOWER RATING
FULL LOAD AMPS AS NOTED

PACKAGED EQUIPMENT
LOAD RATING AS INDICATED
a = RATED LOAD
b = UNIT(HP, KW, KVA) AS INDICATED

TRANSFORMER
a = DEVICE I.D.
b = KVA RATING
c = NUMBER OF PHASES
d = PRIMARY VOLTAGE
e = SECONDARY VOLTAGE
f,g = CONNECTION TYPE SYMBOL
h = IMPEDANCE

GROUNDED WYE CONNECTION

DELTA CONNECTION

G — ENGINE-GENERATOR RATINGS AS INDICATED ON THE DRAWINGS
a = KVA/KW
b = VOLTAGE/CONNECTION
c = PHASE
d = WIRE
e = PF

CURRENT TRANSFORMER WITH SHORTING TERMINAL BLOCK
a = QUANTITY
b = RATIO

POTENTIAL TRANSFORMER
a = QUANTITY
b = RATIO
c,d = CONNECTION TYPE SYMBOL

SSM — SOLID STATE MULTIFUNCTION METER

ATP — AMPERE TEST POINT

VTP — VOLTAGE TEST POINT

UTILITY METER

LIGHTNING ARRESTER

SPD — SURGE PROTECTIVE DEVICE

DRAWOUT CONNECTION

GROUND

CAPACITOR

BATTERY

K — KIRK KEY INTERLOCK

LOAD BANK

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

REGISTERED PROFESSIONAL ENGINEER — JOHN G. BRIONES — No. 15946 — ELECTRICAL — STATE OF CALIFORNIA

APPROVED BY:
NAME _____ PE # _____
APPROVED: _____ DATE _____
APPROVED: _____ DATE _____

carollo

CITY OF PASADENA — INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE APRIL 2017	SCALE AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO OF XX SHEETS
DRAWN BY AD DESIGNED BY AMS CHECKED BY JMJ SUBMITTED BY		ARROYO SECO CANYON PROJECT LEGENDS	WORK ORDER 03055 / FILE NUMBER 00GE-01 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

LAST SAVED BY: jsandoval
Model: Layout1 ColorTable: gshade.ctb DesignScript: Carollo_Std_Pen_v0905.pen PlotScale: 1:1

9137A10 9137A10 FILE NAME: 9137A1000GE01.dgn

ABBREVIATIONS

A	AMP
ABS	ABSOLUTE
AC	ALTERNATING CURRENT
ACK	ACKNOWLEDGE
ACTR	ACTUATOR
AF	AMP FRAME
AFC	AUTOMATIC FREQUENCY CONTROL
AIC	AMP INTERRUPTING CAPACITY
AM	AMMETER
ANN	ANNUNCIATOR
ANT	ANTENNA
APU	AUXILIARY POWER UNIT
ARM	ARMORED CABLE
AS	AMMETER SWITCH
ASYM	ASYMMETRICAL
AT	AMP TRIP
ATO	AUTOMATIC THROW OVER
ATP	AMMETER TEST POINT
ATS	AUTOMATIC TRANSFER SWITCH
AUTO XFMR	AUTOMATIC TRANSFORMER
AUX	AUXILIARY
AWG	AMERICAN WIRE GAGE
B	BELL
BAT	BATTERY
BFG	BELOW FINISHED GRADE
BHP	BRAKE HORSEPOWER
BKR	BREAKER
BRF	BELOW RAISED FLOOR
C	CONDUIT / CONTINUOUS LOAD
CB	CIRCUIT BREAKER
CCTV	CLOSED CIRCUIT TELEVISION
CCW	COUNTER CLOCKWISE
CKT	CIRCUIT
COAX	COAXIAL CABLE
COM	COMMON
COMM	COMMUNICATION
CPT	CONTROL POWER TRANSFORMER
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
CV	CONTROL VALVE
CW	CLOCKWISE / COOL WHITE
DC	DIRECT CURRENT
DCS	DISTRIBUTED CONTROL SYSTEM
DCU - X	DISTRIBUTED CONTROL UNIT NO. X
DEMO	DEMOLITION
DISC	DISCONNECT SWITCH
DM	DEMAND METER
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DS	DOOR SWITCH
E/G	EMERGENCY GENERATOR
EM	EMERGENCY
EMT	ELECTRICAL METALLIC TUBING
ENCL	ENCLOSURE
ENG	ENGINE
ENT	ELECTRICAL NON-METALLIC TUBING
EP	EXPLOSION PROOF
ETM	ELAPSED TIME METER
FA	FIRE ALARM
FACP	FIRE ALARM CONTROL PANEL
FDR	FEEDER
FLA	FULL LOAD AMPS
FLX	FLEXIBLE CONDUIT
FO	FIBER OPTIC
FRC	FIBERGLASS RIGID CONDUIT
FREQ	FREQUENCY
FU	FUSE
FU	SW FUSED SWITCH
FVNR	FULL VOLTAGE NON-REVERSING
FVR	FULL VOLTAGE REVERSING
FWD	FORWARD
G	GROUND / EQUIPMENT GROUND / GROUND FAULT
GEN	GENERATOR
GRC	GALVANIZED STEEL RIGID CONDUIT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER (RECEPTACLE)
GFI	GROUND FAULT INTERRUPTER (BREAKER)
GFR	GROUND FAULT RELAY
H	HOT-LEG
HF	HIGH FREQUENCY
HP	HORSEPOWER
HPS	HIGH PRESSURE SODIUM
HR	HOUR
HSTAT	HUMIDISTAT
HV	HIGH VOLTAGE
HVAC	HEATING/VENTILATION/AIR CONDITIONING
HZ	HERTZ
I	INSTANTANEOUS LOAD
IC	INTERRUPTING CAPACITY
IJB	INSTRUMENT JUNCTION BOX
IMC	INTERMEDIATE METAL CONDUIT
INST	INSTANTANEOUS
INT	INTERLOCK
INTERCOM	INTERCOMMUNICATION
J	JUNCTION BOX
K	KEY INTERLOCK
KA	KILOAMP
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR (REACTANCE)
KW	KILOWATT
KWD	KILOWATT DEMAND
KWH	KILOWATT HOUR
L	LONG-TIME
L-B	LINE-BUS
L-G	LINE-GROUND
LA	LIGHTNING ARRESTOR
LBL	LABEL
LC	LIGHTING CONTACT OR
LCP- X	LOCAL CONTROL PANEL NO. X
LL	LEAD-LAG LOAD REACTOR
LP	LIGHT POLE
LP - X	LIGHTING PANEL NO. X
LTG	LIGHTING
LV	LOW VOLTAGE
LVL	LEVEL
M-X	MOTOR CONTROLLER NO. X
MA	MILLIAMPERE
MCA	MOTOR CIRCUIT AMPS
MCC - X	MOTOR CONTROL CENTER NO. X
MCP	MOTOR CIRCUIT PROTECTOR
MH	MANHOLE / MOUNTING HEIGHT
MLO	MAIN LUGS ONLY
MOD	MOTOR OPERATED DAMPER
MOV	METAL OXIDE VARISTOR
MRP	MOTOR PROTECTION RELAY
MS-X	MOTOR STARTER NO. X
MSP	MOTOR STARTING PANEL
MTO	MANUAL THROW OVER
MTR-X	MOTOR NO. X
MTS	MANUAL TRANSFER SWITCH
MV	MEGAVOLT
MVA	MEGAVOLT-AMPERES
MVS	MEDIUM VOLTAGE SWITCH
MW	MEGAWATT
N	NEUTRAL
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRICAL CODE
NFC	NONMETALLIC FLEXIBLE CONDUIT
NL	NIGHT LIGHT
NO	NORMALLY OPEN
NP	NAMEPLATE
O	OPEN OR OPENED
OH	OVERHEAD
OL	OVERLOAD RELAY
P	POLE
PA	PUBLIC ADDRESS
PB	PUSHBUTTON / PULL BOX
PCS	PVC COATED GALVANIZED STEEL CONDUIT
PCM	PROCESS CONTROL MODULE
PE	PHOTOCELL
PF	POWER FACTOR
PFCC	POWER FACTOR CORRECTION CAPACITOR
PFR	PHASE FAILURE RELAY
PH	PHASE
PNL	PANEL
PPX	POWER PANEL NO. X
PRI	PRIMARY
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE RIGID PLASTIC CONDUIT
PW&P	PASADENA WATER & POWER
PWR	POWER
RAC	RIGID ALUMINUM CONDUIT
RECPT	RECEPTACLE
REV	REVERSE
RF	RADIO FREQUENCY
RMS	ROOT MEAN SQUARED
RVAT	REDUCED VOLTAGE AUTO TRANSFORMER
RVNR	REDUCED VOLTAGE NON-REVERSING
RVSS	REDUCED VOLTAGE SOLID STATE
S	SHIELD / SHORT-TIME
SA	SURGE ARRESTER
SC	SHORT CIRCUIT
SDBC	SOFT DRAWN BARE COPPER
SFL	SUB FEED LUGS
SLT	SEALTIGHT LIQUIDTIGHT FLEXIBLE CONDUIT
SM	SURFACE MOUNTED
SP	SINGLE POLE
SPD	SURGE PROTECTIVE DEVICE
SPDT	SINGLE POLE DOUBLE THROW
SPST	SINGLE POLE SINGLE THROW
SPKR	SPEAKER
SS	SOLID STATE
STB	SHORTING TERMINAL BLOCK
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL
TACH	TACHOMETER
TB - X	TERMINAL BLOCK - UNIT X
TC	THERMOCOUPLE / TIME CLOCK / TRAY CABLE
TD	TEMPERATURE DETECTOR RELAY
TE	TOTALLY ENCLOSED
TEFC	TOTALLY ENCLOSED FAN COOLED
TENV	TOTALLY ENCLOSED NON-VENTILATED
TERM	TERMINAL
TJB	TERMINAL JUNCTION BOX
TM	THERMAL MAGNETIC
TP	TWISTED PAIR
TS	TEMPERATURE SWITCH
TS1W	TWO SPEED CONSEQUENT POLE, ONE WINDING
TS2W	TWO SPEED SEPARATE WINDING
TSTAT	THERMOSTAT
UHF	ULTRA HIGH FREQUENCY
UNG	UNGROUNDED
UPS	UNINTERRUPTABLE POWER SUPPLY
UVR	UNDER VOLTAGE RELAY
V	VOLT
VA	VOLT AMPERE
VAR	VARMETER
VCP	VENDOR CONTROL PANEL
VFD	VARIABLE FREQUENCY DRIVE
VHF	VERY HIGH FREQUENCY
VM	VOLTMETER
VP	VAPORPROOF
VR	VOLTAGE REGULATOR
VS	VOTAGE SWITCH
VT	VOLTAGE TRANSFORMER
VTP	VOLTAGE TEST POINT
W	WATT / WEST
WT	WATER TIGHT
WP	WEATHER PROOF
XFMR	TRANSFORMER

NOTES:

1. REFER TO SPECIFICATIONS OTHER DRAWINGS FOR ADDITIONAL ABBREVIATIONS.

POWER DEVICE FUNCTION NUMBERS

1	MASTER ELEMENT
2	TIME-DELAY STARTING OR CLOSING RELAY
3	CHECKING OR INTERLOCKING RELAY
4	MASTER CONTACTOR
5	STOPPING DEVICE
6	STARTING CIRCUIT BREAKER
7	ANODE CIRCUIT BREAKER
8	CONTROL POWER DISCONNECTING DEVICE
9	REVERSING DEVICE
10	UNIT SEQUENCE SWITCH
11	MULTIFUNCTION DEVICE
12	OVER-SPEED DEVICE
13	SYNCHRONOUS-SPEED DEVICE
14	UNDER-SPEED DEVICE
15	SPEED OR FREQUENCY MATCHING DEVICE
16	DATA COMMUNICATIONS DEVICE
17	SHUNTING OR DISCHARGE SWITCH
18	ACCELERATING OR DECELERATING DEVICE
19	STARTING-TO-RUNNING TRANSITION CONTACTOR
20	ELECTRICALLY OPERATED VALVE
21	DISTANCE RELAY
22	EQUALIZER CIRCUIT BREAKER
23	TEMPERATURE CONTROL DEVICE
24	VOLTS PER HERTZ RELAY
25	SYNCHRONIZING OR SYNCHRONISM-CHECK DEVICE
26	APPARATUS THERMAL DEVICE
27	UNDERVOLTAGE RELAY
27N	GROUND FAULT UNDERVOLTAGE RELAY
28	FLAME DETECTOR
29	ISOLATING CONTACTOR
30	ANNUNCIATOR RELAY
31	SEPARATE EXCITATION DEVICE
32	DIRECTIONAL POWER RELAY
33	POSITION SWITCH
34	MASTER SEQUENCE DEVICE
35	BRUSH-OPERATING OR SLIP-RING SHORT-CIRCUITING DEVICE
36	POLARITY DEVICE
37	UNDERCURRENT OR UNDERPOWER RELAY
38	BEARING PROTECTIVE DEVICE
39	MECHANICAL CONDITION MONITOR
40	FIELD RELAY
41	FIELD CIRCUIT BREAKER
42	RUNNING CIRCUIT BREAKER
43	MANUAL TRANSFER OR SELECTOR DEVICE
44	UNIT SEQUENCE STARTING RELAY
45	ABNORMAL ATMOSPHERIC CONDITION MONITOR
46	REVERSE-PHASE OR BALANCE CURRENT RELAY
47	PHASE-BALANCE OR PHASE-SEQUENCE VOLTAGE RELAY
48	INCOMPLETE SEQUENCE RELAY
49	MACHINE OR TRANSFORMER THERMAL RELAY
50	INSTANTANEOUS OVERCURRENT RELAY
51	AC TIME OVERCURRENT RELAY
52	AC CIRCUIT BREAKER
53	FIELD EXCITATION RELAY
54	TURNING GEAR ENGAGING DEVICE
55	POWER FACTOR RELAY
56	FIELD APPLICATION RELAY
57	SHORT-CIRCUITING OR GROUNDING DEVICE
58	RECTIFICATION FAILURE RELAY
59	OVERVOLTAGE RELAY
60	VOLTAGE OR CURRENT BALANCE RELAY
61	DENSITY SWITCH OR SENSOR
62	TIME-DELAY STOPPING OR OPENING RELAY
63	PRESSURE SWITCH
64	GROUND DETECTOR RELAY
65	GOVERNOR
66	NOTCHING OR JOGGING DEVICE
67	AC DIRECTIONAL OVERCURRENT RELAY
68	BLOCKING OR OUT OF STEP RELAY
69	PERMISSIVE CONTROL DEVICE
70	RHEOSTAT
71	LIQUID LEVEL SWITCH
72	DC CIRCUIT BREAKER
73	LOAD-RESISTOR CONTACTOR
74	ALARM RELAY
75	POSITION CHANGING MECHANISM
76	DC OVERCURRENT RELAY
77	TELEMETERING DEVICE
78	PHASE-ANGLE MEASURING RELAY
79	AC RECLOSING RELAY
80	FLOW SWITCH
81	FREQUENCY RELAY
82	DC LOAD MEASURING RECLOSING RELAY
83	AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
84	OPERATING MECHANISM
85	PILOT COMMUNICATIONS, CARRIER OR PILOT-WIRE RELAY
86	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTIVE RELAY
88	AUXILIARY MOTOR OR MOTOR GENERATOR
89	LINE SWITCH
90	REGULATING DEVICE
91	VOLTAGE DIRECTIONAL RELAY
92	VOLTAGE AND POWER DIRECTIONAL RELAY
93	FIELD-CHANGING CONTACTOR
94	TRIPPING OR TRIP-FREE RELAY

COMMONLY USED SUFFIX LETTERS APPLIED TO POWER DEVICE FUNCTION NUMBERS

A	ALARM ONLY
B	BUS PROTECTION
G	GROUND FAULT PROTECTION (RELAY CT IN A SYSTEM NEUTRAL CIRCUIT OR GENERATOR PROTECTION)
GS	GROUND FAULT PROTECTION (RELAY CT IN TOROIDAL OR GROUND SENSOR TYPE)
L	LINE PROTECTION
M	MOTOR PROTECTION
N	GROUND FAULT PROTECTION (RELAY COIL CONNECTED IN RESIDUAL CT CIRCUIT)
T	TRANSFORMER PROTECTION
V	VOLTAGE
P	PHASE PROTECTION

ABBREVIATIONS

AFD	- ARC FLASH DETECTOR
CLK	- CLOCK OR TIMING SOURCE
DDR	- DYNAMIC DISTURBANCE RECORDER
DFR	- DIGITAL FAULT RECORDER
ENV	- ENVIRONMENTAL DATA
HIZ	- HIGH IMPEDANCE FAULT DETECTOR
HMI	- HUMAN MACHINE INTERFACE
HST	- HISTORIAN
LGC	- SCHEME LOGIC
MET	- SUBSTATION METERING
PDC	- PHASOR DATA CONCENTRATOR
PMU	- PHASOR MEASUREMENT UNIT
PQM	- POWER QUALITY MONITOR
RIO	- REMOTE I/O DEVICE
RTU	- DATA CONCENTRATOR
SER	- SEQUENCE OF EVENTS RECORDER
TCM	- TRIP CIRCUIT MONITOR

X-XX

REVISION

NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

REGISTERED PROFESSIONAL ENGINEER JOHN G. BARNES No. 15946 ELECTRICAL STATE OF CALIFORNIA

APPROVED BY:

PE #

NAME

APPROVED: DATE

APPROVED: DATE

carollo

CITY OF PASADENA INCORPORATED JUNE 1886

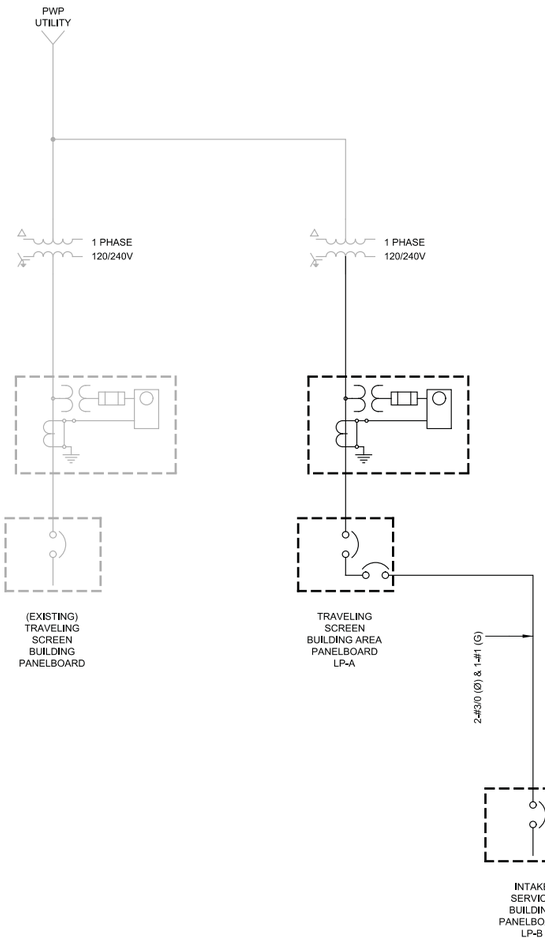
D.S.-206 TO 209

DATE: APRIL 2017	SCALE: AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO OF XX SHEETS
DRAWN BY: AD DESIGNED BY: AMS CHECKED BY: JMJ SUBMITTED BY:		ARROYO SECO CANYON PROJECT ABBREVIATIONS	WORK ORDER: 03055 FILE NUMBER: 00GE-02 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

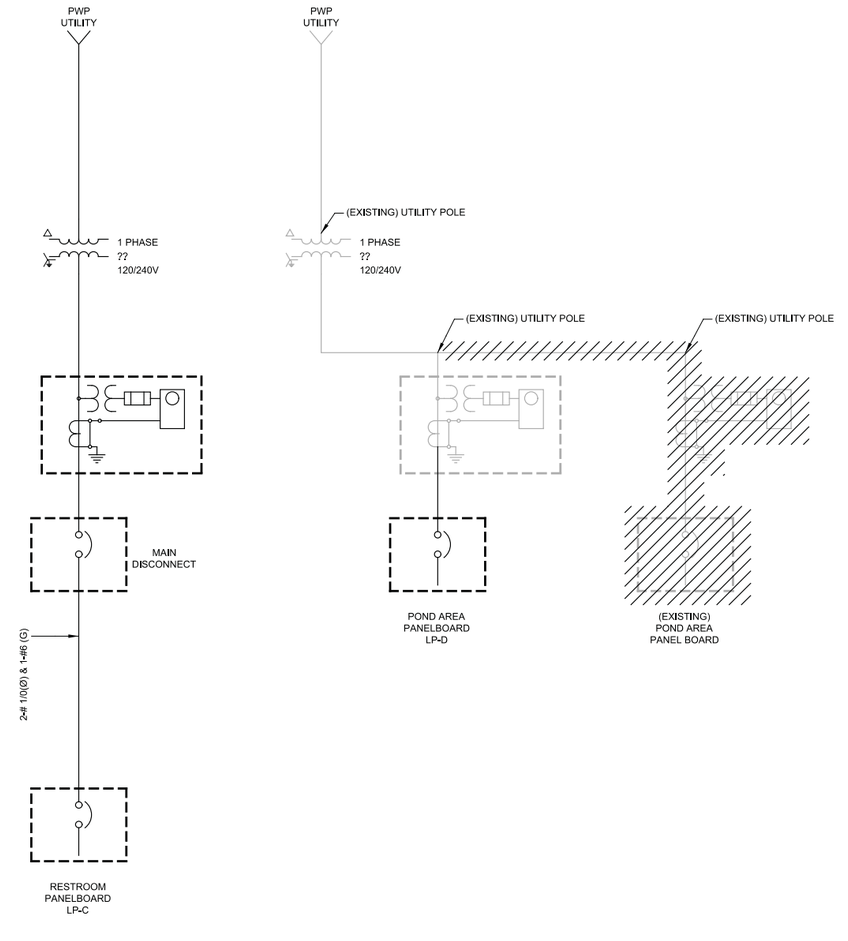
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User: JSandoval
Model: Layout1 ColorTable: gshade.ctb DesignScript: Carollo_Std_Pen_v0905.pen PlotScale: 1:1
LAST SAVED BY: jsandoval



A **AREA 2**
FILE: 9137A1001E601.2dm



B **AREA 3**
FILE: 9137A1001E601.2dm

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

REGISTERED PROFESSIONAL ENGINEER — JOHN G. BRYCKES — No. 15946 — ELECTRICAL — STATE OF CALIFORNIA

APPROVED BY:
PE #
NAME
APPROVED: DATE
APPROVED: DATE

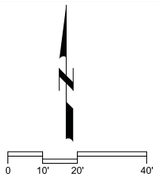
carollo®

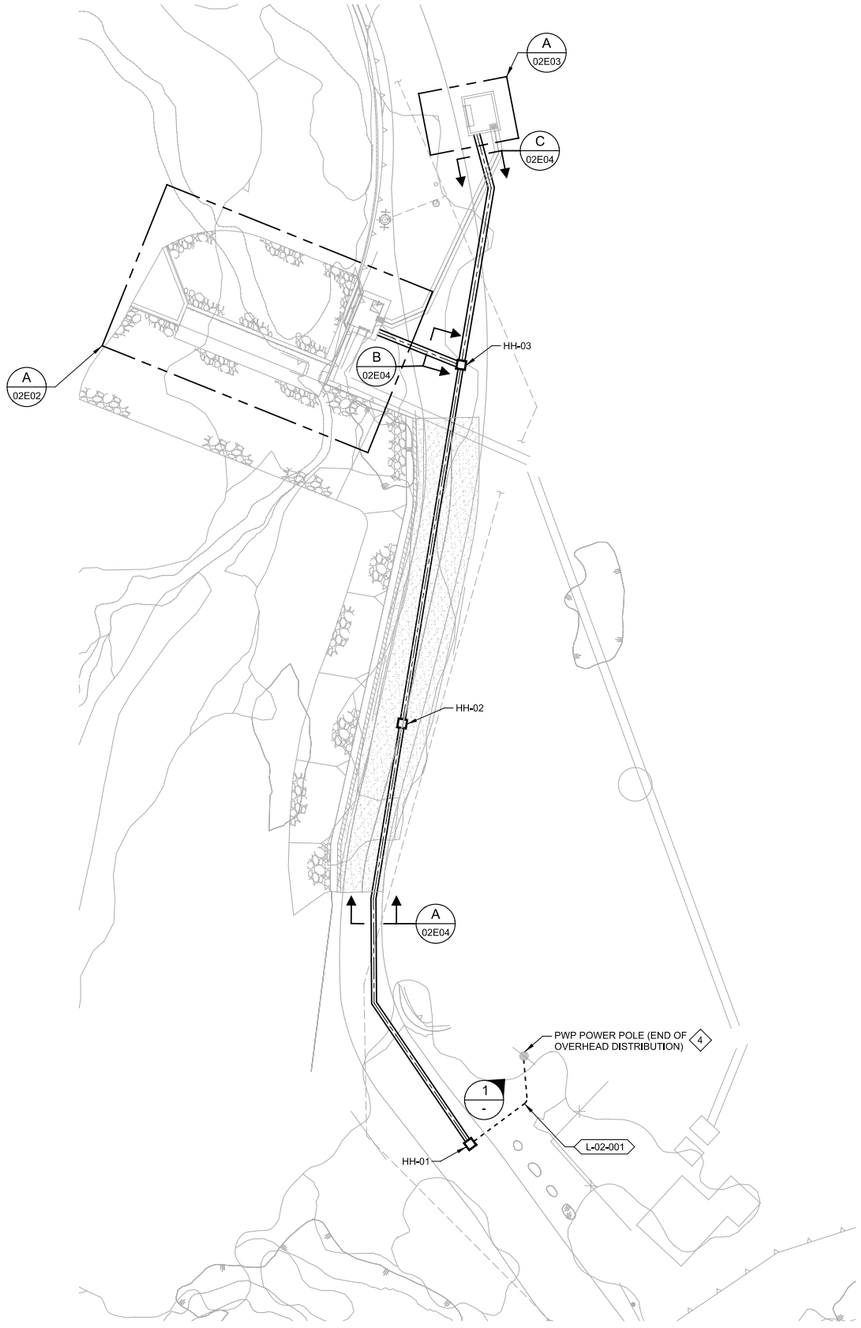
CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE: APRIL 2017	SCALE: AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO OF XX SHEETS
DRAWN BY: JJS DESIGNED BY: AMS CHECKED BY: JMJ SUBMITTED BY:		ARROYO SECO CANYON PROJECT OVERALL ONE-LINE DIAGRAMS	WORK ORDER: 03055 FILE NUMBER: 01E-01 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1001E01.dgn





A PLAN
SCALE: 1' = 20'
FILE: 9137A1002E101

KEY NOTES:

1. ABANDONED UTILITY TRANSFORMER.
2. NEW SERVICE METER IN ACCORDANCE WITH PWP SERVICE REQUIRMENT.
3. NEW SERVICE ENTRANCE MAIN DISCONNECT IN ACCORDANCE WITH PWP SERVICE REQUIRMENT IN PANEL LP-A.
4. PROVIDE SERVICE PEDESTALS TO HOUSE UTILITY METER AND PANELBOARD LP-A. COORDINATE WITH PWP THE REQUIRED SIZE CONDUIT BETWEEN UTILITY TRANSFORMER AND SERVICE PEDESTALS.



1 - DETAIL- 1 EXISTING PWP POWER POLE
SCALE: N.T.S
FILE: 9137A1002E01.dgn

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

REGISTERED PROFESSIONAL ENGINEER JOHN G. BARNES No. 15946 ELECTRICAL STATE OF CALIFORNIA

APPROVED BY:
PE #
NAME
APPROVED: DATE
APPROVED: DATE

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CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

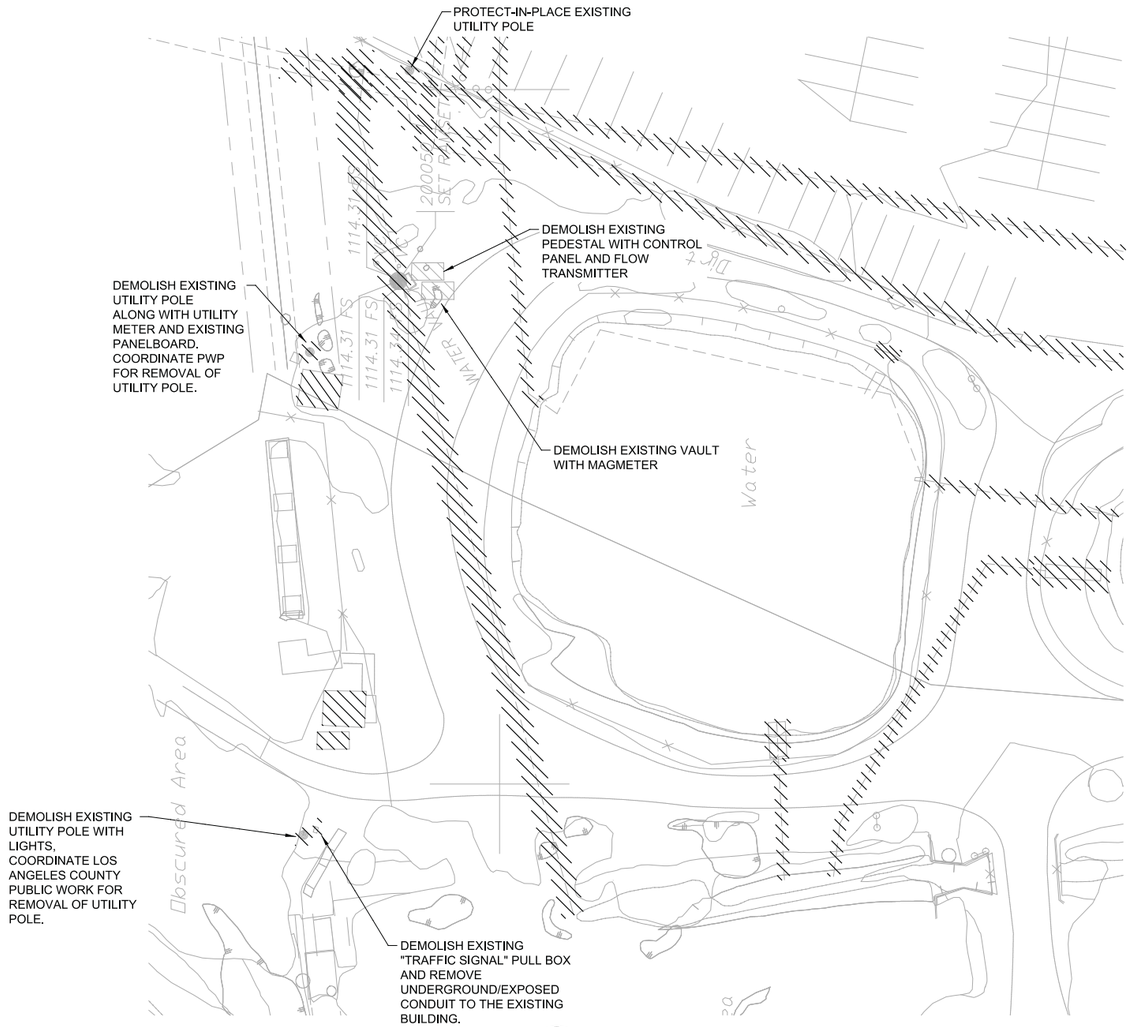
DATE	SCALE	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO OF XX SHEETS
APRIL 2017	AS SHOWN		
DRAWN BY AD DESIGNED BY AMS CHECKED BY JMJ SUBMITTED BY		ARROYO SECO CANYON PROJECT AREA 2 – ELECTRICAL SITE PLAN	WORK ORDER 03055 / FILE NUMBER 02E-01 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1002E01.dgn

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LAST SAVED BY: jsandoval

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LAST SAVED BY: jsandoval

0 10' 20' 40'



1 DETAIL (03D-01)
SCALE: 1" = 20'
FILE: FILE

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

REGISTERED PROFESSIONAL ENGINEER JOHN G. BARONES No. 15946 ELECTRICAL STATE OF CALIFORNIA

APPROVED BY:
PE #
NAME
APPROVED: DATE
APPROVED: DATE

carollo

CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

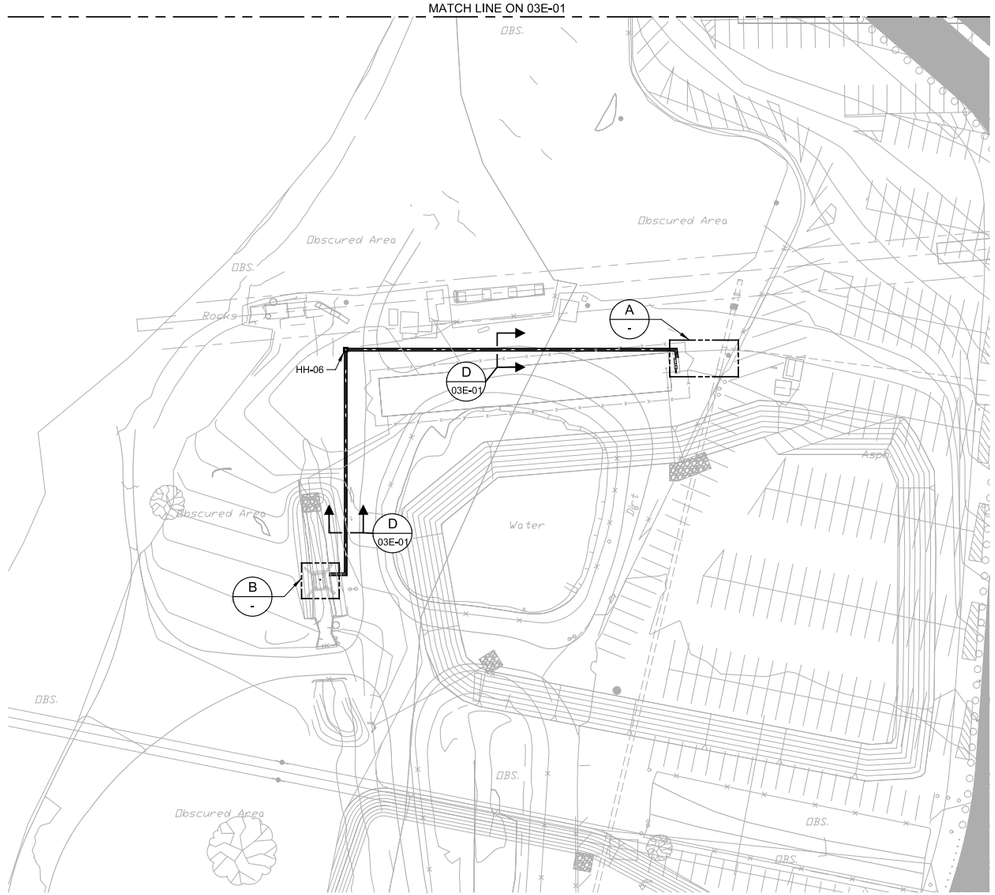
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APRIL 2017	AS SHOWN		
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FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1003DE01.dgn

Plot Date: 13-APR-2017 3:35:37 PM
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Model: Layout1 ColorTable: gshade.ctb DesignScript: Carollo_Std_Pen_v0905.pen PlotScale: 0.083333:1
LAST SAVED BY: jsandoval

0 20' 40' 80'

MATCH LINE ON 03E-01

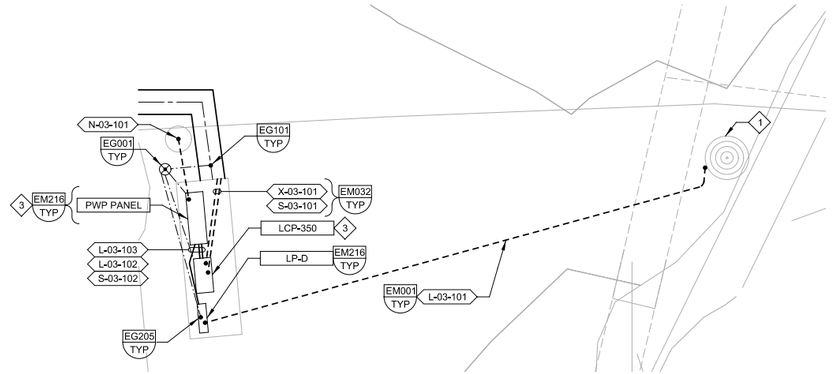


A AREA 3B - BASIN SITE AND GRADING PLAN

SCALE: 1-0"=40'
FILE: 9137A1001E101.2dm

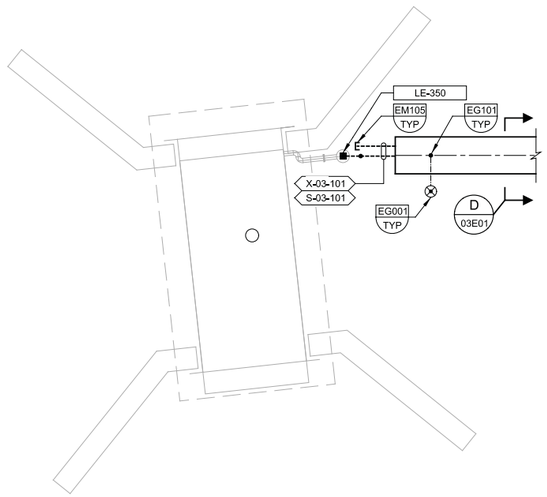
KEY NOTES:

1. EXISTING UTILITY POLE, UTILIZE EXISTING UTILITY METER FOR NEW SERVICE RATED PANELBOARD.
2. ALLOCATE SPACE FOR PWP PROVIDED ENCLOSURE (36" X 36" X 12") FOR TRANSMITTER (LIT-350).
3. PROVIDED NEMA 4X STAINLESS STEEL ENCLOSURE (24" X 24" X 12") FOR TRANSMITTER (LIT-350).



A PLAN

SCALE: 1/4"=1'0"
FILE: 9137A1001E101.2dm



B DETAIL- FLUME

SCALE: 3/8"=1'0"
FILE: 9137A1001E101.2dm

X-XX

REVISION					
NO.	DESCRIPTION	DATE	NO.	DESCRIPTION	DATE
	100% DESIGN SUBMITTAL NOT FOR CONSTRUCTION				

REGISTERED PROFESSIONAL ENGINEER JOHN G. BARNES No. 15946 ELECTRICAL STATE OF CALIFORNIA

APPROVED BY:
NAME PE #
APPROVED: DATE
APPROVED: DATE

carollo

CITY OF PASADENA INCORPORATED JUNE 1886

D.S.-206 TO 209

DATE APRIL 2017	SCALE AS SHOWN	PASADENA WATER & POWER CITY OF PASADENA	SHEET NO OF XX SHEETS
DRAWN BY JJS DESIGNED BY AMS CHECKED BY JMJ SUBMITTED BY		ARROYO SECO CANYON PROJECT AREA 3B – BASIN SITE AND GRADING PLAN	WORK ORDER 03055 / FILE NUMBER 03E-02 (E-1757)
FIELD BOOKS	CALC BOOKS	APPROVED / APPROVED	REVISION

9137A10 9137A10 FILE NAME: 9137A1003E02.dgn

Appendix C

CalEEMod Data for Air Quality and Greenhouse Gas Emissions

Arroyo Seco

South Coast AQMD Air District, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	1.40	Acre	1.40	60,984.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	12			**Operational Year**	2022
Utility Company	Pasadena Water & Power				
CO2 Intensity (lb/MWhr)	1664.14	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CalEEMod Defaults.

Land Use - CalEEMod Defaults.

Construction Phase - Construction schedule information provided by project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

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Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Trips and VMT - Construction Trip information provided by the project applicant.

Grading - Export of 11,000 CY and import of 37,000 CY

Construction Off-road Equipment Mitigation - Compliance with SCAQMD Rule 403

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	FuelType	Diesel	CNG
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstructionPhase	NumDays	10.00	5.00
tblConstructionPhase	NumDays	200.00	36.00
tblConstructionPhase	NumDays	200.00	45.00
tblConstructionPhase	NumDays	20.00	5.00
tblConstructionPhase	NumDays	20.00	10.00
tblConstructionPhase	NumDays	4.00	40.00
tblConstructionPhase	NumDays	4.00	100.00
tblConstructionPhase	NumDays	10.00	45.00
tblConstructionPhase	NumDays	10.00	5.00
tblConstructionPhase	NumDays	2.00	6.00
tblConstructionPhase	NumDays	2.00	5.00
tblConstructionPhase	NumDays	2.00	40.00
tblGrading	AcresOfGrading	0.00	20.00
tblGrading	MaterialExported	0.00	290.00
tblGrading	MaterialExported	0.00	11,000.00
tblGrading	MaterialImported	0.00	37,000.00
tblOffRoadEquipment	HorsePower	84.00	75.00
tblOffRoadEquipment	OffRoadEquipmentType		Pumps
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
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tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	7.00	0.00
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tblTripsAndVMT	HaulingTripNumber	0.00	64.00
tblTripsAndVMT	HaulingTripNumber	36.00	420.00
tblTripsAndVMT	HaulingTripNumber	0.00	142.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
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tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	10.00	2.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.1086	1.0078	0.8330	1.7000e-003	0.1328	0.0475	0.1803	0.0635	0.0449	0.1084	0.0000	148.9132	148.9132	0.0297	0.0000	149.6550
2022	0.1541	1.8753	1.1747	4.0100e-003	0.2987	0.0604	0.3591	0.1477	0.0560	0.2036	0.0000	371.2625	371.2625	0.0640	0.0000	372.8633
Maximum	**0.1541**	**1.8753**	**1.1747**	**4.0100e-003**	**0.2987**	**0.0604**	**0.3591**	**0.1477**	**0.0560**	**0.2036**	**0.0000**	**371.2625**	**371.2625**	**0.0640**	**0.0000**	**372.8633**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.1086	1.0078	0.8330	1.7000e-003	0.0677	0.0475	0.1152	0.0307	0.0449	0.0756	0.0000	148.9130	148.9130	0.0297	0.0000	149.6549
2022	0.1541	1.8753	1.1747	4.0100e-003	0.1673	0.0604	0.2277	0.0754	0.0560	0.1314	0.0000	371.2623	371.2623	0.0640	0.0000	372.8631
Maximum	**0.1541**	**1.8753**	**1.1747**	**4.0100e-003**	**0.1673**	**0.0604**	**0.2277**	**0.0754**	**0.0560**	**0.1314**	**0.0000**	**371.2623**	**371.2623**	**0.0640**	**0.0000**	**372.8631**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**45.55**	**0.00**	**36.43**	**49.76**	**0.00**	**33.67**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)

1	**8-2-2021**	**11-1-2021**	1.0938	1.0938
3	**2-2-2022**	**5-1-2022**	0.2818	0.2818
4	**5-2-2022**	**8-1-2022**	0.9204	0.9204
5	**8-2-2022**	**9-30-2022**	0.5243	0.5243
		Highest	1.0938	1.0938

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.7900e-003	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	4.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.7900e-003**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**4.0000e-005**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	4.7900e-003	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	4.0000e-005

Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**4.7900e-003**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**4.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Area 2: Site Preparation	Site Preparation	8/2/2021	8/9/2021	5	6	
2	Area 2: Demolition	Demolition	8/10/2021	8/16/2021	5	5	
3	Area 2: Grading/Excavation	Grading	8/17/2021	10/11/2021	5	40	
4	Area 2: Building Construction	Building Construction	8/23/2021	10/11/2021	5	36	
5	Area 2: Paving	Paving	10/11/2021	10/15/2021	5	5	
6	Area 3: Site Preparation	Site Preparation	3/21/2022	3/25/2022	5	5	
7	Area 3: Demolition	Demolition	3/28/2022	4/8/2022	5	10	
8	Area 3: Grading/Excavation	Grading	4/11/2022	8/26/2022	5	100	
9	Area 2: Dewatering	Site Preparation	8/2/2021	9/24/2021	5	40	
10	Area 3: Building Construction	Building Construction	8/27/2022	10/28/2022	5	45	
11	Area 3: Paving	Paving	8/29/2022	10/28/2022	5	45	
12	Area 3: Architectural Coating	Architectural Coating	10/29/2022	11/4/2022	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 1.4

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 3,659

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Area 2: Site Preparation	Graders	1	8.00	187	0.41
Area 2: Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Area 2: Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 2: Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Area 2: Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Area 2: Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Area 2: Grading/Excavation	Excavators	1	8.00	158	0.38
Area 2: Grading/Excavation	Graders	0	0.00	187	0.41
Area 2: Grading/Excavation	Rubber Tired Dozers	1	6.00	247	0.40
Area 2: Grading/Excavation	Rubber Tired Loaders	1	8.00	203	0.36
Area 2: Grading/Excavation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Area 2: Building Construction	Cement and Mortar Mixers	1	8.00	9	0.56
Area 2: Building Construction	Cranes	1	6.00	231	0.29
Area 2: Building Construction	Excavators	1	8.00	158	0.38
Area 2: Building Construction	Forklifts	0	0.00	89	0.20
Area 2: Building Construction	Generator Sets	1	0.00	84	0.74
Area 2: Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Area 2: Building Construction	Trenchers	1	8.00	78	0.50
Area 2: Building Construction	Welders	3	8.00	46	0.45
Area 2: Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Area 2: Paving	Pavers	1	6.00	130	0.42
Area 2: Paving	Paving Equipment	1	8.00	132	0.36
Area 2: Paving	Plate Compactors	1	8.00	8	0.43
Area 2: Paving	Pressure Washers	1	8.00	13	0.30
Area 2: Paving	Rollers	1	7.00	80	0.38
Area 2: Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Area 3: Site Preparation	Graders	0	0.00	187	0.41
Area 3: Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Area 3: Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Area 3: Demolition	Rubber Tired Dozers	0	0.00	247	0.40
Area 3: Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Area 3: Grading/Excavation	Graders	0	0.00	187	0.41
Area 3: Grading/Excavation	Other Construction Equipment	1	8.00	172	0.42
Area 3: Grading/Excavation	Rubber Tired Dozers	1	6.00	247	0.40
Area 3: Grading/Excavation	Rubber Tired Loaders	1	8.00	203	0.36
Area 3: Grading/Excavation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Area 3: Building Construction	Cranes	1	6.00	231	0.29
Area 3: Building Construction	Forklifts	1	6.00	89	0.20
Area 3: Building Construction	Generator Sets	1	8.00	84	0.74
Area 3: Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Area 3: Building Construction	Welders	0	0.00	46	0.45
Area 3: Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Area 3: Paving	Graders	1	8.00	187	0.41
Area 3: Paving	Pavers	1	6.00	130	0.42
Area 3: Paving	Paving Equipment	1	8.00	132	0.36
Area 3: Paving	Rollers	1	7.00	80	0.38
Area 3: Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Architectural Coating	Air Compressors	1	6.00	78	0.48
Area 2: Dewatering	Graders	0	0.00	187	0.41
Area 2: Dewatering	Rubber Tired Dozers	0	0.00	247	0.40
Area 2: Dewatering	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 2: Dewatering	Pumps	1	24.00	75	0.74

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Area 2: Site Preparation	3	8.00	2.00	14.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Demolition	5	13.00	2.00	64.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Grading/Excavation	4	10.00	2.00	420.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Building Construction	9	26.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Paving	7	18.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Site Preparation	2	5.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Demolition	4	10.00	2.00	142.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Grading/Excavation	4	10.00	2.00	4,746.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Building Construction	4	26.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Paving	6	15.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Architectural Coating	1	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Dewatering	2	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Alternative Fuel for Construction Equipment

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Area 2: Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0174	0.0000	0.0174	8.8600e-003	0.0000	8.8600e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.6700e-003	0.0523	0.0227	5.0000e-005		2.3000e-003	2.3000e-003		2.1100e-003	2.1100e-003	0.0000	4.5355	4.5355	1.4700e-003	0.0000	4.5722

Total	**4.6700e-003**	**0.0523**	**0.0227**	**5.0000e-005**	**0.0174**	**2.3000e-003**	**0.0197**	**8.8600e-003**	**2.1100e-003**	**0.0110**	**0.0000**	**4.5355**	**4.5355**	**1.4700e-003**	**0.0000**	**4.5722**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-005	1.8200e-003	3.9000e-004	1.0000e-005	1.2000e-004	1.0000e-005	1.3000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.5227	0.5227	4.0000e-005	0.0000	0.5236
Vendor	2.0000e-005	5.8000e-004	1.4000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1465	0.1465	1.0000e-005	0.0000	0.1467
Worker	1.0000e-004	7.0000e-005	8.4000e-004	0.0000	2.6000e-004	0.0000	2.7000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.2294	0.2294	1.0000e-005	0.0000	0.2295
Total	**1.7000e-004**	**2.4700e-003**	**1.3700e-003**	**1.0000e-005**	**4.2000e-004**	**1.0000e-005**	**4.4000e-004**	**1.1000e-004**	**1.0000e-005**	**1.2000e-004**	**0.0000**	**0.8985**	**0.8985**	**6.0000e-005**	**0.0000**	**0.8998**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					7.8300e-003	0.0000	7.8300e-003	3.9900e-003	0.0000	3.9900e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.6700e-003	0.0523	0.0227	5.0000e-005		2.3000e-003	2.3000e-003		2.1100e-003	2.1100e-003	0.0000	4.5355	4.5355	1.4700e-003	0.0000	4.5722
Total	**4.6700e-003**	**0.0523**	**0.0227**	**5.0000e-005**	**7.8300e-003**	**2.3000e-003**	**0.0101**	**3.9900e-003**	**2.1100e-003**	**6.1000e-003**	**0.0000**	**4.5355**	**4.5355**	**1.4700e-003**	**0.0000**	**4.5722**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-005	1.8200e-003	3.9000e-004	1.0000e-005	1.2000e-004	1.0000e-005	1.3000e-004	3.0000e-005	1.0000e-005	4.0000e-005	0.0000	0.5227	0.5227	4.0000e-005	0.0000	0.5236
Vendor	2.0000e-005	5.8000e-004	1.4000e-004	0.0000	4.0000e-005	0.0000	4.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1465	0.1465	1.0000e-005	0.0000	0.1467
Worker	1.0000e-004	7.0000e-005	8.4000e-004	0.0000	2.6000e-004	0.0000	2.7000e-004	7.0000e-005	0.0000	7.0000e-005	0.0000	0.2294	0.2294	1.0000e-005	0.0000	0.2295
Total	**1.7000e-004**	**2.4700e-003**	**1.3700e-003**	**1.0000e-005**	**4.2000e-004**	**1.0000e-005**	**4.4000e-004**	**1.1000e-004**	**1.0000e-005**	**1.2000e-004**	**0.0000**	**0.8985**	**0.8985**	**6.0000e-005**	**0.0000**	**0.8998**

3.3 Area 2: Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9800e-003	0.0492	0.0362	6.0000e-005		2.6000e-003	2.6000e-003		2.4300e-003	2.4300e-003	0.0000	5.2678	5.2678	1.3500e-003	0.0000	5.3015
Total	**4.9800e-003**	**0.0492**	**0.0362**	**6.0000e-005**		**2.6000e-003**	**2.6000e-003**		**2.4300e-003**	**2.4300e-003**	**0.0000**	**5.2678**	**5.2678**	**1.3500e-003**	**0.0000**	**5.3015**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	2.4000e-004	8.3400e-003	1.7700e-003	2.0000e-005	5.5000e-004	3.0000e-005	5.8000e-004	1.5000e-004	2.0000e-005	1.8000e-004	0.0000	2.3894	2.3894	1.6000e-004	0.0000	2.3935
Vendor	1.0000e-005	4.8000e-004	1.2000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1221	0.1221	1.0000e-005	0.0000	0.1223
Worker	1.4000e-004	1.0000e-004	1.1300e-003	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3106	0.3106	1.0000e-005	0.0000	0.3108
Total	**3.9000e-004**	**8.9200e-003**	**3.0200e-003**	**2.0000e-005**	**9.4000e-004**	**3.0000e-005**	**9.7000e-004**	**2.5000e-004**	**2.0000e-005**	**2.9000e-004**	**0.0000**	**2.8221**	**2.8221**	**1.8000e-004**	**0.0000**	**2.8266**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.9800e-003	0.0492	0.0362	6.0000e-005		2.6000e-003	2.6000e-003		2.4300e-003	2.4300e-003	0.0000	5.2678	5.2678	1.3500e-003	0.0000	5.3015
Total	**4.9800e-003**	**0.0492**	**0.0362**	**6.0000e-005**		**2.6000e-003**	**2.6000e-003**		**2.4300e-003**	**2.4300e-003**	**0.0000**	**5.2678**	**5.2678**	**1.3500e-003**	**0.0000**	**5.3015**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.4000e-004	8.3400e-003	1.7700e-003	2.0000e-005	5.5000e-004	3.0000e-005	5.8000e-004	1.5000e-004	2.0000e-005	1.8000e-004	0.0000	2.3894	2.3894	1.6000e-004	0.0000	2.3935
Vendor	1.0000e-005	4.8000e-004	1.2000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1221	0.1221	1.0000e-005	0.0000	0.1223
Worker	1.4000e-004	1.0000e-004	1.1300e-003	0.0000	3.6000e-004	0.0000	3.6000e-004	9.0000e-005	0.0000	1.0000e-004	0.0000	0.3106	0.3106	1.0000e-005	0.0000	0.3108
Total	**3.9000e-004**	**8.9200e-003**	**3.0200e-003**	**2.0000e-005**	**9.4000e-004**	**3.0000e-005**	**9.7000e-004**	**2.5000e-004**	**2.0000e-005**	**2.9000e-004**	**0.0000**	**2.8221**	**2.8221**	**1.8000e-004**	**0.0000**	**2.8266**

3.4 Area 2: Grading/Excavation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0904	0.0000	0.0904	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0304	0.3181	0.1975	4.1000e-004		0.0146	0.0146		0.0134	0.0134	0.0000	36.0918	36.0918	0.0117	0.0000	36.3836
Total	**0.0304**	**0.3181**	**0.1975**	**4.1000e-004**	**0.0904**	**0.0146**	**0.1050**	**0.0497**	**0.0134**	**0.0631**	**0.0000**	**36.0918**	**36.0918**	**0.0117**	**0.0000**	**36.3836**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.5400e-003	0.0547	0.0116	1.6000e-004	3.6100e-003	1.7000e-004	3.7800e-003	9.9000e-004	1.6000e-004	1.1500e-003	0.0000	15.6807	15.6807	1.0700e-003	0.0000	15.7075
Vendor	1.1000e-004	3.8700e-003	9.6000e-004	1.0000e-005	2.5000e-004	1.0000e-005	2.6000e-004	7.0000e-005	1.0000e-005	8.0000e-005	0.0000	0.9766	0.9766	6.0000e-005	0.0000	0.9781
Worker	8.3000e-004	6.2000e-004	6.9700e-003	2.0000e-005	2.1900e-003	2.0000e-005	2.2100e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	1.9113	1.9113	5.0000e-005	0.0000	1.9126
Total	**2.4800e-003**	**0.0592**	**0.0195**	**1.9000e-004**	**6.0500e-003**	**2.0000e-004**	**6.2500e-003**	**1.6400e-003**	**1.9000e-004**	**1.8300e-003**	**0.0000**	**18.5686**	**18.5686**	**1.1800e-003**	**0.0000**	**18.5983**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0407	0.0000	0.0407	0.0224	0.0000	0.0224	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0304	0.3181	0.1975	4.1000e-004		0.0146	0.0146		0.0134	0.0134	0.0000	36.0918	36.0918	0.0117	0.0000	36.3836
Total	**0.0304**	**0.3181**	**0.1975**	**4.1000e-004**	**0.0407**	**0.0146**	**0.0553**	**0.0224**	**0.0134**	**0.0358**	**0.0000**	**36.0918**	**36.0918**	**0.0117**	**0.0000**	**36.3836**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	1.5400e-003	0.0547	0.0116	1.6000e-004	3.6100e-003	1.7000e-004	3.7800e-003	9.9000e-004	1.6000e-004	1.1500e-003	0.0000	15.6807	15.6807	1.0700e-003	0.0000	15.7075
Vendor	1.1000e-004	3.8700e-003	9.6000e-004	1.0000e-005	2.5000e-004	1.0000e-005	2.6000e-004	7.0000e-005	1.0000e-005	8.0000e-005	0.0000	0.9766	0.9766	6.0000e-005	0.0000	0.9781
Worker	8.3000e-004	6.2000e-004	6.9700e-003	2.0000e-005	2.1900e-003	2.0000e-005	2.2100e-003	5.8000e-004	2.0000e-005	6.0000e-004	0.0000	1.9113	1.9113	5.0000e-005	0.0000	1.9126
Total	**2.4800e-003**	**0.0592**	**0.0195**	**1.9000e-004**	**6.0500e-003**	**2.0000e-004**	**6.2500e-003**	**1.6400e-003**	**1.9000e-004**	**1.8300e-003**	**0.0000**	**18.5686**	**18.5686**	**1.1800e-003**	**0.0000**	**18.5983**

3.5 Area 2: Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0365	0.2812	0.2615	4.2000e-004		0.0149	0.0149		0.0141	0.0141	0.0000	35.0230	35.0230	9.1800e-003	0.0000	35.2526

Total	**0.0365**	**0.2812**	**0.2615**	**4.2000e-004**		**0.0149**	**0.0149**		**0.0141**	**0.0141**	**0.0000**	**35.0230**	**35.0230**	**9.1800e-003**	**0.0000**	**35.2526**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.0000e-004	3.4800e-003	8.6000e-004	1.0000e-005	2.3000e-004	1.0000e-005	2.3000e-004	7.0000e-005	1.0000e-005	7.0000e-005	0.0000	0.8789	0.8789	6.0000e-005	0.0000	0.8803
Worker	1.9500e-003	1.4400e-003	0.0163	5.0000e-005	5.1300e-003	4.0000e-005	5.1700e-003	1.3600e-003	4.0000e-005	1.4000e-003	0.0000	4.4725	4.4725	1.2000e-004	0.0000	4.4755
Total	**2.0500e-003**	**4.9200e-003**	**0.0172**	**6.0000e-005**	**5.3600e-003**	**5.0000e-005**	**5.4000e-003**	**1.4300e-003**	**5.0000e-005**	**1.4700e-003**	**0.0000**	**5.3514**	**5.3514**	**1.8000e-004**	**0.0000**	**5.3558**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0365	0.2812	0.2615	4.2000e-004		0.0149	0.0149		0.0141	0.0141	0.0000	35.0230	35.0230	9.1800e-003	0.0000	35.2525
Total	**0.0365**	**0.2812**	**0.2615**	**4.2000e-004**		**0.0149**	**0.0149**		**0.0141**	**0.0141**	**0.0000**	**35.0230**	**35.0230**	**9.1800e-003**	**0.0000**	**35.2525**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.0000e-004	3.4800e-003	8.6000e-004	1.0000e-005	2.3000e-004	1.0000e-005	2.3000e-004	7.0000e-005	1.0000e-005	7.0000e-005	0.0000	0.8789	0.8789	6.0000e-005	0.0000	0.8803
Worker	1.9500e-003	1.4400e-003	0.0163	5.0000e-005	5.1300e-003	4.0000e-005	5.1700e-003	1.3600e-003	4.0000e-005	1.4000e-003	0.0000	4.4725	4.4725	1.2000e-004	0.0000	4.4755
Total	**2.0500e-003**	**4.9200e-003**	**0.0172**	**6.0000e-005**	**5.3600e-003**	**5.0000e-005**	**5.4000e-003**	**1.4300e-003**	**5.0000e-005**	**1.4700e-003**	**0.0000**	**5.3514**	**5.3514**	**1.8000e-004**	**0.0000**	**5.3558**

3.6 Area 2: Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.1400e-003	0.0208	0.0233	4.0000e-005		1.1000e-003	1.1000e-003		1.0200e-003	1.0200e-003	0.0000	3.1081	3.1081	9.5000e-004	0.0000	3.1318
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**2.1400e-003**	**0.0208**	**0.0233**	**4.0000e-005**		**1.1000e-003**	**1.1000e-003**		**1.0200e-003**	**1.0200e-003**	**0.0000**	**3.1081**	**3.1081**	**9.5000e-004**	**0.0000**	**3.1318**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.0000e-005	4.8000e-004	1.2000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1221	0.1221	1.0000e-005	0.0000	0.1223
Worker	1.9000e-004	1.4000e-004	1.5700e-003	0.0000	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4301	0.4301	1.0000e-005	0.0000	0.4303
Total	**2.0000e-004**	**6.2000e-004**	**1.6900e-003**	**0.0000**	**5.2000e-004**	**0.0000**	**5.3000e-004**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**0.5521**	**0.5521**	**2.0000e-005**	**0.0000**	**0.5526**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	2.1400e-003	0.0208	0.0233	4.0000e-005		1.1000e-003	1.1000e-003		1.0200e-003	1.0200e-003	0.0000	3.1081	3.1081	9.5000e-004	0.0000	3.1318
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**2.1400e-003**	**0.0208**	**0.0233**	**4.0000e-005**		**1.1000e-003**	**1.1000e-003**		**1.0200e-003**	**1.0200e-003**	**0.0000**	**3.1081**	**3.1081**	**9.5000e-004**	**0.0000**	**3.1318**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.0000e-005	4.8000e-004	1.2000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1221	0.1221	1.0000e-005	0.0000	0.1223
Worker	1.9000e-004	1.4000e-004	1.5700e-003	0.0000	4.9000e-004	0.0000	5.0000e-004	1.3000e-004	0.0000	1.3000e-004	0.0000	0.4301	0.4301	1.0000e-005	0.0000	0.4303
Total	**2.0000e-004**	**6.2000e-004**	**1.6900e-003**	**0.0000**	**5.2000e-004**	**0.0000**	**5.3000e-004**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**0.5521**	**0.5521**	**2.0000e-005**	**0.0000**	**0.5526**

3.7 Area 3: Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0132	0.0000	0.0132	7.2400e-003	0.0000	7.2400e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.2400e-003	0.0234	0.0134	3.0000e-005		1.1400e-003	1.1400e-003		1.0500e-003	1.0500e-003	0.0000	2.3244	2.3244	7.5000e-004	0.0000	2.3432
Total	**2.2400e-003**	**0.0234**	**0.0134**	**3.0000e-005**	**0.0132**	**1.1400e-003**	**0.0143**	**7.2400e-003**	**1.0500e-003**	**8.2900e-003**	**0.0000**	**2.3244**	**2.3244**	**7.5000e-004**	**0.0000**	**2.3432**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.0000e-005	4.6000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1210	0.1210	1.0000e-005	0.0000	0.1212
Worker	5.0000e-005	3.0000e-005	4.0000e-004	0.0000	1.4000e-004	0.0000	1.4000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1152	0.1152	0.0000	0.0000	0.1153
Total	**6.0000e-005**	**4.9000e-004**	**5.1000e-004**	**0.0000**	**1.7000e-004**	**0.0000**	**1.7000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2362**	**0.2362**	**1.0000e-005**	**0.0000**	**0.2364**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.9300e-003	0.0000	5.9300e-003	3.2600e-003	0.0000	3.2600e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.2400e-003	0.0234	0.0134	3.0000e-005		1.1400e-003	1.1400e-003		1.0500e-003	1.0500e-003	0.0000	2.3244	2.3244	7.5000e-004	0.0000	2.3432
Total	**2.2400e-003**	**0.0234**	**0.0134**	**3.0000e-005**	**5.9300e-003**	**1.1400e-003**	**7.0700e-003**	**3.2600e-003**	**1.0500e-003**	**4.3100e-003**	**0.0000**	**2.3244**	**2.3244**	**7.5000e-004**	**0.0000**	**2.3432**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.0000e-005	4.6000e-004	1.1000e-004	0.0000	3.0000e-005	0.0000	3.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.1210	0.1210	1.0000e-005	0.0000	0.1212
Worker	5.0000e-005	3.0000e-005	4.0000e-004	0.0000	1.4000e-004	0.0000	1.4000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1152	0.1152	0.0000	0.0000	0.1153
Total	**6.0000e-005**	**4.9000e-004**	**5.1000e-004**	**0.0000**	**1.7000e-004**	**0.0000**	**1.7000e-004**	**5.0000e-005**	**0.0000**	**5.0000e-005**	**0.0000**	**0.2362**	**0.2362**	**1.0000e-005**	**0.0000**	**0.2364**

3.8 Area 3: Demolition - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.2600e-003	0.0391	0.0519	8.0000e-005		2.1000e-003	2.1000e-003		1.9900e-003	1.9900e-003	0.0000	6.7875	6.7875	1.4700e-003	0.0000	6.8243

Total	**4.2600e-003**	**0.0391**	**0.0519**	**8.0000e-005**		**2.1000e-003**	**2.1000e-003**		**1.9900e-003**	**1.9900e-003**	**0.0000**	**6.7875**	**6.7875**	**1.4700e-003**	**0.0000**	**6.8243**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-004	0.0171	3.8800e-003	5.0000e-005	1.2200e-003	5.0000e-005	1.2700e-003	3.4000e-004	5.0000e-005	3.8000e-004	0.0000	5.2387	5.2387	3.6000e-004	0.0000	5.2476
Vendor	3.0000e-005	9.2000e-004	2.3000e-004	0.0000	6.0000e-005	0.0000	6.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.2420	0.2420	1.0000e-005	0.0000	0.2424
Worker	2.0000e-004	1.4000e-004	1.6100e-003	1.0000e-005	5.5000e-004	0.0000	5.5000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.4607	0.4607	1.0000e-005	0.0000	0.4610
Total	**7.3000e-004**	**0.0181**	**5.7200e-003**	**6.0000e-005**	**1.8300e-003**	**5.0000e-005**	**1.8800e-003**	**5.1000e-004**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**5.9414**	**5.9414**	**3.8000e-004**	**0.0000**	**5.9510**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	4.2600e-003	0.0391	0.0519	8.0000e-005		2.1000e-003	2.1000e-003		1.9900e-003	1.9900e-003	0.0000	6.7875	6.7875	1.4700e-003	0.0000	6.8243
Total	**4.2600e-003**	**0.0391**	**0.0519**	**8.0000e-005**		**2.1000e-003**	**2.1000e-003**		**1.9900e-003**	**1.9900e-003**	**0.0000**	**6.7875**	**6.7875**	**1.4700e-003**	**0.0000**	**6.8243**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	5.0000e-004	0.0171	3.8800e-003	5.0000e-005	1.2200e-003	5.0000e-005	1.2700e-003	3.4000e-004	5.0000e-005	3.8000e-004	0.0000	5.2387	5.2387	3.6000e-004	0.0000	5.2476
Vendor	3.0000e-005	9.2000e-004	2.3000e-004	0.0000	6.0000e-005	0.0000	6.0000e-005	2.0000e-005	0.0000	2.0000e-005	0.0000	0.2420	0.2420	1.0000e-005	0.0000	0.2424
Worker	2.0000e-004	1.4000e-004	1.6100e-003	1.0000e-005	5.5000e-004	0.0000	5.5000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.4607	0.4607	1.0000e-005	0.0000	0.4610
Total	**7.3000e-004**	**0.0181**	**5.7200e-003**	**6.0000e-005**	**1.8300e-003**	**5.0000e-005**	**1.8800e-003**	**5.1000e-004**	**5.0000e-005**	**5.5000e-004**	**0.0000**	**5.9414**	**5.9414**	**3.8000e-004**	**0.0000**	**5.9510**

3.9 Area 3: Grading/Excavation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.2258	0.0000	0.2258	0.1241	0.0000	0.1241	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0720	0.7451	0.5098	1.0800e-003		0.0346	0.0346		0.0319	0.0319	0.0000	94.7036	94.7036	0.0306	0.0000	95.4693
Total	**0.0720**	**0.7451**	**0.5098**	**1.0800e-003**	**0.2258**	**0.0346**	**0.2605**	**0.1241**	**0.0319**	**0.1560**	**0.0000**	**94.7036**	**94.7036**	**0.0306**	**0.0000**	**95.4693**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0166	0.5708	0.1295	1.7800e-003	0.0408	1.6100e-003	0.0424	0.0112	1.5400e-003	0.0127	0.0000	175.0901	175.0901	0.0119	0.0000	175.3877
Vendor	2.7000e-004	9.1700e-003	2.2700e-003	2.0000e-005	6.3000e-004	2.0000e-005	6.5000e-004	1.8000e-004	2.0000e-005	2.0000e-004	0.0000	2.4200	2.4200	1.5000e-004	0.0000	2.4237
Worker	1.9600e-003	1.3900e-003	0.0161	5.0000e-005	5.4900e-003	4.0000e-005	5.5300e-003	1.4600e-003	4.0000e-005	1.4900e-003	0.0000	4.6070	4.6070	1.2000e-004	0.0000	4.6099
Total	**0.0188**	**0.5814**	**0.1479**	**1.8500e-003**	**0.0469**	**1.6700e-003**	**0.0486**	**0.0128**	**1.6000e-003**	**0.0144**	**0.0000**	**182.1170**	**182.1170**	**0.0122**	**0.0000**	**182.4213**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1016	0.0000	0.1016	0.0559	0.0000	0.0559	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0720	0.7451	0.5098	1.0800e-003		0.0346	0.0346		0.0319	0.0319	0.0000	94.7035	94.7035	0.0306	0.0000	95.4692
Total	**0.0720**	**0.7451**	**0.5098**	**1.0800e-003**	**0.1016**	**0.0346**	**0.1362**	**0.0559**	**0.0319**	**0.0877**	**0.0000**	**94.7035**	**94.7035**	**0.0306**	**0.0000**	**95.4692**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0166	0.5708	0.1295	1.7800e-003	0.0408	1.6100e-003	0.0424	0.0112	1.5400e-003	0.0127	0.0000	175.0901	175.0901	0.0119	0.0000	175.3877
Vendor	2.7000e-004	9.1700e-003	2.2700e-003	2.0000e-005	6.3000e-004	2.0000e-005	6.5000e-004	1.8000e-004	2.0000e-005	2.0000e-004	0.0000	2.4200	2.4200	1.5000e-004	0.0000	2.4237
Worker	1.9600e-003	1.3900e-003	0.0161	5.0000e-005	5.4900e-003	4.0000e-005	5.5300e-003	1.4600e-003	4.0000e-005	1.4900e-003	0.0000	4.6070	4.6070	1.2000e-004	0.0000	4.6099
Total	**0.0188**	**0.5814**	**0.1479**	**1.8500e-003**	**0.0469**	**1.6700e-003**	**0.0486**	**0.0128**	**1.6000e-003**	**0.0144**	**0.0000**	**182.1170**	**182.1170**	**0.0122**	**0.0000**	**182.4213**

3.10 Area 2: Dewatering - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0106	0.0000	0.0106	1.1500e-003	0.0000	1.1500e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0241	0.2099	0.2456	4.1000e-004		0.0118	0.0118		0.0116	0.0116	0.0000	35.7385	35.7385	3.4200e-003	0.0000	35.8239
Total	**0.0241**	**0.2099**	**0.2456**	**4.1000e-004**	**0.0106**	**0.0118**	**0.0224**	**1.1500e-003**	**0.0116**	**0.0127**	**0.0000**	**35.7385**	**35.7385**	**3.4200e-003**	**0.0000**	**35.8239**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	3.1000e-004	3.4800e-003	1.0000e-005	1.1000e-003	1.0000e-005	1.1100e-003	2.9000e-004	1.0000e-005	3.0000e-004	0.0000	0.9557	0.9557	3.0000e-005	0.0000	0.9563
Total	**4.2000e-004**	**3.1000e-004**	**3.4800e-003**	**1.0000e-005**	**1.1000e-003**	**1.0000e-005**	**1.1100e-003**	**2.9000e-004**	**1.0000e-005**	**3.0000e-004**	**0.0000**	**0.9557**	**0.9557**	**3.0000e-005**	**0.0000**	**0.9563**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.7700e-003	0.0000	4.7700e-003	5.2000e-004	0.0000	5.2000e-004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0241	0.2099	0.2456	4.1000e-004		0.0118	0.0118		0.0116	0.0116	0.0000	35.7384	35.7384	3.4200e-003	0.0000	35.8239
Total	**0.0241**	**0.2099**	**0.2456**	**4.1000e-004**	**4.7700e-003**	**0.0118**	**0.0165**	**5.2000e-004**	**0.0116**	**0.0121**	**0.0000**	**35.7384**	**35.7384**	**3.4200e-003**	**0.0000**	**35.8239**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	3.1000e-004	3.4800e-003	1.0000e-005	1.1000e-003	1.0000e-005	1.1100e-003	2.9000e-004	1.0000e-005	3.0000e-004	0.0000	0.9557	0.9557	3.0000e-005	0.0000	0.9563
Total	**4.2000e-004**	**3.1000e-004**	**3.4800e-003**	**1.0000e-005**	**1.1000e-003**	**1.0000e-005**	**1.1100e-003**	**2.9000e-004**	**1.0000e-005**	**3.0000e-004**	**0.0000**	**0.9557**	**0.9557**	**3.0000e-005**	**0.0000**	**0.9563**

3.11 Area 3: Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0184	0.1826	0.1719	3.2000e-004		8.9400e-003	8.9400e-003		8.4900e-003	8.4900e-003	0.0000	28.1499	28.1499	5.6000e-003	0.0000	28.2898

Total	**0.0184**	**0.1826**	**0.1719**	**3.2000e-004**		**8.9400e-003**	**8.9400e-003**		**8.4900e-003**	**8.4900e-003**	**0.0000**	**28.1499**	**28.1499**	**5.6000e-003**	**0.0000**	**28.2898**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2000e-004	4.1300e-003	1.0200e-003	1.0000e-005	2.8000e-004	1.0000e-005	2.9000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	1.0890	1.0890	7.0000e-005	0.0000	1.0907
Worker	2.2900e-003	1.6300e-003	0.0188	6.0000e-005	6.4200e-003	5.0000e-005	6.4600e-003	1.7000e-003	4.0000e-005	1.7500e-003	0.0000	5.3902	5.3902	1.4000e-004	0.0000	5.3936
Total	**2.4100e-003**	**5.7600e-003**	**0.0198**	**7.0000e-005**	**6.7000e-003**	**6.0000e-005**	**6.7500e-003**	**1.7800e-003**	**5.0000e-005**	**1.8400e-003**	**0.0000**	**6.4792**	**6.4792**	**2.1000e-004**	**0.0000**	**6.4842**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0184	0.1826	0.1719	3.2000e-004		8.9400e-003	8.9400e-003		8.4900e-003	8.4900e-003	0.0000	28.1499	28.1499	5.6000e-003	0.0000	28.2898
Total	**0.0184**	**0.1826**	**0.1719**	**3.2000e-004**		**8.9400e-003**	**8.9400e-003**		**8.4900e-003**	**8.4900e-003**	**0.0000**	**28.1499**	**28.1499**	**5.6000e-003**	**0.0000**	**28.2898**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2000e-004	4.1300e-003	1.0200e-003	1.0000e-005	2.8000e-004	1.0000e-005	2.9000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	1.0890	1.0890	7.0000e-005	0.0000	1.0907
Worker	2.2900e-003	1.6300e-003	0.0188	6.0000e-005	6.4200e-003	5.0000e-005	6.4600e-003	1.7000e-003	4.0000e-005	1.7500e-003	0.0000	5.3902	5.3902	1.4000e-004	0.0000	5.3936
Total	**2.4100e-003**	**5.7600e-003**	**0.0198**	**7.0000e-005**	**6.7000e-003**	**6.0000e-005**	**6.7500e-003**	**1.7800e-003**	**5.0000e-005**	**1.8400e-003**	**0.0000**	**6.4792**	**6.4792**	**2.1000e-004**	**0.0000**	**6.4842**

3.12 Area 3: Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0248	0.2707	0.2369	4.5000e-004		0.0116	0.0116		0.0107	0.0107	0.0000	39.5712	39.5712	0.0126	0.0000	39.8869
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0248**	**0.2707**	**0.2369**	**4.5000e-004**		**0.0116**	**0.0116**		**0.0107**	**0.0107**	**0.0000**	**39.5712**	**39.5712**	**0.0126**	**0.0000**	**39.8869**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2000e-004	4.1300e-003	1.0200e-003	1.0000e-005	2.8000e-004	1.0000e-005	2.9000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	1.0890	1.0890	7.0000e-005	0.0000	1.0907
Worker	1.3200e-003	9.4000e-004	0.0109	3.0000e-005	3.7000e-003	3.0000e-005	3.7300e-003	9.8000e-004	2.0000e-005	1.0100e-003	0.0000	3.1097	3.1097	8.0000e-005	0.0000	3.1117
Total	**1.4400e-003**	**5.0700e-003**	**0.0119**	**4.0000e-005**	**3.9800e-003**	**4.0000e-005**	**4.0200e-003**	**1.0600e-003**	**3.0000e-005**	**1.1000e-003**	**0.0000**	**4.1987**	**4.1987**	**1.5000e-004**	**0.0000**	**4.2023**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0248	0.2707	0.2369	4.5000e-004		0.0116	0.0116		0.0107	0.0107	0.0000	39.5712	39.5712	0.0126	0.0000	39.8869
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0248**	**0.2707**	**0.2369**	**4.5000e-004**		**0.0116**	**0.0116**		**0.0107**	**0.0107**	**0.0000**	**39.5712**	**39.5712**	**0.0126**	**0.0000**	**39.8869**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.2000e-004	4.1300e-003	1.0200e-003	1.0000e-005	2.8000e-004	1.0000e-005	2.9000e-004	8.0000e-005	1.0000e-005	9.0000e-005	0.0000	1.0890	1.0890	7.0000e-005	0.0000	1.0907
Worker	1.3200e-003	9.4000e-004	0.0109	3.0000e-005	3.7000e-003	3.0000e-005	3.7300e-003	9.8000e-004	2.0000e-005	1.0100e-003	0.0000	3.1097	3.1097	8.0000e-005	0.0000	3.1117
Total	**1.4400e-003**	**5.0700e-003**	**0.0119**	**4.0000e-005**	**3.9800e-003**	**4.0000e-005**	**4.0200e-003**	**1.0600e-003**	**3.0000e-005**	**1.1000e-003**	**0.0000**	**4.1987**	**4.1987**	**1.5000e-004**	**0.0000**	**4.2023**

3.13 Area 3: Architectural Coating - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	8.4800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1000e-004	3.5200e-003	4.5300e-003	1.0000e-005		2.0000e-004	2.0000e-004		2.0000e-004	2.0000e-004	0.0000	0.6383	0.6383	4.0000e-005	0.0000	0.6394
Total	**8.9900e-003**	**3.5200e-003**	**4.5300e-003**	**1.0000e-005**		**2.0000e-004**	**2.0000e-004**		**2.0000e-004**	**2.0000e-004**	**0.0000**	**0.6383**	**0.6383**	**4.0000e-005**	**0.0000**	**0.6394**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	3.0000e-005	4.0000e-004	0.0000	1.4000e-004	0.0000	1.4000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1152	0.1152	0.0000	0.0000	0.1153
Total	**5.0000e-005**	**3.0000e-005**	**4.0000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1152**	**0.1152**	**0.0000**	**0.0000**	**0.1153**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	8.4800e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.1000e-004	3.5200e-003	4.5300e-003	1.0000e-005		2.0000e-004	2.0000e-004		2.0000e-004	2.0000e-004	0.0000	0.6383	0.6383	4.0000e-005	0.0000	0.6394
Total	**8.9900e-003**	**3.5200e-003**	**4.5300e-003**	**1.0000e-005**		**2.0000e-004**	**2.0000e-004**		**2.0000e-004**	**2.0000e-004**	**0.0000**	**0.6383**	**0.6383**	**4.0000e-005**	**0.0000**	**0.6394**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	3.0000e-005	4.0000e-004	0.0000	1.4000e-004	0.0000	1.4000e-004	4.0000e-005	0.0000	4.0000e-005	0.0000	0.1152	0.1152	0.0000	0.0000	0.1153
Total	**5.0000e-005**	**3.0000e-005**	**4.0000e-004**	**0.0000**	**1.4000e-004**	**0.0000**	**1.4000e-004**	**4.0000e-005**	**0.0000**	**4.0000e-005**	**0.0000**	**0.1152**	**0.1152**	**0.0000**	**0.0000**	**0.1153**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-...	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.549559	0.042893	0.201564	0.118533	0.015569	0.005846	0.021394	0.034255	0.002099	0.001828	0.004855	0.000709	0.000896

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	4.7900e-003	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	4.0000e-005
Unmitigated	4.7900e-003	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	4.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	8.5000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9400e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	4.0000e-005
Total	**4.7900e-003**	**0.0000**	**2.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**4.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

SubCategory	tons/yr										MT/yr					
Architectural Coating	8.5000e-004					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	3.9400e-003					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	4.0000e-005
Total	**4.7900e-003**	**0.0000**	**2.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**4.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000

Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Other Non-Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Arroyo Seco

South Coast AQMD Air District, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	1.40	Acre	1.40	60,984.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	12			**Operational Year**	2022
Utility Company	Pasadena Water & Power				
CO2 Intensity (lb/MWhr)	1664.14	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CalEEMod Defaults.

Land Use - CalEEMod Defaults.

Construction Phase - Construction schedule information provided by project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

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Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Trips and VMT - Construction Trip information provided by the project applicant.

Grading - Export of 11,000 CY and import of 37,000 CY

Construction Off-road Equipment Mitigation - Compliance with SCAQMD Rule 403

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	FuelType	Diesel	CNG
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstructionPhase	NumDays	10.00	5.00
tblConstructionPhase	NumDays	200.00	36.00
tblConstructionPhase	NumDays	200.00	45.00
tblConstructionPhase	NumDays	20.00	5.00
tblConstructionPhase	NumDays	20.00	10.00
tblConstructionPhase	NumDays	4.00	40.00
tblConstructionPhase	NumDays	4.00	100.00
tblConstructionPhase	NumDays	10.00	45.00
tblConstructionPhase	NumDays	10.00	5.00
tblConstructionPhase	NumDays	2.00	6.00
tblConstructionPhase	NumDays	2.00	5.00
tblConstructionPhase	NumDays	2.00	40.00
tblGrading	AcresOfGrading	0.00	20.00
tblGrading	MaterialExported	0.00	290.00
tblGrading	MaterialExported	0.00	11,000.00
tblGrading	MaterialImported	0.00	37,000.00
tblOffRoadEquipment	HorsePower	84.00	75.00
tblOffRoadEquipment	OffRoadEquipmentType		Pumps
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	7.00	0.00
tblTripsAndVMT	HaulingTripNumber	0.00	14.00
tblTripsAndVMT	HaulingTripNumber	0.00	64.00
tblTripsAndVMT	HaulingTripNumber	36.00	420.00
tblTripsAndVMT	HaulingTripNumber	0.00	142.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	10.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	10.00	2.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	5.0160	45.1679	38.8790	0.0785	6.5287	2.1579	7.8849	3.0643	2.0426	4.7618	0.0000	7,537.7859	7,537.7859	1.7084	0.0000	7,574.5592
2022	3.6162	26.2015	19.6805	0.0590	5.4704	0.9158	6.1960	2.9150	0.8552	3.4119	0.0000	6,139.1974	6,139.1974	0.9390	0.0000	6,162.6729
Maximum	**5.0160**	**45.1679**	**38.8790**	**0.0785**	**6.5287**	**2.1579**	**7.8849**	**3.0643**	**2.0426**	**4.7618**	**0.0000**	**7,537.7859**	**7,537.7859**	**1.7084**	**0.0000**	**7,574.5592**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	5.0160	45.1679	38.8790	0.0785	3.0473	2.1579	5.0967	1.4083	2.0426	3.3648	0.0000	7,537.7859	7,537.7859	1.7084	0.0000	7,574.5592
2022	3.6162	26.2015	19.6805	0.0590	2.9863	0.9158	3.7119	1.3778	0.8552	2.0465	0.0000	6,139.1974	6,139.1974	0.9390	0.0000	6,162.6729
Maximum	**5.0160**	**45.1679**	**38.8790**	**0.0785**	**3.0473**	**2.1579**	**5.0967**	**1.4083**	**2.0426**	**3.3648**	**0.0000**	**7,537.7859**	**7,537.7859**	**1.7084**	**0.0000**	**7,574.5592**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**49.72**	**0.00**	**37.44**	**53.40**	**0.00**	**33.80**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**	**0.0000**	**3.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**	**0.0000**	**3.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Area 2: Site Preparation	Site Preparation	8/2/2021	8/9/2021	5	6	
2	Area 2: Demolition	Demolition	8/10/2021	8/16/2021	5	5	
3	Area 2: Grading/Excavation	Grading	8/17/2021	10/11/2021	5	40	
4	Area 2: Building Construction	Building Construction	8/23/2021	10/11/2021	5	36	
5	Area 2: Paving	Paving	10/11/2021	10/15/2021	5	5	
6	Area 3: Site Preparation	Site Preparation	3/21/2022	3/25/2022	5	5	
7	Area 3: Demolition	Demolition	3/28/2022	4/8/2022	5	10	
8	Area 3: Grading/Excavation	Grading	4/11/2022	8/26/2022	5	100	
9	Area 2: Dewatering	Site Preparation	8/2/2021	9/24/2021	5	40	
10	Area 3: Building Construction	Building Construction	8/27/2022	10/28/2022	5	45	
11	Area 3: Paving	Paving	8/29/2022	10/28/2022	5	45	
12	Area 3: Architectural Coating	Architectural Coating	10/29/2022	11/4/2022	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 1.4

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 3,659

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Area 2: Site Preparation	Graders	1	8.00	187	0.41
Area 2: Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Area 2: Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 2: Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Area 2: Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Area 2: Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Area 2: Grading/Excavation	Excavators	1	8.00	158	0.38
Area 2: Grading/Excavation	Graders	0	0.00	187	0.41

Area 2: Grading/Excavation	Rubber Tired Dozers	1	6.00	247	0.40
Area 2: Grading/Excavation	Rubber Tired Loaders	1	8.00	203	0.36
Area 2: Grading/Excavation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Area 2: Building Construction	Cement and Mortar Mixers	1	8.00	9	0.56
Area 2: Building Construction	Cranes	1	6.00	231	0.29
Area 2: Building Construction	Excavators	1	8.00	158	0.38
Area 2: Building Construction	Forklifts	0	0.00	89	0.20
Area 2: Building Construction	Generator Sets	1	0.00	84	0.74
Area 2: Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Area 2: Building Construction	Trenchers	1	8.00	78	0.50
Area 2: Building Construction	Welders	3	8.00	46	0.45
Area 2: Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Area 2: Paving	Pavers	1	6.00	130	0.42
Area 2: Paving	Paving Equipment	1	8.00	132	0.36
Area 2: Paving	Plate Compactors	1	8.00	8	0.43
Area 2: Paving	Pressure Washers	1	8.00	13	0.30
Area 2: Paving	Rollers	1	7.00	80	0.38
Area 2: Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Site Preparation	Graders	0	0.00	187	0.41
Area 3: Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Area 3: Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Area 3: Demolition	Rubber Tired Dozers	0	0.00	247	0.40
Area 3: Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Area 3: Grading/Excavation	Graders	0	0.00	187	0.41
Area 3: Grading/Excavation	Other Construction Equipment	1	8.00	172	0.42
Area 3: Grading/Excavation	Rubber Tired Dozers	1	6.00	247	0.40
Area 3: Grading/Excavation	Rubber Tired Loaders	1	8.00	203	0.36
Area 3: Grading/Excavation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Area 3: Building Construction	Cranes	1	6.00	231	0.29

Area 3: Building Construction	Forklifts	1	6.00	89	0.20
Area 3: Building Construction	Generator Sets	1	8.00	84	0.74
Area 3: Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Area 3: Building Construction	Welders	0	0.00	46	0.45
Area 3: Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Area 3: Paving	Graders	1	8.00	187	0.41
Area 3: Paving	Pavers	1	6.00	130	0.42
Area 3: Paving	Paving Equipment	1	8.00	132	0.36
Area 3: Paving	Rollers	1	7.00	80	0.38
Area 3: Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Architectural Coating	Air Compressors	1	6.00	78	0.48
Area 2: Dewatering	Graders	0	0.00	187	0.41
Area 2: Dewatering	Rubber Tired Dozers	0	0.00	247	0.40
Area 2: Dewatering	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 2: Dewatering	Pumps	1	24.00	75	0.74

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Area 2: Site Preparation	3	8.00	2.00	14.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Demolition	5	13.00	2.00	64.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Grading/Excavation	4	10.00	2.00	420.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Building Construction	9	26.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Paving	7	18.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Site Preparation	2	5.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Demolition	4	10.00	2.00	142.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Grading/Excavation	4	10.00	2.00	4,746.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Building Construction	4	26.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Paving	6	15.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Architectural Coating	1	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

Area 2: Dewatering		2	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix		HDT_Mix		HHDT		

3.1 Mitigation Measures Construction

Use Alternative Fuel for Construction Equipment

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Area 2: Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					5.7996	0.0000	5.7996	2.9537	0.0000	2.9537			0.0000			0.0000
Off-Road	1.5558	17.4203	7.5605	0.0172		0.7654	0.7654		0.7041	0.7041		1,666.5174	1,666.5174	0.5390		1,679.9920
Total	**1.5558**	**17.4203**	**7.5605**	**0.0172**	**5.7996**	**0.7654**	**6.5650**	**2.9537**	**0.7041**	**3.6578**		**1,666.5174**	**1,666.5174**	**0.5390**		**1,679.9920**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0169	0.5903	0.1250	1.7900e-003	0.0408	1.8300e-003	0.0426	0.0112	1.7500e-003	0.0129		193.5592	193.5592	0.0129		193.8821
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0338	0.0219	0.3014	8.9000e-004	0.0894	6.6000e-004	0.0901	0.0237	6.1000e-004	0.0243		88.5923	88.5923	2.3800e-003		88.6518

Total	**0.0563**	**0.8030**	**0.4716**	**3.1900e-003**	**0.1430**	**2.8700e-003**	**0.1459**	**0.0386**	**2.7300e-003**	**0.0413**		**336.6392**	**336.6392**	**0.0186**		**337.1040**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.6098	0.0000	2.6098	1.3292	0.0000	1.3292			0.0000			0.0000
Off-Road	1.5558	17.4203	7.5605	0.0172		0.7654	0.7654		0.7041	0.7041	0.0000	1,666.5174	1,666.5174	0.5390		1,679.9920
Total	**1.5558**	**17.4203**	**7.5605**	**0.0172**	**2.6098**	**0.7654**	**3.3752**	**1.3292**	**0.7041**	**2.0333**	**0.0000**	**1,666.5174**	**1,666.5174**	**0.5390**		**1,679.9920**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0169	0.5903	0.1250	1.7900e-003	0.0408	1.8300e-003	0.0426	0.0112	1.7500e-003	0.0129		193.5592	193.5592	0.0129		193.8821
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0338	0.0219	0.3014	8.9000e-004	0.0894	6.6000e-004	0.0901	0.0237	6.1000e-004	0.0243		88.5923	88.5923	2.3800e-003		88.6518
Total	**0.0563**	**0.8030**	**0.4716**	**3.1900e-003**	**0.1430**	**2.8700e-003**	**0.1459**	**0.0386**	**2.7300e-003**	**0.0413**		**336.6392**	**336.6392**	**0.0186**		**337.1040**

3.3 Area 2: Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9930	19.6966	14.4925	0.0241		1.0409	1.0409		0.9715	0.9715		2,322.7171	2,322.7171	0.5940		2,337.5658
Total	**1.9930**	**19.6966**	**14.4925**	**0.0241**		**1.0409**	**1.0409**		**0.9715**	**0.9715**		**2,322.7171**	**2,322.7171**	**0.5940**		**2,337.5658**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0929	3.2383	0.6855	9.8100e-003	0.2237	0.0100	0.2337	0.0613	9.6000e-003	0.0709		1,061.8106	1,061.8106	0.0708		1,063.5816
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0549	0.0356	0.4897	1.4400e-003	0.1453	1.0700e-003	0.1464	0.0385	9.9000e-004	0.0395		143.9624	143.9624	3.8700e-003		144.0592
Total	**0.1533**	**3.4646**	**1.2205**	**0.0118**	**0.3818**	**0.0115**	**0.3933**	**0.1035**	**0.0110**	**0.1145**		**1,260.2608**	**1,260.2608**	**0.0780**		**1,262.2109**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	1.9930	19.6966	14.4925	0.0241		1.0409	1.0409		0.9715	0.9715	0.0000	2,322.7171	2,322.7171	0.5940		2,337.5658
Total	**1.9930**	**19.6966**	**14.4925**	**0.0241**		**1.0409**	**1.0409**		**0.9715**	**0.9715**	**0.0000**	**2,322.7171**	**2,322.7171**	**0.5940**		**2,337.5658**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0929	3.2383	0.6855	9.8100e-003	0.2237	0.0100	0.2337	0.0613	9.6000e-003	0.0709		1,061.8106	1,061.8106	0.0708		1,063.5816
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0549	0.0356	0.4897	1.4400e-003	0.1453	1.0700e-003	0.1464	0.0385	9.9000e-004	0.0395		143.9624	143.9624	3.8700e-003		144.0592
Total	**0.1533**	**3.4646**	**1.2205**	**0.0118**	**0.3818**	**0.0115**	**0.3933**	**0.1035**	**0.0110**	**0.1145**		**1,260.2608**	**1,260.2608**	**0.0780**		**1,262.2109**

3.4 Area 2: Grading/Excavation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.5174	0.0000	4.5174	2.4828	0.0000	2.4828			0.0000			0.0000
Off-Road	1.5208	15.9045	9.8765	0.0205		0.7304	0.7304		0.6720	0.6720		1,989.2199	1,989.2199	0.6434		2,005.3038
Total	**1.5208**	**15.9045**	**9.8765**	**0.0205**	**4.5174**	**0.7304**	**5.2478**	**2.4828**	**0.6720**	**3.1548**		**1,989.2199**	**1,989.2199**	**0.6434**		**2,005.3038**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0762	2.6564	0.5623	8.0500e-003	0.1835	8.2300e-003	0.1917	0.0503	7.8800e-003	0.0582		871.0165	871.0165	0.0581		872.4693
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0422	0.0274	0.3767	1.1100e-003	0.1118	8.2000e-004	0.1126	0.0296	7.6000e-004	0.0304		110.7403	110.7403	2.9800e-003		110.8148
Total	**0.1240**	**2.8745**	**0.9843**	**9.6700e-003**	**0.3081**	**9.4300e-003**	**0.3175**	**0.0836**	**9.0100e-003**	**0.0926**		**1,036.2446**	**1,036.2446**	**0.0644**		**1,037.8542**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.0328	0.0000	2.0328	1.1173	0.0000	1.1173			0.0000			0.0000
Off-Road	1.5208	15.9045	9.8765	0.0205		0.7304	0.7304		0.6720	0.6720	0.0000	1,989.2199	1,989.2199	0.6434		2,005.3038
Total	**1.5208**	**15.9045**	**9.8765**	**0.0205**	**2.0328**	**0.7304**	**2.7633**	**1.1173**	**0.6720**	**1.7893**	**0.0000**	**1,989.2199**	**1,989.2199**	**0.6434**		**2,005.3038**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0762	2.6564	0.5623	8.0500e-003	0.1835	8.2300e-003	0.1917	0.0503	7.8800e-003	0.0582		871.0165	871.0165	0.0581		872.4693
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0422	0.0274	0.3767	1.1100e-003	0.1118	8.2000e-004	0.1126	0.0296	7.6000e-004	0.0304		110.7403	110.7403	2.9800e-003		110.8148
Total	**0.1240**	**2.8745**	**0.9843**	**9.6700e-003**	**0.3081**	**9.4300e-003**	**0.3175**	**0.0836**	**9.0100e-003**	**0.0926**		**1,036.2446**	**1,036.2446**	**0.0644**		**1,037.8542**

3.5 Area 2: Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Off-Road	2.0285	15.6192	14.5253	0.0236		0.8276	0.8276		0.7803	0.7803		2,144.7931	2,144.7931	0.5623		2,158.8511
Total	**2.0285**	**15.6192**	**14.5253**	**0.0236**		**0.8276**	**0.8276**		**0.7803**	**0.7803**		**2,144.7931**	**2,144.7931**	**0.5623**		**2,158.8511**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.1098	0.0712	0.9795	2.8900e-003	0.2906	2.1400e-003	0.2928	0.0771	1.9700e-003	0.0790		287.9249	287.9249	7.7400e-003		288.1184

Total	**0.1153**	**0.2619**	**1.0248**	**3.4000e-003**	**0.3034**	**2.5200e-003**	**0.3059**	**0.0808**	**2.3400e-003**	**0.0831**		**342.4126**	**342.4126**	**0.0110**		**342.6885**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0285	15.6192	14.5253	0.0236		0.8276	0.8276		0.7803	0.7803	0.0000	2,144.7931	2,144.7931	0.5623		2,158.8510
Total	**2.0285**	**15.6192**	**14.5253**	**0.0236**		**0.8276**	**0.8276**		**0.7803**	**0.7803**	**0.0000**	**2,144.7931**	**2,144.7931**	**0.5623**		**2,158.8510**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.1098	0.0712	0.9795	2.8900e-003	0.2906	2.1400e-003	0.2928	0.0771	1.9700e-003	0.0790		287.9249	287.9249	7.7400e-003		288.1184
Total	**0.1153**	**0.2619**	**1.0248**	**3.4000e-003**	**0.3034**	**2.5200e-003**	**0.3059**	**0.0808**	**2.3400e-003**	**0.0831**		**342.4126**	**342.4126**	**0.0110**		**342.6885**

3.6 Area 2: Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8576	8.2990	9.3102	0.0146		0.4389	0.4389		0.4065	0.4065		1,370.4358	1,370.4358	0.4186		1,380.9012
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8576**	**8.2990**	**9.3102**	**0.0146**		**0.4389**	**0.4389**		**0.4065**	**0.4065**		**1,370.4358**	**1,370.4358**	**0.4186**		**1,380.9012**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0760	0.0493	0.6781	2.0000e-003	0.2012	1.4800e-003	0.2027	0.0534	1.3600e-003	0.0547		199.3326	199.3326	5.3600e-003		199.4666
Total	**0.0816**	**0.2400**	**0.7234**	**2.5100e-003**	**0.2140**	**1.8600e-003**	**0.2159**	**0.0571**	**1.7300e-003**	**0.0588**		**253.8203**	**253.8203**	**8.6600e-003**		**254.0367**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	0.8576	8.2990	9.3102	0.0146		0.4389	0.4389		0.4065	0.4065	0.0000	1,370.4358	1,370.4358	0.4186		1,380.9012
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8576**	**8.2990**	**9.3102**	**0.0146**		**0.4389**	**0.4389**		**0.4065**	**0.4065**	**0.0000**	**1,370.4358**	**1,370.4358**	**0.4186**		**1,380.9012**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5700e-003	0.1908	0.0453	5.1000e-004	0.0128	3.8000e-004	0.0132	3.6900e-003	3.7000e-004	4.0500e-003		54.4877	54.4877	3.3000e-003		54.5701
Worker	0.0760	0.0493	0.6781	2.0000e-003	0.2012	1.4800e-003	0.2027	0.0534	1.3600e-003	0.0547		199.3326	199.3326	5.3600e-003		199.4666
Total	**0.0816**	**0.2400**	**0.7234**	**2.5100e-003**	**0.2140**	**1.8600e-003**	**0.2159**	**0.0571**	**1.7300e-003**	**0.0588**		**253.8203**	**253.8203**	**8.6600e-003**		**254.0367**

3.7 Area 3: Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					5.2693	0.0000	5.2693	2.8965	0.0000	2.8965			0.0000			0.0000
Off-Road	0.8972	9.3701	5.3722	0.0106		0.4553	0.4553		0.4189	0.4189		1,024.8949	1,024.8949	0.3315		1,033.1817
Total	**0.8972**	**9.3701**	**5.3722**	**0.0106**	**5.2693**	**0.4553**	**5.7246**	**2.8965**	**0.4189**	**3.3153**		**1,024.8949**	**1,024.8949**	**0.3315**		**1,033.1817**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0198	0.0124	0.1742	5.4000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		53.3862	53.3862	1.3500e-003		53.4198
Total	**0.0250**	**0.1934**	**0.2170**	**1.0500e-003**	**0.0687**	**7.3000e-004**	**0.0694**	**0.0185**	**6.9000e-004**	**0.0192**		**107.3980**	**107.3980**	**4.5200e-003**		**107.5110**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.3712	0.0000	2.3712	1.3034	0.0000	1.3034			0.0000			0.0000
Off-Road	0.8972	9.3701	5.3722	0.0106		0.4553	0.4553		0.4189	0.4189	0.0000	1,024.8949	1,024.8949	0.3315		1,033.1817
Total	**0.8972**	**9.3701**	**5.3722**	**0.0106**	**2.3712**	**0.4553**	**2.8265**	**1.3034**	**0.4189**	**1.7223**	**0.0000**	**1,024.8949**	**1,024.8949**	**0.3315**		**1,033.1817**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0198	0.0124	0.1742	5.4000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		53.3862	53.3862	1.3500e-003		53.4198
Total	**0.0250**	**0.1934**	**0.2170**	**1.0500e-003**	**0.0687**	**7.3000e-004**	**0.0694**	**0.0185**	**6.9000e-004**	**0.0192**		**107.3980**	**107.3980**	**4.5200e-003**		**107.5110**

3.8 Area 3: Demolition - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Off-Road	0.8518	7.8281	10.3785	0.0156		0.4205	0.4205		0.3989	0.3989		1,496.3815	1,496.3815	0.3246		1,504.4967
Total	**0.8518**	**7.8281**	**10.3785**	**0.0156**		**0.4205**	**0.4205**		**0.3989**	**0.3989**		**1,496.3815**	**1,496.3815**	**0.3246**		**1,504.4967**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Hauling	0.0978	3.3194	0.7518	0.0107	0.2481	9.5700e-003	0.2577	0.0680	9.1600e-003	0.0772		1,164.0520	1,164.0520	0.0772		1,165.9811
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0396	0.0247	0.3484	1.0700e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		106.7724	106.7724	2.6900e-003		106.8397

Total	**0.1427**	**3.5252**	**1.1429**	**0.0123**	**0.3727**	**0.0107**	**0.3834**	**0.1013**	**0.0102**	**0.1115**		**1,324.8362**	**1,324.8362**	**0.0830**		**1,326.9120**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8518	7.8281	10.3785	0.0156		0.4205	0.4205		0.3989	0.3989	0.0000	1,496.3815	1,496.3815	0.3246		1,504.4967
Total	**0.8518**	**7.8281**	**10.3785**	**0.0156**		**0.4205**	**0.4205**		**0.3989**	**0.3989**	**0.0000**	**1,496.3815**	**1,496.3815**	**0.3246**		**1,504.4967**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0978	3.3194	0.7518	0.0107	0.2481	9.5700e-003	0.2577	0.0680	9.1600e-003	0.0772		1,164.0520	1,164.0520	0.0772		1,165.9811
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0396	0.0247	0.3484	1.0700e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		106.7724	106.7724	2.6900e-003		106.8397
Total	**0.1427**	**3.5252**	**1.1429**	**0.0123**	**0.3727**	**0.0107**	**0.3834**	**0.1013**	**0.0102**	**0.1115**		**1,324.8362**	**1,324.8362**	**0.0830**		**1,326.9120**

3.9 Area 3: Grading/Excavation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.5166	0.0000	4.5166	2.4827	0.0000	2.4827			0.0000			0.0000
Off-Road	1.4393	14.9015	10.1962	0.0216		0.6924	0.6924		0.6370	0.6370		2,087.8562	2,087.8562	0.6753		2,104.7375
Total	**1.4393**	**14.9015**	**10.1962**	**0.0216**	**4.5166**	**0.6924**	**5.2090**	**2.4827**	**0.6370**	**3.1197**		**2,087.8562**	**2,087.8562**	**0.6753**		**2,104.7375**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3270	11.0942	2.5127	0.0359	0.8293	0.0320	0.8613	0.2273	0.0306	0.2579		3,890.5570	3,890.5570	0.2579		3,897.0045
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0396	0.0247	0.3484	1.0700e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		106.7724	106.7724	2.6900e-003		106.8397
Total	**0.3718**	**11.3000**	**2.9038**	**0.0375**	**0.9539**	**0.0331**	**0.9870**	**0.2606**	**0.0317**	**0.2923**		**4,051.3412**	**4,051.3412**	**0.2638**		**4,057.9353**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Fugitive Dust					2.0325	0.0000	2.0325	1.1172	0.0000	1.1172			0.0000			0.0000
Off-Road	1.4393	14.9015	10.1962	0.0216		0.6924	0.6924		0.6370	0.6370	0.0000	2,087.8562	2,087.8562	0.6753		2,104.7375
Total	**1.4393**	**14.9015**	**10.1962**	**0.0216**	**2.0325**	**0.6924**	**2.7249**	**1.1172**	**0.6370**	**1.7542**	**0.0000**	**2,087.8562**	**2,087.8562**	**0.6753**		**2,104.7375**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3270	11.0942	2.5127	0.0359	0.8293	0.0320	0.8613	0.2273	0.0306	0.2579		3,890.5570	3,890.5570	0.2579		3,897.0045
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0396	0.0247	0.3484	1.0700e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		106.7724	106.7724	2.6900e-003		106.8397
Total	**0.3718**	**11.3000**	**2.9038**	**0.0375**	**0.9539**	**0.0331**	**0.9870**	**0.2606**	**0.0317**	**0.2923**		**4,051.3412**	**4,051.3412**	**0.2638**		**4,057.9353**

3.10 Area 2: Dewatering - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5303	0.0000	0.5303	0.0573	0.0000	0.0573			0.0000			0.0000
Off-Road	1.2063	10.4941	12.2798	0.0207		0.5875	0.5875		0.5786	0.5786		1,969.7456	1,969.7456	0.1884		1,974.4544
Total	**1.2063**	**10.4941**	**12.2798**	**0.0207**	**0.5303**	**0.5875**	**1.1178**	**0.0573**	**0.5786**	**0.6358**		**1,969.7456**	**1,969.7456**	**0.1884**		**1,974.4544**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0211	0.0137	0.1884	5.6000e-004	0.0559	4.1000e-004	0.0563	0.0148	3.8000e-004	0.0152		55.3702	55.3702	1.4900e-003		55.4074
Total	**0.0211**	**0.0137**	**0.1884**	**5.6000e-004**	**0.0559**	**4.1000e-004**	**0.0563**	**0.0148**	**3.8000e-004**	**0.0152**		**55.3702**	**55.3702**	**1.4900e-003**		**55.4074**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2386	0.0000	0.2386	0.0258	0.0000	0.0258			0.0000			0.0000
Off-Road	1.2063	10.4941	12.2798	0.0207		0.5875	0.5875		0.5786	0.5786	0.0000	1,969.7456	1,969.7456	0.1884		1,974.4544
Total	**1.2063**	**10.4941**	**12.2798**	**0.0207**	**0.2386**	**0.5875**	**0.8261**	**0.0258**	**0.5786**	**0.6043**	**0.0000**	**1,969.7456**	**1,969.7456**	**0.1884**		**1,974.4544**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0211	0.0137	0.1884	5.6000e-004	0.0559	4.1000e-004	0.0563	0.0148	3.8000e-004	0.0152		55.3702	55.3702	1.4900e-003		55.4074
Total	**0.0211**	**0.0137**	**0.1884**	**5.6000e-004**	**0.0559**	**4.1000e-004**	**0.0563**	**0.0148**	**3.8000e-004**	**0.0152**		**55.3702**	**55.3702**	**1.4900e-003**		**55.4074**

3.11 Area 3: Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Off-Road	0.8185	8.1144	7.6390	0.0144		0.3972	0.3972		0.3772	0.3772		1,379.1097	1,379.1097	0.2741		1,385.9629
Total	**0.8185**	**8.1144**	**7.6390**	**0.0144**		**0.3972**	**0.3972**		**0.3772**	**0.3772**		**1,379.1097**	**1,379.1097**	**0.2741**		**1,385.9629**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.1030	0.0643	0.9057	2.7900e-003	0.2906	2.0800e-003	0.2927	0.0771	1.9100e-003	0.0790		277.6082	277.6082	7.0000e-003		277.7832

Total	**0.1082**	**0.2454**	**0.9485**	**3.3000e-003**	**0.3034**	**2.4100e-003**	**0.3058**	**0.0808**	**2.2300e-003**	**0.0830**		**331.6200**	**331.6200**	**0.0102**		**331.8743**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8185	8.1144	7.6390	0.0144		0.3972	0.3972		0.3772	0.3772	0.0000	1,379.1097	1,379.1097	0.2741		1,385.9629
Total	**0.8185**	**8.1144**	**7.6390**	**0.0144**		**0.3972**	**0.3972**		**0.3772**	**0.3772**	**0.0000**	**1,379.1097**	**1,379.1097**	**0.2741**		**1,385.9629**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.1030	0.0643	0.9057	2.7900e-003	0.2906	2.0800e-003	0.2927	0.0771	1.9100e-003	0.0790		277.6082	277.6082	7.0000e-003		277.7832
Total	**0.1082**	**0.2454**	**0.9485**	**3.3000e-003**	**0.3034**	**2.4100e-003**	**0.3058**	**0.0808**	**2.2300e-003**	**0.0830**		**331.6200**	**331.6200**	**0.0102**		**331.8743**

3.12 Area 3: Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1027	12.0314	10.5278	0.0202		0.5147	0.5147		0.4743	0.4743		1,938.6578	1,938.6578	0.6187		1,954.1248
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1027**	**12.0314**	**10.5278**	**0.0202**		**0.5147**	**0.5147**		**0.4743**	**0.4743**		**1,938.6578**	**1,938.6578**	**0.6187**		**1,954.1248**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0594	0.0371	0.5225	1.6100e-003	0.1677	1.2000e-003	0.1689	0.0445	1.1000e-003	0.0456		160.1586	160.1586	4.0400e-003		160.2595
Total	**0.0646**	**0.2182**	**0.5653**	**2.1200e-003**	**0.1805**	**1.5300e-003**	**0.1820**	**0.0482**	**1.4200e-003**	**0.0496**		**214.1704**	**214.1704**	**7.2100e-003**		**214.3507**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	1.1027	12.0314	10.5278	0.0202		0.5147	0.5147		0.4743	0.4743	0.0000	1,938.6578	1,938.6578	0.6187		1,954.1248
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1027**	**12.0314**	**10.5278**	**0.0202**		**0.5147**	**0.5147**		**0.4743**	**0.4743**	**0.0000**	**1,938.6578**	**1,938.6578**	**0.6187**		**1,954.1248**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.2200e-003	0.1811	0.0428	5.1000e-004	0.0128	3.3000e-004	0.0131	3.6900e-003	3.2000e-004	4.0000e-003		54.0118	54.0118	3.1700e-003		54.0912
Worker	0.0594	0.0371	0.5225	1.6100e-003	0.1677	1.2000e-003	0.1689	0.0445	1.1000e-003	0.0456		160.1586	160.1586	4.0400e-003		160.2595
Total	**0.0646**	**0.2182**	**0.5653**	**2.1200e-003**	**0.1805**	**1.5300e-003**	**0.1820**	**0.0482**	**1.4200e-003**	**0.0496**		**214.1704**	**214.1704**	**7.2100e-003**		**214.3507**

3.13 Area 3: Architectural Coating - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	3.3919					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817		281.4481	281.4481	0.0183		281.9062
Total	**3.5964**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**		**281.4481**	**281.4481**	**0.0183**		**281.9062**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0198	0.0124	0.1742	5.4000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		53.3862	53.3862	1.3500e-003		53.4198
Total	**0.0198**	**0.0124**	**0.1742**	**5.4000e-004**	**0.0559**	**4.0000e-004**	**0.0563**	**0.0148**	**3.7000e-004**	**0.0152**		**53.3862**	**53.3862**	**1.3500e-003**		**53.4198**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	3.3919					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817	0.0000	281.4481	281.4481	0.0183		281.9062
Total	**3.5964**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**	**0.0000**	**281.4481**	**281.4481**	**0.0183**		**281.9062**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0198	0.0124	0.1742	5.4000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		53.3862	53.3862	1.3500e-003		53.4198
Total	**0.0198**	**0.0124**	**0.1742**	**5.4000e-004**	**0.0559**	**4.0000e-004**	**0.0563**	**0.0148**	**3.7000e-004**	**0.0152**		**53.3862**	**53.3862**	**1.3500e-003**		**53.4198**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.549559	0.042893	0.201564	0.118533	0.015569	0.005846	0.021394	0.034255	0.002099	0.001828	0.004855	0.000709	0.000896

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					

Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Unmitigated	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0216					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**		**3.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0216					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**		**3.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Arroyo Seco

South Coast AQMD Air District, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Non-Asphalt Surfaces	1.40	Acre	1.40	60,984.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	31
Climate Zone	12			**Operational Year**	2022
Utility Company	Pasadena Water & Power				
CO2 Intensity (lb/MWhr)	1664.14	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CalEEMod Defaults.

Land Use - CalEEMod Defaults.

Construction Phase - Construction schedule information provided by project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Trips and VMT - Construction Trip information provided by the project applicant.

Grading - Export of 11,000 CY and import of 37,000 CY

Construction Off-road Equipment Mitigation - Compliance with SCAQMD Rule 403

Off-road Equipment - Construction equipment information provided by the project applicant.

Off-road Equipment - Construction equipment information provided by the project applicant.

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	FuelType	Diesel	CNG
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstructionPhase	NumDays	10.00	5.00
tblConstructionPhase	NumDays	200.00	36.00
tblConstructionPhase	NumDays	200.00	45.00
tblConstructionPhase	NumDays	20.00	5.00
tblConstructionPhase	NumDays	20.00	10.00
tblConstructionPhase	NumDays	4.00	40.00
tblConstructionPhase	NumDays	4.00	100.00
tblConstructionPhase	NumDays	10.00	45.00
tblConstructionPhase	NumDays	10.00	5.00
tblConstructionPhase	NumDays	2.00	6.00
tblConstructionPhase	NumDays	2.00	5.00
tblConstructionPhase	NumDays	2.00	40.00
tblGrading	AcresOfGrading	0.00	20.00
tblGrading	MaterialExported	0.00	290.00
tblGrading	MaterialExported	0.00	11,000.00
tblGrading	MaterialImported	0.00	37,000.00
tblOffRoadEquipment	HorsePower	84.00	75.00
tblOffRoadEquipment	OffRoadEquipmentType		Pumps
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	3.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	6.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	7.00	0.00
tblTripsAndVMT	HaulingTripNumber	0.00	14.00
tblTripsAndVMT	HaulingTripNumber	0.00	64.00
tblTripsAndVMT	HaulingTripNumber	36.00	420.00
tblTripsAndVMT	HaulingTripNumber	0.00	142.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	10.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	0.00	2.00
tblTripsAndVMT	VendorTripNumber	10.00	2.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	5.0348	45.2089	38.7745	0.0780	6.5287	2.1580	7.8849	3.0643	2.0427	4.7619	0.0000	7,489.1076	7,489.1076	1.7105	0.0000	7,525.9338
2022	3.6181	26.3219	19.5437	0.0583	5.4704	0.9158	6.1965	2.9150	0.8552	3.4124	0.0000	6,058.1314	6,058.1314	0.9496	0.0000	6,081.8721
Maximum	**5.0348**	**45.2089**	**38.7745**	**0.0780**	**6.5287**	**2.1580**	**7.8849**	**3.0643**	**2.0427**	**4.7619**	**0.0000**	**7,489.1076**	**7,489.1076**	**1.7105**	**0.0000**	**7,525.9338**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	5.0348	45.2089	38.7745	0.0780	3.0473	2.1580	5.0968	1.4083	2.0427	3.3649	0.0000	7,489.1076	7,489.1076	1.7105	0.0000	7,525.9338
2022	3.6181	26.3219	19.5437	0.0583	2.9863	0.9158	3.7124	1.3778	0.8552	2.0470	0.0000	6,058.1314	6,058.1314	0.9496	0.0000	6,081.8721
Maximum	**5.0348**	**45.2089**	**38.7745**	**0.0780**	**3.0473**	**2.1580**	**5.0968**	**1.4083**	**2.0427**	**3.3649**	**0.0000**	**7,489.1076**	**7,489.1076**	**1.7105**	**0.0000**	**7,525.9338**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**49.72**	**0.00**	**37.44**	**53.40**	**0.00**	**33.79**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**	**0.0000**	**3.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**	**0.0000**	**3.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Area 2: Site Preparation	Site Preparation	8/2/2021	8/9/2021	5	6	
2	Area 2: Demolition	Demolition	8/10/2021	8/16/2021	5	5	
3	Area 2: Grading/Excavation	Grading	8/17/2021	10/11/2021	5	40	
4	Area 2: Building Construction	Building Construction	8/23/2021	10/11/2021	5	36	
5	Area 2: Paving	Paving	10/11/2021	10/15/2021	5	5	
6	Area 3: Site Preparation	Site Preparation	3/21/2022	3/25/2022	5	5	
7	Area 3: Demolition	Demolition	3/28/2022	4/8/2022	5	10	
8	Area 3: Grading/Excavation	Grading	4/11/2022	8/26/2022	5	100	
9	Area 2: Dewatering	Site Preparation	8/2/2021	9/24/2021	5	40	
10	Area 3: Building Construction	Building Construction	8/27/2022	10/28/2022	5	45	
11	Area 3: Paving	Paving	8/29/2022	10/28/2022	5	45	
12	Area 3: Architectural Coating	Architectural Coating	10/29/2022	11/4/2022	5	5	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 1.4

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 3,659

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Area 2: Site Preparation	Graders	1	8.00	187	0.41
Area 2: Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Area 2: Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 2: Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Area 2: Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Area 2: Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Area 2: Grading/Excavation	Excavators	1	8.00	158	0.38
Area 2: Grading/Excavation	Graders	0	0.00	187	0.41

Area 2: Grading/Excavation	Rubber Tired Dozers	1	6.00	247	0.40
Area 2: Grading/Excavation	Rubber Tired Loaders	1	8.00	203	0.36
Area 2: Grading/Excavation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Area 2: Building Construction	Cement and Mortar Mixers	1	8.00	9	0.56
Area 2: Building Construction	Cranes	1	6.00	231	0.29
Area 2: Building Construction	Excavators	1	8.00	158	0.38
Area 2: Building Construction	Forklifts	0	0.00	89	0.20
Area 2: Building Construction	Generator Sets	1	0.00	84	0.74
Area 2: Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Area 2: Building Construction	Trenchers	1	8.00	78	0.50
Area 2: Building Construction	Welders	3	8.00	46	0.45
Area 2: Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Area 2: Paving	Pavers	1	6.00	130	0.42
Area 2: Paving	Paving Equipment	1	8.00	132	0.36
Area 2: Paving	Plate Compactors	1	8.00	8	0.43
Area 2: Paving	Pressure Washers	1	8.00	13	0.30
Area 2: Paving	Rollers	1	7.00	80	0.38
Area 2: Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Site Preparation	Graders	0	0.00	187	0.41
Area 3: Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Area 3: Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Area 3: Demolition	Rubber Tired Dozers	0	0.00	247	0.40
Area 3: Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Area 3: Grading/Excavation	Graders	0	0.00	187	0.41
Area 3: Grading/Excavation	Other Construction Equipment	1	8.00	172	0.42
Area 3: Grading/Excavation	Rubber Tired Dozers	1	6.00	247	0.40
Area 3: Grading/Excavation	Rubber Tired Loaders	1	8.00	203	0.36
Area 3: Grading/Excavation	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Area 3: Building Construction	Cranes	1	6.00	231	0.29

Area 3: Building Construction	Forklifts	1	6.00	89	0.20
Area 3: Building Construction	Generator Sets	1	8.00	84	0.74
Area 3: Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Area 3: Building Construction	Welders	0	0.00	46	0.45
Area 3: Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Area 3: Paving	Graders	1	8.00	187	0.41
Area 3: Paving	Pavers	1	6.00	130	0.42
Area 3: Paving	Paving Equipment	1	8.00	132	0.36
Area 3: Paving	Rollers	1	7.00	80	0.38
Area 3: Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 3: Architectural Coating	Air Compressors	1	6.00	78	0.48
Area 2: Dewatering	Graders	0	0.00	187	0.41
Area 2: Dewatering	Rubber Tired Dozers	0	0.00	247	0.40
Area 2: Dewatering	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Area 2: Dewatering	Pumps	1	24.00	75	0.74

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Area 2: Site Preparation	3	8.00	2.00	14.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Demolition	5	13.00	2.00	64.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Grading/Excavation	4	10.00	2.00	420.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Building Construction	9	26.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 2: Paving	7	18.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Site Preparation	2	5.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Demolition	4	10.00	2.00	142.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Grading/Excavation	4	10.00	2.00	4,746.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Building Construction	4	26.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Paving	6	15.00	2.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Area 3: Architectural Coating	1	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

Area 2: Dewatering		2	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix		HDT_Mix		HHDT			

3.1 Mitigation Measures Construction

Use Alternative Fuel for Construction Equipment

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Area 2: Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					5.7996	0.0000	5.7996	2.9537	0.0000	2.9537			0.0000			0.0000
Off-Road	1.5558	17.4203	7.5605	0.0172		0.7654	0.7654		0.7041	0.7041		1,666.5174	1,666.5174	0.5390		1,679.9920
Total	**1.5558**	**17.4203**	**7.5605**	**0.0172**	**5.7996**	**0.7654**	**6.5650**	**2.9537**	**0.7041**	**3.6578**		**1,666.5174**	**1,666.5174**	**0.5390**		**1,679.9920**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0174	0.5973	0.1341	1.7600e-003	0.0408	1.8600e-003	0.0426	0.0112	1.7800e-003	0.0130		189.9789	189.9789	0.0135		190.3154
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0369	0.0240	0.2708	8.3000e-004	0.0894	6.6000e-004	0.0901	0.0237	6.1000e-004	0.0243		82.8534	82.8534	2.2200e-003		82.9089

Total	**0.0602**	**0.8115**	**0.4556**	**3.0900e-003**	**0.1430**	**2.9200e-003**	**0.1459**	**0.0386**	**2.7700e-003**	**0.0413**		**325.7424**	**325.7424**	**0.0192**		**326.2229**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.6098	0.0000	2.6098	1.3292	0.0000	1.3292			0.0000			0.0000
Off-Road	1.5558	17.4203	7.5605	0.0172		0.7654	0.7654		0.7041	0.7041	0.0000	1,666.5174	1,666.5174	0.5390		1,679.9920
Total	**1.5558**	**17.4203**	**7.5605**	**0.0172**	**2.6098**	**0.7654**	**3.3752**	**1.3292**	**0.7041**	**2.0333**	**0.0000**	**1,666.5174**	**1,666.5174**	**0.5390**		**1,679.9920**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0174	0.5973	0.1341	1.7600e-003	0.0408	1.8600e-003	0.0426	0.0112	1.7800e-003	0.0130		189.9789	189.9789	0.0135		190.3154
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0369	0.0240	0.2708	8.3000e-004	0.0894	6.6000e-004	0.0901	0.0237	6.1000e-004	0.0243		82.8534	82.8534	2.2200e-003		82.9089
Total	**0.0602**	**0.8115**	**0.4556**	**3.0900e-003**	**0.1430**	**2.9200e-003**	**0.1459**	**0.0386**	**2.7700e-003**	**0.0413**		**325.7424**	**325.7424**	**0.0192**		**326.2229**

3.3 Area 2: Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9930	19.6966	14.4925	0.0241		1.0409	1.0409		0.9715	0.9715		2,322.7171	2,322.7171	0.5940		2,337.5658
Total	**1.9930**	**19.6966**	**14.4925**	**0.0241**		**1.0409**	**1.0409**		**0.9715**	**0.9715**		**2,322.7171**	**2,322.7171**	**0.5940**		**2,337.5658**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0955	3.2768	0.7359	9.6300e-003	0.2237	0.0102	0.2339	0.0613	9.7500e-003	0.0710		1,042.1700	1,042.1700	0.0738		1,044.0158
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0600	0.0390	0.4401	1.3500e-003	0.1453	1.0700e-003	0.1464	0.0385	9.9000e-004	0.0395		134.6368	134.6368	3.6100e-003		134.7270
Total	**0.1613**	**3.5059**	**1.2266**	**0.0115**	**0.3818**	**0.0117**	**0.3934**	**0.1035**	**0.0111**	**0.1146**		**1,229.7169**	**1,229.7169**	**0.0810**		**1,231.7413**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	1.9930	19.6966	14.4925	0.0241		1.0409	1.0409		0.9715	0.9715	0.0000	2,322.7171	2,322.7171	0.5940		2,337.5658
Total	**1.9930**	**19.6966**	**14.4925**	**0.0241**		**1.0409**	**1.0409**		**0.9715**	**0.9715**	**0.0000**	**2,322.7171**	**2,322.7171**	**0.5940**		**2,337.5658**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0955	3.2768	0.7359	9.6300e-003	0.2237	0.0102	0.2339	0.0613	9.7500e-003	0.0710		1,042.1700	1,042.1700	0.0738		1,044.0158
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0600	0.0390	0.4401	1.3500e-003	0.1453	1.0700e-003	0.1464	0.0385	9.9000e-004	0.0395		134.6368	134.6368	3.6100e-003		134.7270
Total	**0.1613**	**3.5059**	**1.2266**	**0.0115**	**0.3818**	**0.0117**	**0.3934**	**0.1035**	**0.0111**	**0.1146**		**1,229.7169**	**1,229.7169**	**0.0810**		**1,231.7413**

3.4 Area 2: Grading/Excavation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.5174	0.0000	4.5174	2.4828	0.0000	2.4828			0.0000			0.0000
Off-Road	1.5208	15.9045	9.8765	0.0205		0.7304	0.7304		0.6720	0.6720		1,989.2199	1,989.2199	0.6434		2,005.3038
Total	**1.5208**	**15.9045**	**9.8765**	**0.0205**	**4.5174**	**0.7304**	**5.2478**	**2.4828**	**0.6720**	**3.1548**		**1,989.2199**	**1,989.2199**	**0.6434**		**2,005.3038**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0784	2.6880	0.6036	7.9000e-003	0.1835	8.3600e-003	0.1918	0.0503	8.0000e-003	0.0583		854.9051	854.9051	0.0606		856.4192
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0461	0.0300	0.3385	1.0400e-003	0.1118	8.2000e-004	0.1126	0.0296	7.6000e-004	0.0304		103.5668	103.5668	2.7800e-003		103.6362
Total	**0.1303**	**2.9081**	**0.9928**	**9.4400e-003**	**0.3081**	**9.5800e-003**	**0.3176**	**0.0836**	**9.1400e-003**	**0.0927**		**1,011.3819**	**1,011.3819**	**0.0669**		**1,013.0539**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.0328	0.0000	2.0328	1.1173	0.0000	1.1173			0.0000			0.0000
Off-Road	1.5208	15.9045	9.8765	0.0205		0.7304	0.7304		0.6720	0.6720	0.0000	1,989.2199	1,989.2199	0.6434		2,005.3038
Total	**1.5208**	**15.9045**	**9.8765**	**0.0205**	**2.0328**	**0.7304**	**2.7633**	**1.1173**	**0.6720**	**1.7893**	**0.0000**	**1,989.2199**	**1,989.2199**	**0.6434**		**2,005.3038**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0784	2.6880	0.6036	7.9000e-003	0.1835	8.3600e-003	0.1918	0.0503	8.0000e-003	0.0583		854.9051	854.9051	0.0606		856.4192
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0461	0.0300	0.3385	1.0400e-003	0.1118	8.2000e-004	0.1126	0.0296	7.6000e-004	0.0304		103.5668	103.5668	2.7800e-003		103.6362
Total	**0.1303**	**2.9081**	**0.9928**	**9.4400e-003**	**0.3081**	**9.5800e-003**	**0.3176**	**0.0836**	**9.1400e-003**	**0.0927**		**1,011.3819**	**1,011.3819**	**0.0669**		**1,013.0539**

3.5 Area 2: Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Off-Road	2.0285	15.6192	14.5253	0.0236		0.8276	0.8276		0.7803	0.7803		2,144.7931	2,144.7931	0.5623		2,158.8511
Total	**2.0285**	**15.6192**	**14.5253**	**0.0236**		**0.8276**	**0.8276**		**0.7803**	**0.7803**		**2,144.7931**	**2,144.7931**	**0.5623**		**2,158.8511**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.1199	0.0779	0.8802	2.7000e-003	0.2906	2.1400e-003	0.2928	0.0771	1.9700e-003	0.0790		269.2737	269.2737	7.2200e-003		269.4541

Total	**0.1258**	**0.2681**	**0.9309**	**3.2000e-003**	**0.3034**	**2.5400e-003**	**0.3060**	**0.0808**	**2.3500e-003**	**0.0831**		**322.1837**	**322.1837**	**0.0108**		**322.4526**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.0285	15.6192	14.5253	0.0236		0.8276	0.8276		0.7803	0.7803	0.0000	2,144.7931	2,144.7931	0.5623		2,158.8510
Total	**2.0285**	**15.6192**	**14.5253**	**0.0236**		**0.8276**	**0.8276**		**0.7803**	**0.7803**	**0.0000**	**2,144.7931**	**2,144.7931**	**0.5623**		**2,158.8510**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.1199	0.0779	0.8802	2.7000e-003	0.2906	2.1400e-003	0.2928	0.0771	1.9700e-003	0.0790		269.2737	269.2737	7.2200e-003		269.4541
Total	**0.1258**	**0.2681**	**0.9309**	**3.2000e-003**	**0.3034**	**2.5400e-003**	**0.3060**	**0.0808**	**2.3500e-003**	**0.0831**		**322.1837**	**322.1837**	**0.0108**		**322.4526**

3.6 Area 2: Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8576	8.2990	9.3102	0.0146		0.4389	0.4389		0.4065	0.4065		1,370.4358	1,370.4358	0.4186		1,380.9012
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8576**	**8.2990**	**9.3102**	**0.0146**		**0.4389**	**0.4389**		**0.4065**	**0.4065**		**1,370.4358**	**1,370.4358**	**0.4186**		**1,380.9012**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0830	0.0539	0.6094	1.8700e-003	0.2012	1.4800e-003	0.2027	0.0534	1.3600e-003	0.0547		186.4202	186.4202	5.0000e-003		186.5451
Total	**0.0889**	**0.2441**	**0.6600**	**2.3700e-003**	**0.2140**	**1.8800e-003**	**0.2159**	**0.0571**	**1.7400e-003**	**0.0588**		**239.3303**	**239.3303**	**8.5400e-003**		**239.5437**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	0.8576	8.2990	9.3102	0.0146		0.4389	0.4389		0.4065	0.4065	0.0000	1,370.4358	1,370.4358	0.4186		1,380.9012
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.8576**	**8.2990**	**9.3102**	**0.0146**		**0.4389**	**0.4389**		**0.4065**	**0.4065**	**0.0000**	**1,370.4358**	**1,370.4358**	**0.4186**		**1,380.9012**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.8600e-003	0.1902	0.0507	5.0000e-004	0.0128	4.0000e-004	0.0132	3.6900e-003	3.8000e-004	4.0600e-003		52.9100	52.9100	3.5400e-003		52.9985
Worker	0.0830	0.0539	0.6094	1.8700e-003	0.2012	1.4800e-003	0.2027	0.0534	1.3600e-003	0.0547		186.4202	186.4202	5.0000e-003		186.5451
Total	**0.0889**	**0.2441**	**0.6600**	**2.3700e-003**	**0.2140**	**1.8800e-003**	**0.2159**	**0.0571**	**1.7400e-003**	**0.0588**		**239.3303**	**239.3303**	**8.5400e-003**		**239.5437**

3.7 Area 3: Site Preparation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					5.2693	0.0000	5.2693	2.8965	0.0000	2.8965			0.0000			0.0000
Off-Road	0.8972	9.3701	5.3722	0.0106		0.4553	0.4553		0.4189	0.4189		1,024.8949	1,024.8949	0.3315		1,033.1817
Total	**0.8972**	**9.3701**	**5.3722**	**0.0106**	**5.2693**	**0.4553**	**5.7246**	**2.8965**	**0.4189**	**3.3153**		**1,024.8949**	**1,024.8949**	**0.3315**		**1,033.1817**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0217	0.0135	0.1562	5.0000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		49.9268	49.9268	1.2500e-003		49.9582
Total	**0.0272**	**0.1939**	**0.2041**	**9.9000e-004**	**0.0687**	**7.4000e-004**	**0.0694**	**0.0185**	**7.0000e-004**	**0.0192**		**102.3657**	**102.3657**	**4.6600e-003**		**102.4821**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					2.3712	0.0000	2.3712	1.3034	0.0000	1.3034			0.0000			0.0000
Off-Road	0.8972	9.3701	5.3722	0.0106		0.4553	0.4553		0.4189	0.4189	0.0000	1,024.8949	1,024.8949	0.3315		1,033.1817
Total	**0.8972**	**9.3701**	**5.3722**	**0.0106**	**2.3712**	**0.4553**	**2.8265**	**1.3034**	**0.4189**	**1.7223**	**0.0000**	**1,024.8949**	**1,024.8949**	**0.3315**		**1,033.1817**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0217	0.0135	0.1562	5.0000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		49.9268	49.9268	1.2500e-003		49.9582
Total	**0.0272**	**0.1939**	**0.2041**	**9.9000e-004**	**0.0687**	**7.4000e-004**	**0.0694**	**0.0185**	**7.0000e-004**	**0.0192**		**102.3657**	**102.3657**	**4.6600e-003**		**102.4821**

3.8 Area 3: Demolition - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Off-Road	0.8518	7.8281	10.3785	0.0156		0.4205	0.4205		0.3989	0.3989		1,496.3815	1,496.3815	0.3246		1,504.4967
Total	**0.8518**	**7.8281**	**10.3785**	**0.0156**		**0.4205**	**0.4205**		**0.3989**	**0.3989**		**1,496.3815**	**1,496.3815**	**0.3246**		**1,504.4967**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Hauling	0.1006	3.3549	0.8051	0.0105	0.2481	9.7300e-003	0.2579	0.0680	9.3100e-003	0.0773		1,142.3379	1,142.3379	0.0803		1,144.3460
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0434	0.0271	0.3125	1.0000e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		99.8537	99.8537	2.5100e-003		99.9163

Total	**0.1495**	**3.5623**	**1.1655**	**0.0120**	**0.3727**	**0.0109**	**0.3836**	**0.1013**	**0.0104**	**0.1117**		**1,294.6303**	**1,294.6303**	**0.0862**		**1,296.7863**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8518	7.8281	10.3785	0.0156		0.4205	0.4205		0.3989	0.3989	0.0000	1,496.3815	1,496.3815	0.3246		1,504.4967
Total	**0.8518**	**7.8281**	**10.3785**	**0.0156**		**0.4205**	**0.4205**		**0.3989**	**0.3989**	**0.0000**	**1,496.3815**	**1,496.3815**	**0.3246**		**1,504.4967**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.1006	3.3549	0.8051	0.0105	0.2481	9.7300e-003	0.2579	0.0680	9.3100e-003	0.0773		1,142.3379	1,142.3379	0.0803		1,144.3460
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0434	0.0271	0.3125	1.0000e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		99.8537	99.8537	2.5100e-003		99.9163
Total	**0.1495**	**3.5623**	**1.1655**	**0.0120**	**0.3727**	**0.0109**	**0.3836**	**0.1013**	**0.0104**	**0.1117**		**1,294.6303**	**1,294.6303**	**0.0862**		**1,296.7863**

3.9 Area 3: Grading/Excavation - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					4.5166	0.0000	4.5166	2.4827	0.0000	2.4827			0.0000			0.0000
Off-Road	1.4393	14.9015	10.1962	0.0216		0.6924	0.6924		0.6370	0.6370		2,087.8562	2,087.8562	0.6753		2,104.7375
Total	**1.4393**	**14.9015**	**10.1962**	**0.0216**	**4.5166**	**0.6924**	**5.2090**	**2.4827**	**0.6370**	**3.1197**		**2,087.8562**	**2,087.8562**	**0.6753**		**2,104.7375**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3364	11.2129	2.6908	0.0352	0.8293	0.0325	0.8618	0.2273	0.0311	0.2584		3,817.9827	3,817.9827	0.2685		3,824.6943
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0434	0.0271	0.3125	1.0000e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		99.8537	99.8537	2.5100e-003		99.9163
Total	**0.3853**	**11.4203**	**3.0512**	**0.0367**	**0.9539**	**0.0337**	**0.9875**	**0.2606**	**0.0322**	**0.2928**		**3,970.2752**	**3,970.2752**	**0.2744**		**3,977.1346**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Fugitive Dust					2.0325	0.0000	2.0325	1.1172	0.0000	1.1172			0.0000			0.0000
Off-Road	1.4393	14.9015	10.1962	0.0216		0.6924	0.6924		0.6370	0.6370	0.0000	2,087.8562	2,087.8562	0.6753		2,104.7375
Total	**1.4393**	**14.9015**	**10.1962**	**0.0216**	**2.0325**	**0.6924**	**2.7249**	**1.1172**	**0.6370**	**1.7542**	**0.0000**	**2,087.8562**	**2,087.8562**	**0.6753**		**2,104.7375**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.3364	11.2129	2.6908	0.0352	0.8293	0.0325	0.8618	0.2273	0.0311	0.2584		3,817.9827	3,817.9827	0.2685		3,824.6943
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0434	0.0271	0.3125	1.0000e-003	0.1118	8.0000e-004	0.1126	0.0296	7.4000e-004	0.0304		99.8537	99.8537	2.5100e-003		99.9163
Total	**0.3853**	**11.4203**	**3.0512**	**0.0367**	**0.9539**	**0.0337**	**0.9875**	**0.2606**	**0.0322**	**0.2928**		**3,970.2752**	**3,970.2752**	**0.2744**		**3,977.1346**

3.10 Area 2: Dewatering - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.5303	0.0000	0.5303	0.0573	0.0000	0.0573			0.0000			0.0000
Off-Road	1.2063	10.4941	12.2798	0.0207		0.5875	0.5875		0.5786	0.5786		1,969.7456	1,969.7456	0.1884		1,974.4544
Total	**1.2063**	**10.4941**	**12.2798**	**0.0207**	**0.5303**	**0.5875**	**1.1178**	**0.0573**	**0.5786**	**0.6358**		**1,969.7456**	**1,969.7456**	**0.1884**		**1,974.4544**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0231	0.0150	0.1693	5.2000e-004	0.0559	4.1000e-004	0.0563	0.0148	3.8000e-004	0.0152		51.7834	51.7834	1.3900e-003		51.8181
Total	**0.0231**	**0.0150**	**0.1693**	**5.2000e-004**	**0.0559**	**4.1000e-004**	**0.0563**	**0.0148**	**3.8000e-004**	**0.0152**		**51.7834**	**51.7834**	**1.3900e-003**		**51.8181**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.2386	0.0000	0.2386	0.0258	0.0000	0.0258			0.0000			0.0000
Off-Road	1.2063	10.4941	12.2798	0.0207		0.5875	0.5875		0.5786	0.5786	0.0000	1,969.7456	1,969.7456	0.1884		1,974.4544
Total	**1.2063**	**10.4941**	**12.2798**	**0.0207**	**0.2386**	**0.5875**	**0.8261**	**0.0258**	**0.5786**	**0.6043**	**0.0000**	**1,969.7456**	**1,969.7456**	**0.1884**		**1,974.4544**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0231	0.0150	0.1693	5.2000e-004	0.0559	4.1000e-004	0.0563	0.0148	3.8000e-004	0.0152		51.7834	51.7834	1.3900e-003		51.8181
Total	**0.0231**	**0.0150**	**0.1693**	**5.2000e-004**	**0.0559**	**4.1000e-004**	**0.0563**	**0.0148**	**3.8000e-004**	**0.0152**		**51.7834**	**51.7834**	**1.3900e-003**		**51.8181**

3.11 Area 3: Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Off-Road	0.8185	8.1144	7.6390	0.0144		0.3972	0.3972		0.3772	0.3772		1,379.1097	1,379.1097	0.2741		1,385.9629
Total	**0.8185**	**8.1144**	**7.6390**	**0.0144**		**0.3972**	**0.3972**		**0.3772**	**0.3772**		**1,379.1097**	**1,379.1097**	**0.2741**		**1,385.9629**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.1128	0.0704	0.8124	2.6000e-003	0.2906	2.0800e-003	0.2927	0.0771	1.9100e-003	0.0790		259.6195	259.6195	6.5200e-003		259.7824

Total	**0.1183**	**0.2507**	**0.8603**	**3.0900e-003**	**0.3034**	**2.4200e-003**	**0.3058**	**0.0808**	**2.2400e-003**	**0.0830**		**312.0583**	**312.0583**	**9.9300e-003**		**312.3064**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.8185	8.1144	7.6390	0.0144		0.3972	0.3972		0.3772	0.3772	0.0000	1,379.1097	1,379.1097	0.2741		1,385.9629
Total	**0.8185**	**8.1144**	**7.6390**	**0.0144**		**0.3972**	**0.3972**		**0.3772**	**0.3772**	**0.0000**	**1,379.1097**	**1,379.1097**	**0.2741**		**1,385.9629**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.1128	0.0704	0.8124	2.6000e-003	0.2906	2.0800e-003	0.2927	0.0771	1.9100e-003	0.0790		259.6195	259.6195	6.5200e-003		259.7824
Total	**0.1183**	**0.2507**	**0.8603**	**3.0900e-003**	**0.3034**	**2.4200e-003**	**0.3058**	**0.0808**	**2.2400e-003**	**0.0830**		**312.0583**	**312.0583**	**9.9300e-003**		**312.3064**

3.12 Area 3: Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.1027	12.0314	10.5278	0.0202		0.5147	0.5147		0.4743	0.4743		1,938.6578	1,938.6578	0.6187		1,954.1248
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1027**	**12.0314**	**10.5278**	**0.0202**		**0.5147**	**0.5147**		**0.4743**	**0.4743**		**1,938.6578**	**1,938.6578**	**0.6187**		**1,954.1248**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0651	0.0406	0.4687	1.5000e-003	0.1677	1.2000e-003	0.1689	0.0445	1.1000e-003	0.0456		149.7805	149.7805	3.7600e-003		149.8745
Total	**0.0706**	**0.2209**	**0.5166**	**1.9900e-003**	**0.1805**	**1.5400e-003**	**0.1820**	**0.0482**	**1.4300e-003**	**0.0496**		**202.2193**	**202.2193**	**7.1700e-003**		**202.3985**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Off-Road	1.1027	12.0314	10.5278	0.0202		0.5147	0.5147		0.4743	0.4743	0.0000	1,938.6578	1,938.6578	0.6187		1,954.1248
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.1027**	**12.0314**	**10.5278**	**0.0202**		**0.5147**	**0.5147**		**0.4743**	**0.4743**	**0.0000**	**1,938.6578**	**1,938.6578**	**0.6187**		**1,954.1248**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	5.5000e-003	0.1803	0.0479	4.9000e-004	0.0128	3.4000e-004	0.0131	3.6900e-003	3.3000e-004	4.0100e-003		52.4388	52.4388	3.4100e-003		52.5240
Worker	0.0651	0.0406	0.4687	1.5000e-003	0.1677	1.2000e-003	0.1689	0.0445	1.1000e-003	0.0456		149.7805	149.7805	3.7600e-003		149.8745
Total	**0.0706**	**0.2209**	**0.5166**	**1.9900e-003**	**0.1805**	**1.5400e-003**	**0.1820**	**0.0482**	**1.4300e-003**	**0.0496**		**202.2193**	**202.2193**	**7.1700e-003**		**202.3985**

3.13 Area 3: Architectural Coating - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	3.3919					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817		281.4481	281.4481	0.0183		281.9062
Total	**3.5964**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**		**281.4481**	**281.4481**	**0.0183**		**281.9062**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0217	0.0135	0.1562	5.0000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		49.9268	49.9268	1.2500e-003		49.9582
Total	**0.0217**	**0.0135**	**0.1562**	**5.0000e-004**	**0.0559**	**4.0000e-004**	**0.0563**	**0.0148**	**3.7000e-004**	**0.0152**		**49.9268**	**49.9268**	**1.2500e-003**		**49.9582**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	3.3919					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2045	1.4085	1.8136	2.9700e-003		0.0817	0.0817		0.0817	0.0817	0.0000	281.4481	281.4481	0.0183		281.9062
Total	**3.5964**	**1.4085**	**1.8136**	**2.9700e-003**		**0.0817**	**0.0817**		**0.0817**	**0.0817**	**0.0000**	**281.4481**	**281.4481**	**0.0183**		**281.9062**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0217	0.0135	0.1562	5.0000e-004	0.0559	4.0000e-004	0.0563	0.0148	3.7000e-004	0.0152		49.9268	49.9268	1.2500e-003		49.9582
Total	**0.0217**	**0.0135**	**0.1562**	**5.0000e-004**	**0.0559**	**4.0000e-004**	**0.0563**	**0.0148**	**3.7000e-004**	**0.0152**		**49.9268**	**49.9268**	**1.2500e-003**		**49.9582**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Other Non-Asphalt Surfaces	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Other Non-Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Other Non-Asphalt Surfaces	0.549559	0.042893	0.201564	0.118533	0.015569	0.005846	0.021394	0.034255	0.002099	0.001828	0.004855	0.000709	0.000896

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					

Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Other Non-Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Unmitigated	0.0263	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0216					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**		**3.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	4.6500e-003					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0216					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.4000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		3.1000e-004	3.1000e-004	0.0000		3.3000e-004
Total	**0.0263**	**0.0000**	**1.4000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**3.1000e-004**	**3.1000e-004**	**0.0000**		**3.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Appendix D

Biological Resources Technical Report for the Arroyo Seco Canyon Project Areas 2 and 3, June 2020

ARROYO SECO CANYON PROJECT AREAS 2 AND 3 BIOLOGICAL RESOURCES TECHNICAL REPORT

Prepared for:

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JUNE 2020

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
amsl	above mean sea level
ANF	Angeles Natural Forest
ASCP	Arroyo Seco Canyon Project
BMP	best management practice
BRTR	Biological Resources Technical Report
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cfs	cubic feet per second
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CUP	Conditional Use Permit
EIR	Environmental Impact Report
FESA	federal Endangered Species Act
HCP	Habitat Conservation Plan
HWP	Hahamonga Watershed Park
I	Interstate
IS/MND	Initial Study/Mitigated Negative Declaration
JPL	Jet Propulsion Laboratory
MBTA	Migratory Bird Treaty Act
NCCP	Natural Community Conservation Plan
OHWM	ordinary high-water mark
PWP	Pasadena Water and Power
RWQCB	Regional Water Quality Control Board
SR	State Route
SSC	Species of Special Concern
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1 INTRODUCTION

1.1 Project Summary

Dudek has prepared this Biological Resources Technical Report (BRTR) for Pasadena Water and Power (PWP) in support of the City of Pasadena's (City) Arroyo Seco Canyon Project Areas 2 and 3 (proposed Project or Project). The Project is located in the northwest corner of the City of Pasadena in Los Angeles County, California as shown in Figure 1, Local Vicinity and Regional Location. Figure 1 also depicts the Project's 37.38-acre Study Area, which is defined as the following Project components (Area 2, Area 3, the Gabrielino Trail/Access Road between Area 2 and Area 3, and North Arroyo Boulevard[1] from Ventura Street), a 50-foot buffer around each component, and two staging areas. Figure 1 also identifies the municipal boundaries of the adjacent City of La Cañada Flintridge and the community of Altadena, as well as other nearby properties, including the Jet Propulsion Laboratory (JPL) and the Devil's Gate Reservoir and Dam.

The proposed Project consists of two primary action areas: a diversion dam and intake replacement in Area 2, and the spreading basin expansion in Area 3. These areas are connected by the Gabrielino Trail/Access Road, which serves as a recreational trail and the access road for the City of Pasadena and U.S. Forest Service vehicles heading into and out of the Angeles National Forest (ANF). No improvements are expected to the Gabrielino Trail/Access Road. The North Arroyo Boulevard connects with the Gabrielino Trail/Access Road and is included in the Study Area, as it connects Area 3 to the public road intersection of Ventura Street and Windsor Avenue.

This BRTR has been prepared to evaluate the potential impacts to biological resources pursuant to the California Environmental Quality Act (CEQA). This BRTR documents the vegetation communities, plants, wildlife; existing and potential special-status wildlife and plant species; wildlife movement; and jurisdictional waters within the Study Area. The biological significance of these resources and potential Project-related impacts are evaluated, and mitigation measures are recommended, if needed, to avoid or substantially lessen potentially significant environmental impacts.

This BRTR presents the findings of several biological surveys conducted at the Project site by Dudek, including a general biological reconnaissance survey conducted on April 23, 2019, focused special-status plant surveys conducted in May and July 2019, focused amphibian survey in May 3, 2019, focused special-status bird surveys from April to July 2019, jurisdictional delineation

[1] Also known as "Arroyo Seco Road".

update on July 5, 2019, focused fish survey conducted on October 14, 2019, and protected tree survey conducted on April 2 and 3, 2020.

1.1.1 Project Background

On October 9, 2014, PWP circulated the Arroyo Seco Canyon Project (ASCP) Initial Study/Mitigated Negative Declaration (IS/MND) and associated technical studies, State Clearinghouse Number 2014101022, for a 30-day public review period from October 9, 2014, to November 8, 2014. The PWP was seeking approval of a Conditional Use Permit (CUP) No. 6222 for the ASCP, which involved improvements to three areas, including Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, JPL East Parking Lot. The 2014 IS/MND included the following biological studies to support the analysis of the ASCP:

- Biological Technical Report, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014a)
- Special Status Botanical Surveys for the Arroyo Seco Canyon Project, dated January 20, 2014 (BonTerra Psomas 2014b)
- Native Tree Survey, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014c)
- Jurisdictional Delineation Report, Arroyo Seco Canyon Project, dated May 2014 (BonTerra Psomas 2014d)
- Results of the 2013 Amphibian Surveys for the Arroyo Seco Canyon Project, dated February 4, 2014 (BonTerra Psomas 2014e)
- Results of the 2013 Least Bell's Vireo/Southwestern Willow Flycatcher Survey for the Arroyo Seco Canyon Project Dated September 2013 (BonTerra Consulting 2013)

Figure 2, Study Area Comparison, shows a comparison of the areas studied in 2013 and 2014 documents listed above to the areas studied for this BRTR. As described below, the study areas are different to reflect the direction given through a Court judgement and associated Settlement Agreement related to the environmental review requirements of the proposed Project.

On January 12, 2015, the City's Hearing Officer made findings to approve the ASCP IS/MND for CUP No. 6222. On January 20, 2015, Spirit of the Sage Council, Project Soliton, and Hugh Bowles submitted an appeal of the Hearing Officer's decision to the Board of Zoning Appeals. The Board of Zoning Appeals hearing took place on March 4, 2015, and upheld the Hearing Officer's decision by a unanimous vote. The approval was again appealed to the City Council, and on June 1, 2015, the City Council voted to uphold the Board of Zoning Appeals decision by unanimous vote.

On July 2, 2015, a lawsuit (Court Case No. BS156207) was filed against the City by petitioners Spirit of the Sage Council and Project Soliton challenging the approval of the ASCP. On March 20, 2017, the Los Angeles Superior Court issued its decision and on June 26, 2017, entered a judgment that partially favored the petitioners. The Court found that the elements of the ASCP that related to increased diversions of surface water (i.e., greater taking of stream water from the Arroyo Seco beyond its current withdrawal) were inadequately analyzed under CEQA and required the preparation of an Environmental Impact Report (EIR).

The Court also ruled that the elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP and complied with CEQA. As such, the Court determined that CUP #6222 and its related findings and conditions of approval, and the ASCP IS/MND shall remain intact for these components, (Spirit of the Sage Council v. City of Pasadena 2017) and would be allowed to move forward without any additional environmental review pursuant to CEQA. These components include the following:

- Area 1, Arroyo Seco Headworks: All ASCP elements
- Area 2, Arroyo Seco Intake: Access road improvements and related slope reconstruction and protective riprap elements, except the diversion dam and intake replacement
- Area 3, JPL East Parking Lot: All ASCP elements, except the expansion of four existing spreading basins and the construction of two new spreading basins

As stated above, for Area 2, the demolition and replacement of the diversion dam and intake structure were required to be analyzed in an EIR. For Area 3, components of the ASCP IS/MND that would be allowed to proceed include the parking lot, access road, sedimentation basin, demolition of existing structures and pipelines, new pipelines, new public restroom, new security booth, and associated utility services (water, sewer, power, and communication lines), while the expansion of four existing spreading basins and the construction of two new spreading basins were required to be analyzed in an EIR.

In addition, a Settlement Agreement was negotiated, which stated that the City shall have the right to perform maintenance activities, including tilling and grading of the existing spreading basins to reestablish historical percolation rates and maintenance activities that involve negligible or no expansion of use as described in CEQA Guidelines Section 15301 for a Class 1 Categorical Exemption. The Settlement Agreement further clarified that the City may perform excavation and grading necessary for the temporary bridges as described in the ASCP IS/MND.

In accordance with the terms and provisions of the Writ of Mandate and Judgment, as modified by the Settlement Agreement, the City is preparing an EIR for the proposed Project in accordance with CEQA and the CEQA Guidelines. Because several components of the ASCP were allowed

to proceed without any additional environmental review pursuant to CEQA, the proposed Project boundaries of Area 2 and Area 3 have been refined from those shown in the ASCP IS/MND to reflect the activities subject to review under the EIR, as described below.

1.1.2 Report Format and Approach

This BRTR has been prepared to satisfy the requirements of CEQA and the terms and provisions of the Writ of Mandate and Judgment, as modified by the Settlement Agreement, regarding the biological impacts of Project implementation. As such, the Study Area for this BRTR is defined as Areas 2 and 3 as shown on Figure 1.

It is anticipated that this BRTR, in conjunction with the previous biological studies listed above that supported implementation of certain components of the ASCP (supported by the 2014 IS/MND and associated studies), would support the applications for a Section 404 Permit by the U.S. Army Corps of Engineers (USACE), a Section 1602 Streambed Alteration Agreement by the California Department of Fish and Wildlife (CDFW), and a Section 401 Water Quality Certification by the Los Angeles Regional Water Quality Control Board (RWQCB).

As such, it is anticipated that the future discretionary issuance of regulatory permits will be supported by the 2014 IS/MND and associated biological studies, as well as the 2019 EIR and this BRTR. Therefore, the Least Bell's Vireo/Southwestern Willow Flycatcher Focused Surveys Memorandum (Appendix A), California Red-Legged Frog/Arroyo Toad Survey Memorandum (Appendix B), and Focused Fish Survey Memorandum (Appendix C) are updated survey efforts that include areas of the ASCP that were allowed to proceed under the Settlement Agreement (e.g., Area 1 and portions of Areas 2 and 3), as well as the Study Area of the proposed Project (see Figure 1), to facilitate resource agency review of permit applications for the entirety of the ASCP

1.2 Project Description

1.2.1 Project Location

The Project site is located in the City of Pasadena within the Arroyo Seco Canyon, located in Township 1 North, Range 12 West on the Pasadena, California 7.5-inch U.S. Geologic Survey quadrangle map. The Project site can be accessed via Interstate (I) 210 by exiting Windsor Avenue and traveling northward for approximately 0.8-mile to the intersection of Windsor Avenue and Ventura Street. From this intersection, the City's open area (i.e., the former JPL East Parking Lot) is located approximately 0.3 miles north along Explorer Road, which constitutes the southern boundary of Area 3.

1.2.2 Project Purpose

The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco and currently conveys this water to spreading basins for water pumping credits in the Raymond Basin. The City receives groundwater pumping credit between 60 to 80 percent of the amount of water recharged into the groundwater basin. In the two storm seasons following the 2009 Station Fire, excessive amounts of sediment washed down from the watershed. The debris flows damaged City structures, greatly reducing the City's capacity to divert water for spreading. As a result, PWP proposes to repair and replace damaged facilities in the Upper Arroyo Seco Canyon as a part of the proposed Project. The improvements would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this important local water resource. The proposed Project would implement a multi-benefit approach to the repair and replacement of damaged infrastructure in the Arroyo Seco, with the overall Project objectives to increase the beneficial use of the surface water rights held by the City and to improve biological functions within the Arroyo Seco for both fish protection and through improved opportunities for fish passage.

The Project site consists of two primary areas, as shown on Figure 1: Area 2 (Diversion and Intake Replacement) and Area 3 (Spreading Basin Improvements), which are connected by the Gabrielino Trail/Access Road. The proposed Project would involve construction activity and facility improvements in both areas, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road.

1.2.3 Project Components

1.2.3.1 Area 2: Diversion and Intake Replacement

Area 2 includes approximately 1.4 acres of the Study Area. Figure 3a, Area 2 Existing Conditions, identifies the primary existing structures in Area 2, including the concrete diversion weir and intake structure, and a historic bridge (Bridge No. 3) over the Arroyo Seco. The diversion weir directs water into the intake structure by obstructing the stream flow and creating a small pool of water that flows into the intake. The intake would be operated to divert the City's 25 cfs of water rights, while additional flows beyond 25 cfs would continue downstream. Due to sediment buildup trapped on the upstream side of the weir, the pooling capacity is reduced and the ability to collect water for spreading is limited. When water enters the intake, it is conveyed downstream through a combination of tunnels and pipelines to the PWP's spreading basins. The existing intake/diversion system consists of an approximate 9-foot high reinforced concrete training wall and intake with a trash rack on the east bank of the stream, and a reinforced concrete weir with stop logs in slots.

Under current conditions, the weir crest is approximately 2 feet above the streambed on the downstream side.

Improvements in Area 2 include the demolition and removal of the existing concrete weir and portions of the intake structure and the construction of a new diversion structure that would be operated to divert up to 25 cfs of stream flows into the existing conveyance system. The intake structure would be remodeled with new concrete walls and top deck to accommodate the replacement of a trash rack, gates and flushing line, and also a new screen configuration. An existing concrete slab that previously supported an equipment building located adjacent to the Gabrielino Trail/Access Road would be demolished. A new 106 square foot (11 feet 4 inches by 9 feet 4 inches) intake service building would be constructed to house the electrical and hydraulic controls for the diversion structure. Electric power for the operation of the diversion structure and control equipment enclosure would be supplied by an existing power line at the screen building (southeast of the intake structure). The locations of the proposed facilities and improvements are shown on Figure 3b, Area 2 Conceptual Design Overview.

The proposed new diversion/intake structure would capture flows up to PWP's surface water rights. Similar to existing operations, this would include all flows during small storm events and dry weather flows in the Arroyo Seco. However, the improvements will allow for diversion of flows during large storm events as well. During larger storms when the water is too turbid with suspended sediments (e.g., flows generally above 100 cfs), the stream with its associated sediment load would bypass the diversion/intake structure and continue downstream to Devil's Gate Reservoir. Operation of the weir during high flows would be facilitated by the adjustable height weir or crest gate. At low flows, the gate would start in the 'up' position and as flows increase, the gate would be lowered to maintain a constant water surface level in the diversion pool (a pool created behind the weir to allow for an appropriate water elevation to flow into the diversion intake). When the gate is fully lowered, flows would entirely bypass the diversion structure and carry all flows and sediment downstream.

The new diversion/intake structure would improve biological functions in the Arroyo Seco by allowing for fish passage if future fish populations are established, as well as other aquatic wildlife. The existing weir/diversion structure is a barrier to upstream fish passage due to the elevation drop downstream of the structure. The new diversion structure would be designed for the possibility that some future fish may pass downstream when the diversion is not operating (i.e., the gate is lowered to allow flows to continue downstream without diversion) or when the diversion is operating and flows are high enough to spill over the crest gate. A roughened channel would be constructed downstream of the new diversion structure and operable weir such that upstream passage for future fish populations may occur during periods when the diversion is not operating and flows are adequate to allow for passage. In the current condition, water passes through a trash rack to prevent debris from entering the conveyance system to the spreading basins. In addition to

filtering such debris, the proposed new intake structure would include a fish screening feature to prevent future fish populations from passing into the intake and conveyance system.

1.2.3.2 Area 3: Spreading Basin Improvements

Area 3 includes approximately 23.27 acres of the Study Area and is located approximately 0.3 miles downstream from Area 2. The Area 3 Study Area includes two existing spreading basins (Pasadena Ponds 1 and 2, formerly used as sludge ponds for the Behner Treatment Plant), Spreading Basins Nos. 1 and 2, a portion of Spreading Basin No. 3, the former JPL East Parking Lot removed in 2015 to accommodate the spreading basin expansion, and the adjacent Explorer Road. North Arroyo Boulevard is adjacent to Area 3 and would provide construction vehicle access to Area 2, while Explorer Road will be used to Access Area 3. Figure 4a, Area 3 Existing Conditions, identifies the primary structures and facilities in Area 3.

Improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of stream flows for infiltration into the Raymond Basin. Spreading basins provide an additional means for recharge rather than losing this water to the ocean while allowing PWP to earn groundwater pumping credits for additional local water supply. Various facilities would be demolished, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chain link fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins.

Figure 4b, Conceptual Site Plan, depicts the proposed spreading basin improvements. Stream flows from the existing conveyance system would outlet to the new sedimentation basin or to new spreading Basin E located over the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's open area (i.e., former JPL East Parking Lot). Each new basin would have an access ramp for maintenance. Rock boulders would be placed along the western edge of Explorer Road to separate the roadway from the adjacent basins. With the area's sloping terrain, depths of the basins would range from three feet to seven feet. When spreading water, the water depth in the basins would be approximately 1 foot. All basins would include inlets/outlets with 24-inch interconnection piping. Spillways, pipelines, culverts, and valves would be provided to connect the basins to each other. Basin J would be the last newly constructed basin located entirely within the former JPL East Parking Lot, which would include interconnection piping into the existing Basin 3. Other basins downstream of Basin 3 are not a part of the proposed Project, although Basin 4 may be temporarily impacted during construction.

1.2.3.3 Gabrielino Trail/Access Road

The Gabrielino Trail (i.e., North Arroyo Boulevard) runs generally parallel to the Arroyo Seco and along the eastern side of the former JPL East Parking Lot and serves as a recreation trail for hikers, bikers, and equestrian uses. The portion of the Gabrielino Trail that will be used for access constitutes 11.78 acres. It serves as a maintenance access road that leads to the Behner Water Treatment Plant and into the Arroyo Seco Canyon area to provide access for PWP and the USFS. During construction activities, the Gabrielino Trail/Access Road would provide for vehicular access to and from Area 2, and sometimes Area 3 (Explorer Road will be its primary access road). No changes will be made to the Gabrielino Trail as part of the Project.

1.2.4 Construction Activities

Construction of the Project improvements is anticipated to take approximately 16 months, starting in August 2021 with Project completion expected by January 2023. In the interest of minimizing the export of excavated materials from the Project site, the City may implement a mechanical shaker to sort and sift through excavated soils to separate finer soils from larger rocks, thereby allowing for the beneficial reuse of the materials as engineered fill materials during the construction of the spreading basins. Rock materials may be used on site for decorative/landscaping purposes throughout the Project study area, added to an existing stockpile that has been created by the City in an area along the west bank of the Arroyo for future uses, or may be exported off site.

Construction trucks hauling soils and debris to and from to Irwindale – Durbin Inert Debris Engineered Fill Site are expected to come to the site from I-210 at the Windsor Avenue off-ramp and head north on Windsor Avenue to the intersection with Ventura Street. At this intersection is a fork in the road, one leading to Explorer Road into Area 3 and the other leading to the gated North Arroyo Boulevard, which passes adjacent to residential properties and the Behner Treatment Plant. Near the JPL Bridge over the Arroyo Seco near the northern boundary of Area 3, North Arroyo Boulevard splits and provides access to the Gabrielino Trail/Access Road and to the JPL Bridge/Explorer Road. Construction trucks would use North Arroyo Boulevard to access Area 2 and Explorer Road would be used to access Area 3. From I-210, trucks would head east and then south on I-605; exit at Lower Azusa Road off-ramp; and head east onto Los Angeles Street to enter Irwindale – Durbin Inert Debris Engineered Fill Site. Trucks would come back from the landfill entering the northbound on-ramp of I-605at Los Angeles Street and head north; trucks would then go west on I-210 to Windsor Avenue to Explorer Road and, ultimately, to the site.

1.2.4.1 Staging Areas

The Screen Building adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging. The Screen Building staging area constitutes 0.09 acres of the Study Area and the Behner Treatment Plant Staging Area constitutes 0.84 acres.

1.2.5 Operational Activities

City personnel would continue to provide maintenance of the diversion and intake structures in Area 2 as occurs under existing conditions. When necessary, cleaning of the spreading basins in Area 3 would continue to be accomplished by mechanically scraping the top layer of soil using front-end loaders, graders, or scrapers. Following removal, the surface would be disked or harrowed to loosen any soil compaction caused by cleaning. An estimated 100 truckloads of soil from the existing and proposed spreading basins would have to be disposed of offsite every five years, which is reflective of current maintenance activities. As such, no substantive changes to ongoing operations and/or maintenance activities are anticipated.

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2 REGULATORY SETTING

This chapter outlines the federal, state, and local regulations pertinent to the biological resources located on the Project site.

2.1 Federal

2.1.1 Federal Endangered Species Act

The federal Endangered Species Act (FESA) of 1973 (16 USC 1531 et seq.), as amended, is administered by the U.S. Fish and Wildlife Service (USFWS) for most plant and animal species and by the National Oceanic and Atmospheric Administration National Marine Fisheries Service for certain marine species. This legislation is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species, thus preventing the extinction of plants and wildlife. The FESA defines an endangered species as "any species that is in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as "any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Under FESA, it is unlawful to "take" any listed species, and "take" is defined as, "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

FESA allows for the issuance of incidental take permits for listed species under Section 7, which is generally available for projects that also require other federal agency permits or other approvals, and under Section 10, which provides for the approval of habitat conservation plans on private property without any other federal agency involvement.

2.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC 703 et seq.), as amended, prohibits the intentional take of any migratory bird or any part, nest, or eggs of any such bird. Under the Migratory Bird Treaty Act, "take" is defined as pursuing, hunting, shooting, capturing, collecting, or killing, or attempting to do so. In December 2017, Department of the Interior Principal Deputy Solicitor Jorjani issued a memorandum (M-37050) that interprets the Migratory Bird Treaty Act's "take" prohibition to apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs. Unintentional or accidental take is not prohibited (DOI 2017). Additionally, Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires that any project with federal involvement address impacts of federal actions on

migratory birds with the purpose of promoting conservation of migratory bird populations (66 FR 3853–3856). The Executive Order requires federal agencies to work with USFWS to develop a memorandum of understanding. USFWS reviews actions that might affect these species.

2.1.3 Clean Water Act

The Clean Water Act provides guidance for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Section 401 requires a project operator for a federal license or permit that allows activities resulting in a discharge to waters of the United States to obtain state certification, thereby ensuring that the discharge will comply with provisions of the Clean Water Act. The RWQCBs administer the certification program in California. Section 402 establishes a permitting system for the discharge of any pollutant (except dredged or fill material) into waters of the United States. Section 404 establishes a permit program administered by USACE that regulates the discharge of dredged or fill material into waters of the United States, including wetlands. USACE implementing regulations are found at 33 CFR 320 and 330. Guidelines for implementation are referred to as the Section 404(b)(1) Guidelines, which were developed by the U.S. Environmental Protection Agency in conjunction with USACE (40 CFR 230). The guidelines allow the discharge of dredged or fill material into the aquatic system only if there is no practicable alternative that would have less adverse impacts.

Wetlands and Other Waters of the United States

Aquatic resources, including riparian areas, wetlands, and certain aquatic vegetation communities, are considered sensitive biological resources and can fall under the jurisdiction of several regulatory agencies. USACE exerts jurisdiction over waters of the United States, including all waters that are subject to the ebb and flow of the tide; wetlands and other waters such as lakes, rivers, streams (including intermittent or ephemeral streams), mudflats, sandflats, sloughs, prairie potholes, vernal pools, wet meadows, playa lakes, or natural ponds; and tributaries of the above features.

The extent of waters of the United States is generally defined as that portion that falls within the limits of an ordinary high-water mark (OHWM). Typically, the OHWM corresponds to the water surface elevation of a 2-year flood event (USACE 2008a). In addition, waters of the United States may include wetlands, including swamps, bogs, seasonal wetlands, seeps, marshes, and similar areas, defined by USACE as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3[b]; 40 CFR 230.3[t]). Indicators of three wetland parameters (i.e., hydric soils, hydrophytic vegetation,

and wetlands hydrology), as determined by field investigation, must be present for a site to be classified as a wetland by USACE (USACE 1987).

2.2 State

2.2.1 California Endangered Species Act

The California Endangered Species Act (CESA) (California Fish and Game Code, Section 2050-2068) provides protection and prohibits the take of plant, fish, and wildlife species listed by the State of California. Unlike FESA, under CESA state-listed plants have the same degree of protection as wildlife, but insects and other invertebrates may not be listed. Take is defined similarly to FESA and is prohibited for both listed and candidate species. Take authorization may be obtained by the project applicant from CDFW under CESA Section 2081, which allows take of a listed species for educational, scientific, or management purposes. In this case, private developers consult with CDFW to develop a set of measures and standards for managing the listed species, including full mitigation for impacts, funding of implementation, and monitoring of mitigation measures.

2.2.2 California Fish and Game Code

Fully Protected Species

Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code outline protection for fully protected species of mammals, birds, reptiles, amphibians, and fish. Species that are fully protected by these sections may not be taken or possessed at any time. CDFW cannot issue permits or licenses that authorize the "take" of any fully protected species, except under certain circumstances, such as scientific research and live capture and relocation of such species pursuant to a permit for the protection of livestock. Furthermore, it is the responsibility of the CDFW to maintain viable populations of all native species. Toward that end, the CDFW has designated certain vertebrate species as Species of Special Concern (SSC), because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.

Section 5901

Section 5901 makes it unlawful to construct or maintain any device or contrivance that prevents, impedes, or tends to prevent or impede, the passing of fish up and down stream. Fish are defined in Section 45 as a wild fish, mollusk, crustacean, invertebrate, amphibian, or part, spawn, or ovum of any of those animals.

Section 5937

Section 5937 requires that the owner of any dam shall allow sufficient water at all times to pass through a fishway, or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or exist below the dam. During the minimum flow of water in any river or stream, permission may be granted by the department to the owner of any dam to allow sufficient water to pass through a culvert, waste gate, or over or around the dam, to keep in good condition any fish that may be planted or exist below the dam, when, in the judgment of the department, it is impracticable or detrimental to the owner to pass the water through the fishway.

Section 1602

Under Section 1602 of the California Fish and Game Code, a project operator is required to notify CDFW prior to any project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. Pursuant to the code, a "stream" is defined as a body of water that flows at least periodically, or intermittently, through a bed or channel having banks and supporting fish or other aquatic life. Based on this definition, a watercourse with surface or subsurface flows that supports or has supported riparian vegetation is a stream and is subject to CDFW jurisdiction. Altered or artificial watercourses valuable to fish and wildlife are subject to CDFW jurisdiction. CDFW also has jurisdiction over dry washes that carry water during storm events.

Preliminary notification and project review generally occur during the environmental process. When an existing fish or wildlife resource may be substantially adversely affected, CDFW is required to propose reasonable project changes to protect the resource. These modifications are formalized in a Streambed Alteration Agreement, which becomes part of the plans, specifications, and bid documents for the project.

California Native Plant Protection Act

The Native Plant Protection Act of 1977 (see Section 1900 et seq. of the California Fish and Game Code) directed CDFW to carry out the Legislature's intent to "preserve, protect and enhance rare and endangered plants in this State." The Native Plant Protection Act gave the California Fish and Game Commission the power to designate native plants as "endangered" or "rare" and protect endangered and rare plants from take. CESA expanded on the original Native Plant Protection Act and enhanced legal protection for plants, but the Native Plant Protection Act remains part of the California Fish and Game Code. To align with federal regulations, CESA created the categories of "threatened" and "endangered" species. It converted all "rare" animals into the act as threatened species, but did not do so for rare plants. Thus, there are three listing categories for plants in California: rare, threatened, and endangered. Because rare plants are not included in CESA,

mitigation measures for impacts to rare plants are specified in a formal agreement between CDFW and the project proponent.

Nesting Birds

Section 3503 of the California Fish and Game Code states that it is unlawful to take, possess, or needlessly destroy the nests or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto. Section 3503.5 protects all birds of prey (raptors) and their eggs and nests. Section 3511 states that fully protected birds or parts thereof may not be taken or possessed at any time. Section 3513 states that it is unlawful to take or possess any migratory non-game bird as designated in the MBTA.

2.2.3 California Environmental Quality Act

CEQA requires identification of a project's potentially significant impacts on biological resources and ways that such impacts can be avoided, minimized, or mitigated. The act also provides guidelines and thresholds for use by lead agencies for evaluating the significance of proposed impacts.

CEQA Guidelines Section 15380(b)(1) defines endangered animals or plants as species or subspecies whose "survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors." A rare animal or plant is defined in Section 15380(b)(2) as a species that, although not presently threatened with extinction, exists "in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or … [t]he species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered 'threatened' as that term is used in the federal Endangered Species Act." Additionally, an animal or plant may be presumed to be endangered, rare, or threatened if it meets the criteria for listing, as defined further in CEQA Guidelines Section 15380(c).

CDFW has developed a list of "Special Species" as "a general term that refers to all of the taxa the California Natural Diversity Database (CNDDB) is interested in tracking, regardless of their legal or protection status." This is a broader list than those species that are protected under the FESA, CESA, and other California Fish and Game Code provisions, and includes lists developed by other organizations, including for example the Audubon Watch List Species. Guidance documents prepared by other agencies, including the Bureau of Land Management Sensitive Species and USFWS Birds of Special Concern, are also included on this CDFW Special Species list. Additionally, CDFW has concluded that plant species listed as California Rare Plant Rank (CRPR)

1 and 2 by the California Native Plant Society (CNPS), and potentially some CRPR 3 plants, are covered by CEQA Guidelines Section 15380.

Section IV, Appendix G (Environmental Checklist Form), of the CEQA Guidelines requires an evaluation of impacts to "any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service."

2.2.4 Porter–Cologne Water Quality Control Act

The intent of the Porter–Cologne Water Quality Control Act is to protect water quality and the beneficial uses of water, and it applies to both surface water and groundwater. Under this law, the State Water Resources Control Board develops statewide water quality plans, and the nine RWQCBs develop basin plans that identify beneficial uses, water quality objectives, and implementation plans. The RWQCBs have the primary responsibility to implement the provisions of both statewide and basin plans. Waters regulated under the Porter–Cologne Water Quality Control Act include isolated waters that are no longer regulated by USACE. Developments with impact to jurisdictional waters must demonstrate compliance with the goals of the act by developing stormwater pollution prevention plans, standard urban stormwater mitigation plans, and other measures to obtain an order of Waste Discharge Requirement (or, in cases where a Clean Water Act Section 401 certification is required, a waiver of Waste Discharge Requirement).

2.3 Local

City of Pasadena Trees and Tree Protection Ordinance

For this proposed Project, trees subject to City permit requirements include those defined by municipal code Chapter 8.52.020 (City of Pasadena 2010), as follows:

- "Public tree" means a tree located in a place or area under ownership or control of the city including but without limitation streets, parkways, open space, parkland and including city owned property under the operational control of another entity by virtue of a lease, license, operating or other agreement.

- "Protected tree" means a native, specimen, landmark, landmark-eligible, mature (except for the trees in RS or RM-12 zones), or public tree.

All surveyed trees are located in a City owned property, and therefore meet the definition of a "Public tree", which are considered a "Protected tree" by the City Municipal Code.

Tree replacement ratios are determined based on the size of the tree to be removed (i.e., larger trees require a higher replacement ratio). Tree replacement guidelines as specified in the City Tree Ordinance are as follows:

Trunk Diameter of Removed Tree	Replacement Ratio	Container Replacement Size
8.0–12.9 inches	6:1	15 gallons
	3:1	24-inch box
13.0–18.9 inches	8:1	15 gallons
	4:1	24-inch box
	2:1	36-inch box
19.0–36.9 inches	8:1	24-inch box
	4:1	36-inch box
>37 inches	12:1	24-inch box
	8:1	36-inch box

Source: City of Pasadena 2010

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3 METHODS

Data regarding biological resources present within the Study Area was obtained through a review of pertinent literature, field reconnaissance, habitat assessments, and protocol/focused surveys, which are described in detail in this chapter.

3.1 Literature Review

Prior to conducting the field investigation, a literature review was conducted to evaluate the environmental setting of the Project site and identify potential special-status biological resources that may be found on the site. The following reports that encompass the Project site were reviewed and are referenced, as appropriate, in this BRTR:

- Arroyo Seco Canyon Diversions Biological Impacts Memorandum, dated November 8, 2018 (Psomas 2018)
- Fish and Fish Passage Related to Pasadena Water and Power Department Diversion on Arroyo Seco above Pasadena, dated October 29, 2019 (Swift 2019)
- Draft Basis of Design Report, Arroyo Seco Canyon Project – Intake/Diversion Design, dated May 2020 (Northwest Hydraulics Consultants 2020)
- Biological Technical Report, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014a)
- Special Status Botanical Surveys for the Arroyo Seco Canyon Project, dated January 20, 2014 (BonTerra Psomas 2014b)
- Native Tree Survey, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014c)
- Jurisdictional Delineation Report, Arroyo Seco Canyon Project, dated May 2014 (BonTerra Psomas 2014d)
- Jurisdictional Delineation Report, Arroyo Seco Canyon Project, dated April 2016 (BonTerra Psomas 2016a)
- Results of the 2013 Amphibian Surveys for the Arroyo Seco Canyon Project, dated February 4, 2014 (BonTerra Psomas 2014e)
- Results of the 2013 Least Bell's Vireo/Southwestern Willow Flycatcher Survey for the Arroyo Seco Canyon Project Dated September 2013 (BonTerra Consulting 2013)
- Results of the 2016 Least Bell's Vireo/Southwestern Willow Flycatcher Survey for the Arroyo Seco Canyon Project Dated August 2016 (BonTerra Psomas 2016b)

The following reports prepared for adjacent projects were also reviewed:

- Biological Technical Report for the Devil's Gate Reservoir Project Site in the City of Pasadena, Los Angeles County, California, dated November 2010, and appendices (Chambers Group 2010a)
- IS/MND for Berkshire Creek Area Improvements, dated May 2019 (Psomas 2019a)
- Upper Arroyo Seco Habitat Enhancement Plan, dated July 2019 (Psomas 2019b)

The following online databases and applications were queried:

- CNDDB (CDFW 2019a, 2019b)
- CNPS Inventory of Rare and Endangered Vascular Plants (CNPS 2019a)
- Calflora's What Grow Here (Calflora 2019)
- Biogeographic Information and Observation System (CDFW 2019d)
- USFWS Species Occurrence Data (USFWS 2019a)
- Information for Planning and Consultation (IPaC) occurrence data (USFWS 2019b)
- eBird's online database of bird distribution and abundance (eBird 2019)
- Critical Habitat online viewer (USFWS 2019c)
- Los Angeles County GIS Viewer (County of Los Angeles 2019)
- Historic aerials and topographic maps (Google Maps 2019; NETR 2019; USGS 2019)
- Wetland Mapper online viewer (USFWS 2019d)
- U.S. Department of Agriculture's Web Soil Survey (USDA 2019a)

The CNDDB and the CNPS Inventory were queried based on the U.S. Geological Survey (USGS) 7.5-minute quadrangle on which the Project site is located (Pasadena, California) and the eight surrounding quadrangles (Sunland, Condor Peak, Chilao Flat, Burbank, Mount Wilson, Hollywood, Los Angeles, and El Monte). The USFWS occurrence data and critical habitat databases were queried using geographic information system (GIS) software based on a 5-mile buffer around the Project site.

3.2 Resource Mapping

Dudek Senior Biologist Michael Cady performed a general reconnaissance-level biological survey on April 23, 2019, which was used to guide the schedule of surveys listed in Table 1, Schedule of

Surveys. The field effort for the Project also included vegetation mapping, a jurisdictional waters delineation, a focused special-status plant survey, and focused wildlife surveys.

Table 1
Schedule of Surveys

Date	Hours	Personnel	Focus	Conditions
4/23/2019	1300–1630	MC	General biological reconnaissance level survey	80°F–82°F, 0% cc, clear, 1–2 mph
5/3/2019	0700–1000	MC	Focused least Bell's vireo survey	59°F–68°F, 0%–100% cc, 1–2 mph
5/3/2019	1000–1200	MC	Non-protocol California red-legged frog and arroyo toad survey	68°F–71°F, 0% cc, 1–2 mph
5/15/2019	1030–1700	MC	Focused special-status plant survey/ vegetation mapping	62°F–67°F, 100% cc, 0–2 mph
5/22/2019	0558–1004	MB	Focused least Bell's vireo survey/focused southwestern willow flycatcher survey	52°F–64°F, 0%–45% cc, 0–4 mph
6/4/2019	0630–1018	MB	Focused least Bell's vireo survey/focused southwestern willow flycatcher survey	58°F–63°F, 100% cc, 0–2 mph
6/14/2019	0614–0934	MB	Focused least Bell's vireo survey/focused southwestern willow flycatcher survey	63°F–65°F, 100% cc, 0–3 mph
6/26/2019	0649–1003	MB	Focused least Bell's vireo survey/focused southwestern willow flycatcher survey	61°F–62°F, 100% cc, misty, 0–3 mph
7/5/2019	0800–1400	MC	Focused special-status plant survey/jurisdictional waters delineation	64°F–86°F, 0% cc, 0–5 mph
7/8/2019	0642–0935	MB	Focused least Bell's vireo survey/focused southwestern willow flycatcher survey	62°F–67°F, 100% cc, 0–1 mph
7/18/2019	0630–0900	MC	Focused least Bell's vireo survey	65°F–72°F, 100% cc, 0–1 mph
7/29/2019	0630–0900	MC	Focused least Bell's vireo survey	64°F–70°F, 5%-50% cc, 0 mph
10/14/2019	0900-1500	MC	Focused fish survey	61°F–73°F, 0% cc, 1–2 mph
4/2/2020	0800-1600	CL	Protected Tree Survey	NR
4/3/2020	0800-1600	CL	Protected Tree Survey	NR

Notes: cc = cloud cover; mph = miles per hour; NR = not recorded
Survey Personnel: CL = Christopher LaCroix; MB = Melissa Blundell; MC = Michael Cady.

Binoculars were used to survey areas that were not physically accessible due to terrain or dense vegetation. All plant and animal species detected by sight, calls, tracks, scat, or other sign were recorded, as well as a determination of potential wildlife linkages based on sign and track detection. Observable sensitive resources including flowering annual plants, shrubs, and trees, and conspicuous wildlife (i.e., birds and some reptiles) commonly accepted as regionally sensitive by CNPS, CDFW, or USFWS were also documented, if observed.

3.2.1 Vegetation Community and Land Cover Mapping

Vegetation communities and land uses within the Project site were mapped in the field directly onto a 200-scale (1 inch = 200 feet) color digital orthographic map of the property (Bing 2018). Following completion of the fieldwork, all vegetation polygons were digitized using ArcGIS software and GIS coverage was created. Vegetation communities within the Project site were mapped using A Manual of California Vegetation, Second Edition (Sawyer et al. 2009. Some modifications were incorporated to accommodate the lack of conformity of the observed communities to those included in these references.

3.2.2 Flora

Latin and common names for plant species with a CRPR (formerly CNPS List) follow the Inventory of Rare and Endangered Plants (CNPS 2019a). For plant species without a CRPR, Latin names follow the Jepson Interchange List of Currently Accepted Names of Native and Naturalized Plants of California (Jepson Flora Project 2019), and common names follow the California Natural Community list (CDFW 2019e) or the U.S. Department of Agriculture Natural Resources Conservation Service PLANTS Database (USDA 2019b).

3.2.2.1 Focused Special-Status Plant Survey

Dudek Senior Biologist Michael Cady conducted focused surveys for special-status plant species with a potential to occur within the two work areas, Gabrielino Trail/Access Road, and North Arroyo Boulevard, plus a 50-foot buffer surrounding each. Two surveys were conducted, one in the spring and one in the summer, in order to cover the blooming period of the target species. Prior to the start of focused surveys, nearby reference populations were checked to verify that target species were in bloom. The surveys conformed to CNPS Botanical Survey Guidelines (CNPS 2001); Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (CDFW 2018); and Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants (USFWS 1996).

The Study Area was surveyed with meandering transects searching for federally and/or state-listed plants known to occur or with the potential to occur within the Study Area. Additionally, the Arroyo Seco streambed between Area 2 and the JPL Bridge was surveyed for special-status plant species associated with riparian habitats. All plant species encountered during the field surveys were identified to subspecies or variety, if applicable, to determine sensitivity status. Moreover, all plant species encountered in the field were recorded. If target species were encountered, data points were mapped in the field using a GPS unit.

3.2.3 Fauna

All wildlife species detected during the field surveys by sight, vocalizations, burrows, tracks, scat, and other signs were recorded. Binoculars (10 mm × 42 mm) were used to aid in the identification of observed wildlife. In addition to species observed on site, expected wildlife usage of the site was determined according to known habitat preferences and knowledge of relative distributions of regional wildlife in the area. Latin and common names of animals follow Crother (2012) for reptiles and amphibians, American Ornithologists' Union (AOU 2018) for birds, Wilson and Reeder (2005) for mammals, North American Butterfly Association (NABA 2016) for butterflies, and Moyle (2002) for fish.

3.2.3.1 Focused Least Bell's Vireo and Southwestern Willow Flycatcher Surveys

The surveys for least Bell's vireo (*Vireo bellii pusillus*) and southwestern willow flycatcher (*Empidonax traillii extimus*) were conducted according to USFWS (2001) and U.S. Geological Survey (Sogge et al. 2010) survey protocols. The surveys were conducted between May 3, 2019, and July 29, 2019. The focused surveys were conducted in any riparian habitats in the two work areas and along the Gabrielino Trail/Access Road. All southwestern willow flycatcher surveys were conducted by Dudek biologist Melissa Blundell, who holds a federal recovery permit (No. TE97717A) to survey for the species. Michael Cady conducted the surveys where only least Bell's vireo was the focus. The full methodology is included in Appendix A, Southwestern Willow Flycatcher and Least Bell's Vireo Survey Memorandum.

3.2.3.2 Non-Protocol California Red-Legged Frog and Arroyo Toad Survey

Dudek conducted a focused, but non-protocol, survey for California red-legged frog (*Rana draytonii*) and arroyo toad (*Anaxyrus californicus*) within the Study Area and within portions of Arroyo Seco from Area 2 to the JPL Bridge, and the spreading basins in Area 3 that had standing water. The purpose of the survey was to look for individuals of the two species and identify potential habitat. The survey was conducted on May 3, 2019 by Dudek Senior Biologist Michael Cady. The focused survey passes were conducted by walking along the stream. The full methodology is included in Appendix B, Non-Protocol California Red-Legged Frog and Arroyo Toad Survey Memorandum.

3.2.3.3 Focused Fish Survey

Dudek conducted a focused survey for fish within the Arroyo Seco from where the waters go sub-grade to the west of Area 3 (during drier periods of the year) and upstream to the Brown Mountain Dam; approximately 4.5 river miles. The focus of the survey was to determine if southern steelhead/rainbow trout (*Oncorhynchus mykiss*) and arroyo chub (*Gila orcuttii*) were present in

the survey area. The focused survey pass was conducted by walking along the stream. The full methodology is included in Appendix C, Focused Fish Survey Memorandum.

3.2.4 Jurisdictional Delineation

A jurisdictional delineation of waters of the United States, including wetlands, under the jurisdiction of the USACE, CDFW, and RWQCB was conducted by Dudek Senior Biologist Michael Cady to update potential jurisdictional waters in the Study Area in accordance with the 1987 USACE Wetland Delineation Manual: Arid West Region (USACE 2008b). The wetland delineation focused on identifying the changes to the extent of regulated resources within Arroyo Seco and the spreading basins that had been previously delineated (BonTerra Psomas 2014a, 2016a). This included the evaluation of the OHWM, surface water, and hydrophytic vegetation. Riparian habitat previously mapped was also checked to determine any changes. The previous jurisdictional delineation (BonTerra Psomas 2016a) was relied on to assess the potential presence of hydric soils.

Under current regulatory standards, an applicant under Section 404 of the Clean Water Act may request a Preliminary Jurisdictional Determination from USACE in which federal jurisdiction of aquatic resources is assumed. Alternatively, an Approved Jurisdictional Determination can be requested in which an assessment of surface water connectivity and/or significant nexus of aquatic resources within the Study Area with downstream navigable waters of the United States would be required to determine whether aquatic resources in the Study Area are "isolated" and can be excluded from federal jurisdiction. Since an assessment of surface water connectivity and/or significant nexus was not completed, aquatic resources within the Study Area are assumed to be under federal, as well as state, jurisdiction.

3.2.5 Protected Tree Survey

Dudek mapped tree locations for all trees located within the Area 2 and Area 3 Study Areas. Tree mapping was conducted using a Trimble Pathfinder Pro XH Global Positioning System (GPS) receiver with H-Star Technology. Since tree canopies can sometimes cause loss of satellite lock by blocking the line-of-sight to satellites, an electronic compass and reflectorless, electronic distance-measuring device were also used in mapping tree locations. The reflectorless, electronic distance-measuring device/compass combination operates in concert with the Pathfinder system to position offsets, and offset information is automatically attached to the GPS position data string. The electronic tree locations were then evaluated using ArcView 10.4 software to determine the position of the trees related to the project development footprint.

All inventoried and assessed protected trees were tagged with an aluminum tag bearing a unique identification number, which was placed on the trunk of each tree. Tree trunk diameters were measured using a diameter tape providing adjusted figures[2] for diameter measurements when wrapping the tape around an object's circumference. Diameter measurements were taken using protocol provided by the Council of Tree and Landscape Appraisers in the Guide for Plant Appraisal (ISA 2000). The trunk diameter measurement of each tree was taken at 4.5 feet above the ground along the trunk axis. Tree height was visually estimated by experienced tree surveyors. Tree canopy diameters were typically estimated by "pacing-off" the measurement based on the investigator's knowledge of their stride length or by visually estimating the canopy width. The crown diameter measurements were made along an imaginary line intersecting the tree trunk that best approximated the average canopy diameter. Additionally, Dudek arborists calculated composite trunk diameters for multiple-stem trees according to ISA standards. According to these standards, the sum of all stem diameters was calculated to ascertain composite trunk diameter values for multiple-stem trees.

Pursuant to the Guide for Plant Appraisal (ISA 2000), tree health and structure were evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Each component of the tree was assessed with regard to health factors such as insect and pathogen damage, mechanical damage, presence of decay, presence of wilted or dead leaves, and wound closure. Tree health and structure were graded as good, fair, poor, and dead, with "good" representing no apparent problems, and "dead" representing a dying and/or dead tree. Good condition trees exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Fair condition trees are typically those with few maladies but declining vigor. This method of tree condition rating is comprehensive and results in ratings that are useful for determining the status of trees based on common urban forestry standards.

3.2.6 Survey Limitations

The focused rare plant surveys were conducted in the spring and summer after a higher-than-normal rainy season. A weather station at Devil's Gate Dam has recorded 25.55 inches of precipitation since the beginning (October 1, 2018) of the current rainy season (LACDPW 2019), which is above the normal of 20.4 inches for Pasadena (City of Pasadena 2019a). This allowed for an above-average bloom from the plants in the region.

Climatic conditions during the survey generally were favorable for identification of wildlife. Potential limitations of the survey included seasonal constraints, a diurnal bias, and the absence of focused trapping for small mammals and reptiles. Surveys were conducted during the daytime to

[2] Inches divided by 3.14 (π) provide diameter measurement in inches.

maximize visibility for the detection of plants and most animals. Birds represent the largest component of the vertebrate fauna, and because they are active in the daytime, diurnal surveys maximize the number of observations of this portion of the fauna. In contrast, daytime surveys usually result in few observations of mammals, many of which may only be active at night. In addition, many species of reptiles and amphibians are secretive in their habits and are difficult to observe using standard meandering transects.

3.3 Special-Status Species Habitat Assessment

Endangered, rare, or threatened plant species as defined in Section 15380(b) of the CEQA Guidelines (14 CCR 15000 et seq.) are referred to as "special-status plant species" in this BRTR and include endangered or threatened plant species recognized in the context of CESA and FESA (CDFW 2019b) and plant species with a CRPR 1 through 4 (CNPS 2019a). Species with CRPR 3 or 4 may, but generally do not, qualify for protection under this provision. Species with CRPR 3 and 4 are those that require more information to determine status and plants of limited distribution. Thus, only CRPR 3 and 4 plant species that were also locally recognized by the City of Pasadena Trees and Tree Protection Ordinance were analyzed further.

Endangered, rare, or threatened wildlife species as defined in CEQA Guidelines, Section 15380(b) (14 CCR 15000 et seq.), are referred to as "special-status wildlife species" and, as used in this report, include (1) endangered or threatened wildlife species recognized in the context of CESA and FESA (CDFW 2019b); (2) California Species of Special Concern and Watch List species as designated by CDFW (2019c); (3) mammals and birds that are fully protected species as described in the California Fish and Game Code, Sections 4700 and 3511; and (4) Birds of Conservation Concern as designated by USFWS (2008).

The CNDDB and CNPS database queries conducted during the literature review resulted in a list of plant and wildlife species that have recorded occurrences within the Project vicinity. For each species evaluated, a determination was made regarding the potential for the species to occur in the Study Area based on information gathered during the field reconnaissance, including the location of the site, habitats present, current site conditions, known range, habitat associations, preferred soil substrate, life form, elevation, and blooming period.

4 ENVIRONMENTAL SETTING

The purpose of this chapter is to describe the general existing conditions within and adjacent to the Study Area to document the baseline conditions for the BRTR and subsequent analysis.

4.1 Climate

The Project vicinity has a Mediterranean climate, with typically hotter summers and slightly cooler winters than nearby coastal areas. The average temperature for the year is 63.9°F. The warmest month on average is August, with an average temperature of 74.7°F. The coolest month on average is January, with an average temperature of 54.4°F. The average amount of precipitation for the year in Pasadena is 20.4 inches. Its location relative to the San Gabriel Mountains means it receives orographic precipitation (precipitation produced when moist air is lifted as it moves over a mountain range), which adds several more inches of rainfall per year than nearby areas. Most of the precipitation occurs between October and April, with the most precipitation on average in February, with 4.6 inches (City of Pasadena 2019a).

4.2 Geology and Topography

The northern portion of the Study Area is mostly composed of steep slopes of the San Gabriel Mountains, with flat areas in the canyon bottom. The Arroyo Seco empties out into a broad piedmont plain that slopes downward from the base of the San Gabriel Mountains to Devil's Gate Reservoir, the lowest ground surface point of the Raymond Groundwater Basin within the Study Area. The Raymond Basin lies in the northwestern part of the San Gabriel Valley, bounded by the San Gabriel Mountains to the north, the San Rafael Hills to the west, and ending to the south and east at the Raymond Fault. The Raymond Fault separates the Raymond Basin from the Main San Gabriel Basin in the vicinity of the southeasterly boundary. The California Department of Water Resources characterized the water-bearing formations of the Raymond Basin as alluvial fill having characteristics of the coarse deposits found in the small basins near the mountain margins. The deposits are coarsest at the base of the mountains where they contain boulders several feet in diameter, but even in the southerly part of the basin, cobbles, stones, and boulders are not uncommon. There are practically no true sand beds in the northerly part of Raymond Basin. Recent alluvium occupies channels, washes, and flood plains of Arroyo Seco, Eaton Creek, and Big and Little Santa Anita Creeks, and to a lesser extent, exists as veneers scattered along the slope of the valley resulting from flood discharges of intermittent streams (Psomas 2018).

Area 2 is located approximately half a mile from the mouth of Arroyo Seco Canyon at an elevation of approximately 1,175 feet above mean sea level (AMSL). The canyon bottom is relatively narrow between Area 2 and the canyon mouth at the JPL bridge. Area 3 is within the piedmont

plain and has elevations that range between 1,130 feet AMSL in the north to 1,090 feet AMSL in the south. Area 3 is located approximately 20 to 30 feet above the current active floodplain of the Arroyo Seco (USGS 2018).

4.3 Soils

As shown in Figure 5, Soil Types, three soil types have been previously mapped for the Project site according to the U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey (USDA 2019a): Hanford gravelly sandy loam, Ramona loam, and Ramona sandy loam.

Hanford Series

The Hanford series consists of very deep, well drained soils that formed in moderately coarse textured alluvium dominantly from granite. Hanford soils are on stream bottoms, floodplains and alluvial fans. The soils are well-drained, with negligible to low runoff and moderately rapid permeability. Vegetation in uncultivated areas is mainly annual grasses (USDA 2019c). Hanford soils are found in the northernmost portion of the Study Area and includes Area 2.

Ramona Series

The Ramona series are composed of fine sandy loam formed in alluvium derived mostly from granitic and related rock sources. Ramona soils are found on terraces and alluvial fans. The soils are well-drained, with slow to rapid runoff and moderately slow permeability. Uncultivated areas have a cover of annual grasses, forbs, chamise or chaparral. (USDA 2019c). Ramona soils are found in the remainder of the site and includes Area 3.

4.4 Surrounding Land Uses

The Arroyo Seco originates in the San Gabriel Mountains, with waters flowing south through the Cities of Pasadena, South Pasadena, and Los Angeles before joining the Los Angeles River just east of Elysian Park and west of the I-5/I-110 Interchange. Within the City of Pasadena, the Arroyo Seco passes through three distinct recreational areas: (1) Upper Arroyo Seco, containing the Hahamonga Watershed Park (HWP) and Devil's Gate Dam; (2) Central Arroyo Seco, containing the Brookside Golf Course and the Rose Bowl; and (3) Lower Arroyo Seco, containing an archery range, a casting pond, and Memorial Grove. HWP is bounded on the south by the Devil's Gate Dam and Oak Grove Drive. Oak Grove Drive and JPL mark the boundaries of the HWP to the west in the City of La Cañada Flintridge. To the east, HWP is bounded by the residential neighborhoods of Pasadena and Altadena. The HWP extends northward into the San Gabriel

Mountains and includes approximately 1,300 acres of open space and recreational amenities, including the Gabrielino Trail, which is heavily used for hiking/bicycling and equestrian activities.

Downstream of the JPL Bridge, the Arroyo Seco fans out into the alluvial system of the Devil's Gate Reservoir. In October 2018, the Los Angeles County Flood Control District (LACFCD) began preparing to start work on the Devil's Gate Sediment Removal Project, which plans to remove up to 1.7 million cubic yards of accumulated sediment located within 42 acres of the Devil's Gate Reservoir. In November 2018, the LACFCD began vegetation removal from within the sediment excavation footprint, and the sediment removal activities began in February of 2019.

The northernmost limit of the LACFCD's sediment removal area is located approximately 0.5-mile south of Area 3. Sediment removal would occur from that point southerly to the Devil's Gate Dam, which is located approximately 1.0-mile mile south of Area 3. The LACFCD's habitat restoration activities are planned adjacent to the sediment removal area as well as areas to the north, including along the slopes between the Arroyo Seco and the spreading basins as well as within the southernmost Spreading Basin No. 17 (i.e. Johnson Field). Sediment removal activities are anticipated to continue through 2022 with habitat restoration activities occurring through 2023 (Los Angeles County Public Works 2018).

Upstream of the Project's Study Area is the ANF, which is located within the San Gabriel Mountains. The ANF covers over 650,000 acres of primarily natural open space, which includes the upper portion of the Arroyo Seco watershed. Much of the ANF is covered with dense chaparral, which changes to pine- and fir-covered slopes near the mountain peaks at the higher elevations.

4.5 Watersheds and Hydrology

The Arroyo Seco watershed, a subwatershed of the Los Angeles River watershed, spans from mountainous headwaters through a mix of natural and urban lowlands where it converges with the Los Angeles River. Approximately 47 square miles drain into the Arroyo Seco watershed, approximately two-thirds of which are in the San Gabriel Mountains/ANF. The Arroyo Seco is a perennial stream, which means there is generally flowing water year-round, but the flow is below the surface (underground) in some locations at various times throughout the year. The Arroyo Seco flows through a deeply incised canyon through the San Gabriel Mountains before emptying into areas of open alluvium and incised channels downstream of the JPL Bridge to Devil's Gate Dam and Reservoir (USACE and LACDPW 2011). During high flow periods, surface flows can reach the Devil's Gate Reservoir area, but during low flow periods in the drier months of the year, water infiltrate into the sandy sediment at the uppermost portion of the Reservoir.

Also, during periods of high flow, the Arroyo Seco collects storm water from drains that either outlet directly into the stream, or indirectly from discharge points throughout the Hahamongna

Watershed Basin. The storm drains originate in the neighboring communities of Altadena and La Canada Flintridge, as well as JPL and Pasadena. Collectively, the amount of rainfall and storm water captured in the Arroyo Seco that finds its way to Devil's Gate Reservoir can exceed the natural percolation capacity of the streambed. When the water level behind the dam rises to a certain level, the LACFCD releases water that eventually flows to the ocean.

Below Devil's Gate Dam, Arroyo Seco is mostly channelized, with a stream bottom constructed of impervious materials and water flows restricted and controlled by the Dam (USACE and LACDPW 2011). The watershed outside of the San Gabriel Mountains consists primarily of urban lands where impervious surfaces dominate the land cover. Flow during the dry season, from May to October, consists primarily of nuisance urban runoff (USACE and LACDPW 2011).

The streambed in Area 2 is generally comprised of coarse sediments ranging from sand to boulders. Bedrock exposure was noted in several locations between the JPL bridge and the diversion in the banks and bed of the channel. Active streambed widths vary between about 20 and 40 feet. The channel varies between step-pool and plane bed morphology, with step-pools associated with steeper reaches and very coarse (cobble to boulder) bed material and bedrock exposures. These two channel morphologies are consistent with the overall slope of the channel of about 2.5 to 3 percent. The diversion dam in Area 2 forms a small high point in the bed to facilitate flow into the intake. The stream slope is significantly flattened upstream of the diversion but maintains a continuous positive slope of about 1.5 percent.

The watershed was severely burned in the 2009 Station Fire and was subject to elevated sediment debris and sediment loads in the years following the fire. Peak flows of approximately 4,600 cfs and 2,300 cfs were recorded at a gage upstream of Area 2 (USGS stream gage 11098000) in Water Years 2010 and 2011, respectively. At the present time, there is very little fine-grained material (silt or clay) in the present bed material in the reach between the JPL bridge and the diversion.

Numerous barriers to aquatic organism passage occur in Arroyo Seco and Los Angeles River downstream of the project area. In the vicinity of the project, Devil's Gate Dam is a complete barrier and the reservoir stream segment above the dam is subject to deposition, channel shifting, and frequent dry conditions due to loss of flow into the alluvium as the channel emerges from the canyon. Upstream of the JPL bridge, partial temporal barriers may be present during low flows due to steep channel segments and step-pool or bedrock drops. An anthropogenic barrier exists at the road crossing (Bridge 3) approximately 500 feet downstream of the diversion at a channel spanning weir that may have been installed for flow measurement. A drop of approximately three feet occurs at this concrete structure. At the diversion in Area 2, a drop of approximately two feet occurs from the base of the flashboard notch to the water surface in the scour pool downstream. The top of the diversion dam is approximately 2.5 feet higher than the notch.

4.6 Station Fire

In August 26, 2009, the Station Fire started in the ANF approximately 4 miles north of La Cañada Flintridge along the Angeles Crest Highway (SR-2). The fire was the largest fire in the recorded history of the ANF (est. 1892) and the 10th largest fire in California since 1933, as of 2019. The fire burned a total of 161,189 acres, 96% of which was on ANF lands. The fire burned almost the entire watershed of the Arroyo Seco in the ANF, which led to significant sediment flows following precipitation events. These sediments were deposited primarily in the Hahamongna alluvial plain and having significant effects on riparian communities, in some places completely burying them. (USACE and LACDPW 2011).

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5 RESULTS

This chapter describes the results of the literature review, field surveys, and habitat assessments within the Study Area. Representative site photographs of the Project site are provided in Appendix D of this BRTR.

5.1 Vegetation Communities, Land Covers, and Floral Diversity

Ten vegetation communities and land cover types are identified within the approximately 34.57-acre Study Area during the biological resource evaluation: California sagebrush–California buckwheat scrub–laurel sumac scrub association, coast live oak woodland alliance, white alder–California sycamore woodland association, California sycamore woodlands alliance, arroyo willow–mulefat scrub association, laurel sumac scrub alliance, California sagebrush–California buckwheat scrub alliance, urban/developed, disturbed habitat, and parks and ornamental plantings. These vegetation communities and land cover types are described below, their acreages tabulated in Table 2, Vegetation Types, and their spatial distributions depicted on Figure 6, Vegetation Types (Sheets 1 and 2).

Table 2
Vegetation Communities and Land Covers within the Study Area

Vegetation Community or Land Cover	California Natural Community Codes[a]	Global-State Rarity Ranks[b]	Area 2 Study Area	Area 3 Study Area	Access Road Study Area	Screen Building Staging Area	Behner Treatment Plant Staging Area	Total Area (acres)
Native Vegetation Communities								
California sagebrush–California buckwheat–laurel sumac scrub association	32.110.06	G4/S4	0.05	5.93	4.42	—	0.02	10.41
Coast live oak woodland alliance	71.060.00	G5/S4	0.03	—	3.01	0.06	—	3.1
White alder–California sycamore woodland association[c]	61.420.15	G3[c]	0.86	—	0.02	—	—	0.88
California sycamore woodlands alliance[c]	61.310.00	G3/S3[c]	0.24	—	—	—	—	0.24

Table 2
Vegetation Communities and Land Covers within the Study Area

Vegetation Community or Land Cover	California Natural Community Codes[a]	Global-State Rarity Ranks[b]	Area 2 Study Area	Area 3 Study Area	Access Road Study Area	Screen Building Staging Area	Behner Treatment Plant Staging Area	Total Area (acres)
Arroyo willow–mulefat scrub association	61.201.06	G4	—	0.10	—	—	—	0.10
Laurel sumac scrub alliance	45.455.00	G4/S4	—	0.17	—	—	—	0.17
California sagebrush–California buckwheat scrub alliance[c]	32.110.00	G4/S4	0.06	—	0.03	—	—	0.09
Non-Natural Land covers								
Urban/developed	—	—	0.15	10.25	4.09	0.04	0.82	15.35
Disturbed habitat	—	—	—	6.83	—	—	—	6.83
Parks and ornamental plantings	—	—	—	—	0.22	—	—	0.22
Total	—	—	**1.40**	**23.27**	**11.78**	**0.09**	**0.84**	**37.38**

Notes: Numbers may not sum due to rounding.

[a] Unique codes assigned to alliances and associations.

[b] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

[c] Sensitive community

5.1.1 California Sagebrush–California Buckwheat–Laurel Sumac Scrub Association (32.110.06)

The California sagebrush–California buckwheat–laurel sumac scrub association consists of a codominance of California sagebrush (*Artemisia californica*), California buckwheat (*Eriogonum fasciculatum*), and laurel sumac (*Malosma laurina*). The association is part of the California Sagebrush–California Buckwheat scrub alliance (32.110.00) but is not considered a sensitive natural community (CDFW 2018). Laurel sumac is a large, large-leaved sclerophyllous shrub that grows to 16 feet in height. California sagebrush is a much-branched shrub up to 8 feet tall with shallow roots. California buckwheat is a semi-woody, multi-branched shrub with woody, many-branched roots. Many additional shrubs may be present in the community and the herbaceous layer is seasonally present (CNPS 2019b).

In the Study Area, California sagebrush–California buckwheat–laurel sumac scrub is found along North Arroyo Boulevard, on the slope adjacent to the eastern side of Area 3, and on the slopes above the riparian corridor within the canyon. Additional common shrubs found in the community in the Study Area include blue elderberry (*Sambucus nigra*), lemonade berry (*Rhus integrifolia*), deerweed (*Acmispon glaber*), white sage (*Salvia apiana*), black sage (*Salvia mellifera*), bush monkeyflower (*Diplacus aurantiacus*), hoary leaf ceanothus (*Ceanothus crassifolius*), and California coffee berry (*Frangula californica*). Common native herbaceous species included yellow pincushion (*Chaenactis glabriuscula*), small wirelettuce (*Stephanomeria exigua*), Clearwater cryptantha (*Cryptantha intermedia*), caterpillar phacelia (*Phacelia cicutaria*), and miniature lupine (*Lupinus bicolor*). Non-native species present include tree tobacco (*Nicotiana glauca*), Spanish broom (*Spartium junceum*), shortpod mustard (*Hirschfeldia incana*), and various grasses (*Avena* spp. and *Bromes* spp.).

5.1.2 Coast Live Oak Woodland Alliance (71.060.00)

Coast live oak woodland alliance is dominated by coast live oak (*Quercus agrifolia*), but it may include other tree species with less frequency. Coast live oak is a drought-resistant evergreen tree that grows to 80 feet in height. The canopy structure can be open to continuous and the shrub and herbaceous layers are sparse to intermittent. Coast live oak woodland are found on alluvial terraces, canyon bottoms, stream banks, slopes, flats. Soils are typically deep, sandy, or loamy with high organic matter (CNPS 2019b).

In the Study Area, coast live oak woodland is found along Gabrielino Trail/Access Road and Arroyo Boulevard. Additional tree species found in the community include canyon live oak (*Quercus chrysolepis*), California sycamore (*Platanus racemosa*), and bigleaf maple (*Acer macrophyllum*). The shrub component is sparse and consists of species also found in California sagebrush–California buckwheat–laurel sumac scrub. The understory was also sparse and common native herbaceous species include poison oak (*Toxicodendron diversilobum*), American black nightshade (*Solanum americanum*), golden currant (*Ribes aureum*), miner's lettuce (*Claytonia perfoliata*), and California polypody (*Polypodium californicum*).

5.1.3 White Alder–California Sycamore Woodland Association (61.420.11)

White alder–California sycamore woodland association is dominated by white alder (*Alnus rhombifolia*) and California sycamore. The association is part of the white alder groves alliance (61.420.00). White alder is a deciduous hardwood that attains 115 feet in height. California sycamore is a fast-growing, deciduous tree that attains 80 feet in height and is well adapted to intermittent flooding conditions. The community typically occurs in inland foothills and lower montane zones, usually as narrow strips along perennial stream courses throughout cismontane

California. It is well adapted to many flood regimes. White alder–California sycamore woodland is considered a sensitive vegetation community by CDFW (2018).

In the Study Area, white alder–California sycamore woodland is found in Area 2. The understory was very sparse and native herbaceous species include California blackberry (*Rubus ursinus*), and scarlet monkeyflower (*Erythranthe cardinalis*).

5.1.4 California Sycamore Woodlands Alliance (61.310.00)

California sycamore woodlands alliance is dominated by California sycamore, but it may include other tree species with less frequency. California sycamore is a fast-growing, deciduous tree that attains 80 feet in height and is well adapted to intermittent flooding conditions. The canopy structure can be open to continuous, the shrub layer is sparse to continuous, and the herbaceous layers is variable. California sycamore woodlands are found in gullies, intermittent streams, springs, seeps, stream banks, and terraces adjacent to floodplains that are subject to high-intensity flooding. Soils are typically rocky or cobbly alluvium with permanent moisture at depth (CNPS 2019b). California sycamore woodlands is considered a sensitive vegetation community by CDFW (CDFW 2019e).

In the Study Area, California sycamore woodlands are found within the Area 2 portion of the Study Area, on the west side of the Gabrielino Trail/Access Road and at the base of a steep slope. The understory consisted of poison oak and the non-native English ivy (*Hedera helix*).

5.1.5 Arroyo Willow–Mulefat Scrub Association (61.201.06)

Arroyo willow–mulefat scrub association is dominated by arroyo willow (*Salix lasiolepis*) and mulefat (*Baccharis salicifolia*). The association is part of the arroyo willow thickets alliance (61.201.00). Arroyo willow is a riparian tall shrub or tree that grows up to 26 feet in height. Mulefat is an evergreen shrub with willow-like leaves that have widely spaced, fine teeth and shiny upper surfaces. The canopy is open to continuous and the herbaceous layer is variable. The community is typically found on stream banks and benches, slope seeps, and stringers along drainages.

In the Study Area, arroyo willow–mulefat scrub association is located within the wash of the Arroyo Seco, adjacent to Area 3. Additional species present are similar to those found in the California sagebrush–California buckwheat–laurel sumac scrub association.

5.1.6 Laurel Sumac Scrub Alliance (45.455.00)

Laurel sumac scrub alliance is dominated by laurel sumac but may include other shrub species. Laurel sumac is a large, large-leaved sclerophyllous shrub that grows to 16 feet in height. The canopy of Laurel sumac scrub is open or continuous and the herbaceous layer is sparse or grassy. The community is typically found on steep slopes and soils are shallow and fine textured (CNPS 2019b).

In the Study Area, laurel sumac scrub is found in only one location on the western edge of Area 3. No other substantial shrub species are present. The understory is composed primarily of non-native vegetation that was dominated by shortpod mustard (*Hirschfeldia incana*) and various grasses (primarily *Avena* spp. and *Bromes* spp.).

5.1.7 California sagebrush–California Buckwheat Scrub Alliance (32.110.00)

California sagebrush–California buckwheat scrub alliance is dominated by California sagebrush and California buckwheat. California sagebrush is a much-branched shrub up to eight feet tall with shallow roots. California buckwheat is a semi-woody, multi-branched shrub with woody, many-branched roots. The herbaceous layer is seasonally present. The community is typically found on slopes that are steep and occurs on fine-textured soils developed from granitic or sedimentary rocks (CNPS 2019b). California sagebrush–California buckwheat scrub is considered a sensitive vegetation community by CDFW (CDFW 2019e).

In the Study Area, California sagebrush–California buckwheat scrub is found on the eastern slope adjacent to Area 2. Other species present are similar to those found in the California sagebrush–California buckwheat–laurel sumac scrub association.

5.1.8 Urban/Developed

Urban/developed land refers to areas that have been constructed upon or disturbed so severely that native vegetation is no longer supported (Holland 1986). Developed land includes areas with permanent or semi-permanent structures, pavement or hardscape, landscaped areas, and areas with a large amount of debris or other materials (Holland 1986). Developed areas are generally graded and compacted, sometimes covered with gravel road base or built, and have little to no vegetation present. Developed land dominates the majority of the Study Area for the project and refers to those areas supporting manmade structures or features including paved/compacted roadways, driveways, parking lots, residences, and commercial or industrial buildings. These areas support limited natural ecological processes, native vegetation, or habitat for wildlife species and thus are not considered sensitive by local, state, and/or federal agencies.

In the Study Area, the urban/developed land is primarily found in Area 3 and the Gabrielino Trail/Access Road. Non-native herbaceous species are present scattered throughout. Common species include redstem stork's bill (*Erodium cicutarium*), puncturevine (*Tribulus terrestris*), and various grasses (primarily *Avena* spp. and *Bromes* spp.).

5.1.9 Disturbed Habitat

Disturbed habitat refers to areas that are not developed yet, lack vegetation, and generally are the result of severe or repeated mechanical perturbation. Areas mapped as disturbed land may include unpaved roads, trails, and graded areas. Vegetation in these areas, if present at all, is usually sparse and dominated by non-native weedy herbaceous species (Jones & Stokes 1993).

In the Study Area, disturbed habitat is found within Area 3 and is primarily associated with the existing spreading basins. Routine maintenance of the basins keeps a vegetation community from becoming established. Dominant species found in disturbed habitat are non-native and include prickly lettuce (*Lactuca serriola*), shortpod mustard, wild radish (*Raphanus sativa*), tocalote (*Centaurea melitensis*), and various grasses (*Avena* spp. and *Bromes* spp.). Common native species include Canadian horseweed (*Erigeron canadensis*), common sunflower (*Helianthus annuus*), and telegraph weed (*Heterotheca grandiflora*). Components of California sagebrush–California buckwheat scrub are present, but native shrub cover is present in low abundance and density (i.e., less than 20% cover within minimum mapping units of 0.1 acres or more).

5.1.10 Parks and Ornamental Plantings

Parks and ornamental plantings consist of introduced trees, shrubs, flowers, and turf grass. Ornamental landscaping occurs in greenbelts, parks, and horticultural plantings throughout the county (Jones & Stokes 1993). In the Study Area, ornamental landscaping occurs at the southern end of North Arroyo Boulevard.

5.2 Plants

A total of 182 plant species were recorded in the Study Area, including 112 native species (61%) and 71 non-native species (39%). The more common plant species in the Study Area were identified in the description of the vegetation communities in Section 5.1, Vegetation Communities, Land Covers, and Floral Diversity. The majority of non-native species were found in Area 3. The cumulative list of plant species observed in the Study Area is provided in Appendix E to this BRTR. Special-status plant species are discussed in Section 5.5.1.

5.3 Wildlife

A total of 69 wildlife species were recorded in the Study Area, including 65 native species (94%) and four non-native species (6%), during the field effort for the Project. The cumulative list of wildlife species observed in the Study Area is provided in Appendix F to this BRTR. Special-status wildlife species are discussed in Section 5.5.2.

5.3.1 Fish

The Arroyo Seco historically provided habitat for seven species of native freshwater fish, namely Pacific brook lamprey (*Lampetra* spp.), Pacific lamprey (*Entosphenus tridentata*), rainbow trout/steelhead, arroyo chub, Santa Ana speckled dace (*Rhinichthys osculus*), Santa Ana sucker (*Catostomus santaanae*), and unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*). All occurred in Arroyo Seco and were recorded by Culver and Hubbs (1917). None, except rainbow trout, have been recorded as present in Arroyo Seco upstream of Devil's Gate Dam for at least 50 years (Swift and Seigel, 1993; Moyle, 2002) and probably much longer. Rainbow trout that have been observed in upper Arroyo Seco are believed to be present at least partly due to fish planting over the years. Rainbow trout were present in upper Arroyo Seco (upstream of the diversion) prior to the 2009 Station Fire but have not been detected since (Swift 2019).

Only three of these native species listed above remain elsewhere in the Los Angeles River drainage; Santa Ana sucker, arroyo chub, and Santa Ana speckled dace. They are present in the Los Angeles drainage only in Big Tujunga Wash above Hansen Dam and mostly below Big Tujunga dam, except that arroyo chub, which occurs above the Big Tujunga Dam as well. A few years ago a few hundred arroyo chub were moved from Big Tujunga to a couple of natural stretches of the Arroyo Seco below Devil's Gate Dam and under the Colorado Street Bridge, but these individuals did not survive beyond a second year; perhaps due to sediment deposition from the 2009 Station Fire. Judging by their occurrences elsewhere in the Los Angeles and Santa Ana rivers, only the Santa Ana speckled dace and rainbow trout would have been common in Arroyo Seco from the JPL bridge and upstream. The others would have primarily been in the lower reaches in habitats with lower gradients (Swift 2019).

No fish were observed during the 2019 surveys for the Project, including the focused fish survey (see Appendix C) that included all waters from the surface water terminus at the southern end in the Arroyo Seco wash adjacent to Area 3 to the Brown Mountain Dam. There was an incidental sighting of rainbow trout during the focused amphibian surveys conducted in 2013, but its provenance was not determined (BonTerra Psomas 2014e). The low flows and intermittent presence of surface water during a few to many months of the dry season means the habitat in the Study Area, while having desirable features, is very reduced and would temporarily support only

a few fish in the larger pools where some cover is present to deter predation. During dry years the pool habitat may be very limited or unsuitable due to lack of cover and temperature. This would account for the lack of fish other than a few small trout historically observed in the area of Area 2, probably strays from upstream. In addition, limited pool areas receive significant recreational use for swimming/bathing, and this disturbance would be adverse for fish in the limited areas available. (Northwest Hydraulic Consultants 2020)

The Arroyo Seco canyon is subject to occasional high flows and episodic disturbance associated with wildfire. Very high flows may wash fish downstream to the Devil's Gate Reservoir where they would likely perish under current conditions. These flows may also remove riparian vegetation, as noted in recent observations of single age class stands of riparian trees. In addition, sediment delivery associated with mass wasting processes or wildfire may bury suitable substrates and vegetation, eliminate cover, and change turbidity and temperatures in the stream. The observations of fish in the Arroyo Seco watershed before the Station Fire and few observations almost a decade later are indicative of the significance of these types of events to fish populations (Northwest Hydraulic Consultants 2020).

5.3.2 Amphibians

Three common amphibian species were observed in the Study Area: western toad (*Anaxyrus boreas*), California treefrog (*Pseudacris cadaverina*), and Baja California treefrog (*Pseudacris hypochondriaca*). These three species are primarily terrestrial, with predator avoidance, breeding activities, egg laying, and larval development occurring in the water. Numerous immature western toads were observed in the dried portions of the northern spreading basins in Area 3. Treefrog tadpoles were observed in the Arroyo Seco between Area 2 and the JPL Bridge during the California red-legged frog and arroyo toad non-protocol survey (Appendix B). Additional common amphibians with potential to occur in the Study Area are black-bellied slender salamander (*Batrachoseps nigriventris*) and garden slender salamander (*Batrachoseps major major*). These two species of slender salamander are terrestrial.

5.3.3 Reptiles

Three species of reptile were observed in the Study Area: San Diego alligator lizard (*Elgaria multicarinata webbii*), common side-blotched lizard (*Uta stansburiana*), and western fence lizard (*Sceloporus occidentalis*). Common species expected to occur include California striped racer (*Coluber lateralis lateralis*), San Diego nightsnake (*Hypsiglena ochrorhyncha klauberi*), California kingsnake (*Lampropeltis californiae*), gopher snake (*Pituophis catenifer*), and southern Pacific rattlesnake (*Crotalus oreganus helleri*).

5.3.4 Birds

Birds were the most common wildlife observed throughout the Study Area with 59 species observed. Common abundant species observed included bushtit (*Psaltriparus minimus*), house finch (*Haemorhous mexicanus*), lesser goldfinch (*Spinus psaltria*), Anna's hummingbird (*Calypte anna*), California scrub-jay (*Aphelocoma californica*), common raven (*Corvus corax*), mourning dove (*Zenaida macroura*), cliff swallow (*Petrochelidon pyrrhonota*), acorn woodpecker (*Melanerpes formicivorus*), Bewick's wren (*Thryomanes bewickii*), and dark-eyed junco (*Junco hyemalis*). The Study Area is expected to be used by many species during spring and fall migration.

5.3.5 Mammals

Four species of mammal were observed in the Study Area: western gray squirrel (Sciurus griseus), California ground squirrel (*Otospermophilus beecheyi*), coyote (*Canis latrans*), and mule deer (*Odocoileus hemionus*). Many mammal species are primarily nocturnal and would not have been seen during the surveys. Common species expected to occur include Virginia opossum (*Didelphis virginiana*), Audubon's Cottontail (*Sylvilagus audubonii*), Botta's pocket gopher (*Thomomys bottae*), big-eared woodrat (*Neotoma macrotis*), black bear (*Ursus americanus*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), mountain lion (*Puma concolor*), and bobcat (*Lynx rufus*). Bats are expected to forage over the Study Area, and potential day roost, but hibernation and maternal roosting is not expected due to the lack of physical structures (e.g., caves, mines, and abandoned buildings) that are associated with those activities.

5.4 Special-status Species Protocol/Focused Survey Results

Protocol surveys were conducted for least Bell's vireo and southwestern flycatcher, and focused surveys were conducted for arroyo chub, rainbow trout/southern steelhead, arroyo toad, and California red-legged frog. None of the focal species were observed. Table 3, Protocol/Focused Survey Special-Status Wildlife Species, summarizes the species status, habitat, and potential to occur.

Table 3
Protocol/Focused Survey Special-Status Wildlife Species

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Fish				
Gila orcuttii	arroyo chub	None/SSC	Warm, fluctuating streams with slow-moving or backwater sections of warm to cool streams at depths >40 centimeters (16 inches); substrates of sand or mud	Focused surveys for the species were negative in 2019. Not expected to occur in the Study Area or upstream and downstream from the Study Area. Habitat for the species is marginal in the Study Area. The species is considered to be extirpated from the Arroyo Seco.
Oncorhynchus mykiss irideus pop. 10	steelhead – Southern California DPS	FE/None	Clean, clear, cool, well-oxygenated streams; needs relatively deep pools in migration and gravelly substrate to spawn	Focused surveys for the species were negative in 2019. Not expected to occur in the Study Area or downstream from the Study Area. Population within Arroyo Seco are from historic stocking of hatchery-raised rainbow trout by CDFW. Access to the Study Area from downstream waters is blocked by Devil's Gate Dam.
Amphibians				
Anaxyrus californicus	arroyo toad	FE/SSC	Semi-arid areas near washes, sandy riverbanks, riparian areas, palm oasis, Joshua tree, mixed chaparral and sagebrush; stream channels for breeding (typically third order); adjacent stream terraces and uplands for foraging and wintering	Focused surveys for the species were negative in 2019. Not expected to occur in the Study Area or upstream and downstream from the Study Area. Habitat for the species is marginal in the Study Area. The species historically occurred in the Arroyo Seco but are considered extirpated due to the loss of habitat and the introduction of predators and competitors. Protocol surveys for the species conducted in 2013 for the Study Area were negative.

Table 3
Protocol/Focused Survey Special-Status Wildlife Species

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Rana draytonii	California red-legged frog	FT/SSC	Lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby or emergent vegetation associated with deep, still or slow-moving water; uses adjacent uplands	Focused surveys for the species were negative in 2019. Not expected to occur on the Study Area or upstream and downstream from the Study Area. Habitat for the species is marginal in the Study Area. The species is considered extirpated from the system due to the loss of habitat and the introduction of predators and competitors. Protocol surveys for the species conducted in 2013 for the Study Area were negative.
Birds				
Empidonax traillii extimus (nesting)	southwestern willow flycatcher	FE/SE	Nests in dense riparian habitats along streams, reservoirs, or wetlands; uses variety of riparian and shrubland habitats during migration	Low potential to occur. Protocol surveys for the species were negative in 2019. Marginal nesting habitat for the species does occur in the Study Area.
Vireo bellii pusillus (nesting)	least Bell's vireo	FE/SE	Nests and forages in low, dense riparian thickets along water or along dry parts of intermittent streams; forages in riparian and adjacent shrubland late in nesting season	Low potential to occur. Protocol surveys for the species were negative in 2019. Suitable nesting habitat for the species does occur in the Study Area.

Notes:
Status:
Federal
FE = Federal Endangered
FT = Federal Threatened
State
SE = State Endangered
SSC = Species of Special Concern

Arroyo Chub

Arroyo chub is a CDFW SSC. It occurs in slow-moving or backwater sections of warm to cool (10ºC to 24ºC) streams with mud or sand substrates; it thrives in low-gradient systems (Swift et al. 1993). This species may tolerate high temperatures and hypoxic conditions that occur in slow-

flowing or stagnant streams and backwater pools in dry summers. The arroyo chub feeds primarily on algae but also feeds on insects and small crustaceans.

Arroyo chub was not observed during the focused survey for fish conducted in 2019. Arroyo chub is not expected to occur in the Study Area, upstream of the Study Area, or immediately downstream from the Study Area. Suitable associated habitat is present, and the species was reintroduced to the Arroyo Seco below Devil's Gate Dam on August 25, 2008 (USACE and LACDPW 2011), but this species was not observed during fish-focused surveys conducted in 2012 (Chambers Group 2013). It is believed that the heavy sediment flow produced by rains following the Station Fire in 2009, which burned most of the watershed of the Arroyo Seco in the San Gabriel Mountains, may have removed the transplanted population (Scauzillo 2017).

Southern Steelhead

Southern steelhead (*Oncorhynchus mykiss irideus* pop. 10) is federally listed as endangered. In streams, the species use habitat consisting of relatively cool, well-oxygenated water with adequate depth and cover. Steelhead require relatively clean unconsolidated gravel and cobble for spawning. Steelhead have an ecological or migratory life cycle called anadromy, in which adults mature in the ocean and must return to freshwater to spawn. After their first year of life, steelhead may undergo physiological and morphological changes to smolts enabling them to survive in a marine environment. Downstream migration of juveniles usually occurs between March and June (Shapovalov and Taft 1954). In southern California, steelhead typically migrates to the ocean as one- or two-year olds (Moore 1980). Out-migrating steelhead in the Santa Clara River, for example, have been observed from January through early June, but the majority of steelhead smolt emigrate during the period from March through early May, and the timing of migration is strongly dependent on streamflows (ENTRIX 2000).

Genetically the native rainbow trout are the same as steelhead and usually can be distinguished genetically from various hatchery stocks. Thus genetic testing can determine if a population is native or not. Genetically identified native landlocked inland populations can be considered important for steelhead recovery if and when they regain access to the sea.

Historic stocking of Arroyo Seco with hatchery-raised rainbow trout by CDFW occurred; hence, there is some debate as to whether some of the trout seen in these currently landlocked areas are descendants of anadromous native *O. mykiss* (Friends of the Los Angeles River 2008). A recent genetic study of *O. mykiss* in southern California found that most populations have substantial genetic lineage from introduced hatchery rainbow trout, representing almost complete introgression or replacement of native fish by introduced hatchery trout (Jacobsen et al. 2014). Among the populations in tributaries of rivers that run through the highly urbanized areas of Southern California, only three groups of populations contained significant evidence of native

coastal steelhead ancestry: (1) populations from the San Gabriel River system, (2) Coldwater Canyon in the Santa Ana River, and (3) the San Luis Rey River; however, tissue sample were not collected from the Arroyo Seco, with only Santa Anita Stream (located 10 miles from the Study Area) representing the Los Angeles River watershed. The individuals from Santa Anita Stream had genetics that corresponded to rainbow trout raised at the Mount Whitney Fish Hatchery (Jacobsen et al. 2014).

Southern steelhead was not observed during the focused survey for fish conducted in 2019. Southern steelhead is not expected to occur in the Study Area or downstream from the Study Area. Access to the Study Area from downstream waters is blocked by impassable barriers of various types along the Los Angeles River and Arroyo Seco (e.g., Devil's Gate Dam, built in 1920, and an abandoned stream gage at Bridge 3). The species was not found during previous surveys conducted downstream from Devil's Gate Dam in the Arroyo Seco and Los Angeles River to the Pacific Ocean (Chambers Group 2010b). The Brown Mountain Dam is located approximately 3.5 miles upstream of the Study Area, which limits upstream movement. Additionally, the existing diversion dam and headworks structure in Area 1 are barriers to upstream movement.

The Southern California Steelhead Recovery Plan (NOAA 2012) describes priority actions for recovery of steelhead in the region, including the Los Angeles River basin. The Arroyo Seco watershed has a low ranking in relative viability for recovery. The Recovery Plan lists removal of barriers at dams, diversions, roads, and other structures as a priority action in the biogeographic region (NOAA 2012). Southern steelhead recovery in Arroyo Seco would involve modification of multiple flood control facilities and removal of multiple barriers between the project area and the ocean.

Arroyo Toad

Arroyo toad is federally listed as endangered and a CDFW SSC. The species is found in semi-arid areas near washes, sandy riverbanks, riparian areas, palm oasis, Joshua tree, mixed chaparral and sagebrush; stream channels for breeding (typically third order); adjacent stream terraces and uplands for foraging and wintering. Breeding habitat for the arroyo toad is created and maintained by the fluctuating hydrological, geological, and ecological processes operating in riparian ecosystems and the adjacent uplands. Periodic flooding that modifies stream channels, redistributes channel sediments, and alters pool location and form, coupled with upper terrace stabilization by vegetation, is required to keep a stream segment suitable for all life stages of the arroyo toad (66 FR 9413–9474). Periodic flooding helps maintain areas of open, sparsely vegetated, sandy stream channels and terraces (Sweet 1992; Griffin and Case 2001). During the day and other periods of inactivity, arroyo toads seek shelter by burrowing into sand (Sweet 1992). Thus, areas of sandy or friable (readily crumbled) soils are the most important habitat for the species, and these soils can be interspersed with gravel or cobble deposits (70 FR 19562–19633).

Arroyo toad was not observed during the focused survey for amphibians conducted in 2019 (see Appendix B). The species is not expected to occur in the Study Area, or upstream or immediately downstream from the Study Area. Marginal associated habitat is present and there is anecdotal evidence of arroyo toads along a small tributary of Arroyo Seco above Devil's Gate Reservoir in 1996 and in or near the settling ponds in the main channel above Devil's Gate Dam in 1997 and 1998 (USFWS 1999). The USFWS included this portion of the Arroyo Seco in the 2001 designation of critical habitat but it was not included in the 2005-revised designation of critical habitat, as there had been no sightings of the species since 1998. The population that historically occurred at this location are considered extirpated due to the loss of habitat and the introduction of predators and competitors (USFWS 2009). In addition, protocol surveys for the species conducted in 2013 for the majority of the Study Area were negative (BonTerra Psomas 2014e).

California Red-Legged Frog

California red-legged frog is federally listed as threatened and a CDFW SSC. The species is found in lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby, or emergent vegetation associated with deep, still or slow-moving water. It also uses adjacent uplands. Breeding must occur in aquatic habitats including streams, deep pools, backwaters within streams and streams, ponds, marshes, sag ponds, dune ponds, lagoons, and stock ponds. Red-legged frogs can occur in ephemeral ponds or permanent streams and ponds, but populations probably cannot persist in ephemeral streams (Jennings and Hayes 1985). Habitats with the highest densities of frogs are deep water ponds with dense stands of overhanging willows (*Salix* sp.) and a fringe of cattails (*Typha latifolia*) between the willow roots and overhanging willow limbs (Jennings 1988; Rathbun et al. 1993).

California red-legged frog was not observed during the focused survey for amphibians conducted in 2019 (see Appendix B). The species is not expected to occur in the Study Area, or upstream or immediately downstream from the Study Area. Marginal associated habitat is present, and the species was historically abundant in the Los Angeles River watershed, including Arroyo Seco, but it is considered extirpated from the system due to the loss of habitat and the introduction of predators and competitors (USFWS 2002). Protocol surveys for the species conducted in 2013 for the Study Area were negative (BonTerra Psomas 2014e).

Southwestern Willow Flycatcher

The willow flycatcher (*Empidonax traillii*), consisting of four or five subspecies, is the most widely distributed of the Empidonax flycatchers. It also has a sporadic breeding distribution throughout California, where three of the subspecies occur, including little willow flycatcher (*E. t. brewsteri*), *E. t. adastus* (which has no common name other than "willow flycatcher"), and southwestern willow flycatcher (*E. t. extimus*) (Craig and Williams 1998; Sedgwick 2000). The

different subspecies of willow flycatcher each occupy distinct breeding ranges and have subtle differences in color and morphology (Sogge et al. 1997), and possibly vocalizations.

Willow flycatchers are late spring migrants and have a breeding season of three months or less (Sedgwick 2000). The earliest spring arrival of the willow flycatcher in Southern California is typically between late April and early May. Along and near the California coast, migrations of *E. t. brewsteri* and *E. t. extimus* overlap, with *E. t. brewsteri* by far the more common subspecies. The numbers of E. t. brewsteri outweigh those of *E. t. extimus* so far that, unless detected at a known breeding site, it is almost certain that a willow flycatcher observed at a low elevation location in Southern California is *E. t. brewsteri,* although positive identification in the field to subspecies level may not be possible. When a willow flycatcher is observed in Southern California after about June 22, or if nesting activity is observed, it can be concluded that the individual is *E. t. extimus* (southwestern willow flycatcher). By this date, most migrant willow flycatchers have passed through Southern California; however, migrant willow flycatchers may again be observed—virtually always away from the coast—in late July as they pass through the region heading south to their wintering area (Sogge et al. 1997).

Southwestern willow flycatcher is a riparian-obligate species restricted to complex streamside vegetation. Four general habitat types are used by the species at its breeding sites: monotypic high elevation willow; exotic monotypes; native broadleaf-dominated riparian forest; and mixed native/exotic forests (Sogge et al. 1997). Of these, native broadleaf-dominated and mixed native/exotic are the primary habitats used by southwestern willow flycatcher in California. The native broadleaf-dominated habitat is composed of a single species, such as Goodding's willow (*Salix gooddingii*) or other willow (*Salix* spp.) species, or a mixture of broadleaf trees and shrubs, including cottonwood (*Populus* spp.), willow, box elder (*Acer negundo*), ash (*Fraxinus* spp.), and alder (*Alnus* spp.). Stands are usually three to 15 meters (10 to 50 feet) in height and are characterized by trees of different size classes, yielding multiple layers of canopy (Sogge et al. 1997). The vegetation of occupied nest sites includes dense patches interspersed with frequent small openings, open water, and a well-developed herbaceous layer, creating a habitat mosaic that is not uniformly dense (Sogge et al. 1997). Southwestern willow flycatcher nests typically occur in areas with multilayered vegetation and fairly closed (60% to 65%) tree canopy cover (Craig and Williams 1998).

There is marginal habitat for southwestern willow flycatcher in the Study Area; however, the species was not detected during the protocol surveys for the species conducted in 2019. Southwestern willow flycatcher was also not detected during protocol surveys in 2013 (BonTerra Consulting 2013) and 2016 (BonTerra Psomas 2016b). There are no CNDDB records for the species from the Arroyo Seco and only two for the species from Los Angeles County (Santa Clara River and Snow Spring) within the last 100 years (CDFW 2019a). Additionally, there are no eBird

records of *E. traillii* from the Arroyo Seco between late June and late July (eBird 2009), when southwestern willow flycatcher is known to nest in the region.

Least Bell's Vireo

Least Bell's vireo primarily occupies riverine riparian habitats along water, including dry portions of intermittent streams that typically provide dense cover within one to two meters (3.3 to 6.6 feet) of the ground, often adjacent to a complex, stratified canopy. Least Bell's vireo nesting habitats in cismontane and coastal areas include southern willow scrub, mulefat scrub, arroyo willow riparian forest edge, wild blackberry thickets, and, more rarely, cottonwood forest, sycamore alluvial woodland, and southern coast live oak riparian forest. Nests are typically built within approximately 1 meter (3.3 feet) of the ground in the forks of willows, wild rose (*Rosa* spp.), mulefat, or other understory vegetation (Franzreb 1989). Cover surrounding nests is moderately open mid-story with an overstory of willow, cottonwood (*Populus* spp.), western sycamore, or oak (*Quercus* spp.). Crown cover is usually more than 50% and contains occasional small openings. The most critical structural component to least Bell's vireo breeding habitat is a dense shrub layer at 0.6 to 3 meters (2 to 10 feet) above the ground (Goldwasser 1981; Franzreb 1989).

There is suitable habitat for least Bell's vireo in the Study Area and the species has been detected recently in the Hahamonga Wilderness Park to the south of the Study Area (eBird 2019). However, Least Bell's vireo was not detected during the protocol surveys for the species conducted in 2019. Least Bell's vireo flycatcher was also not detected during protocol surveys in 2013 (BonTerra Consulting 2013) and 2016 (BonTerra Psomas 2016b). The species does not have records within the Study Area or within the Arroyo Seco north of the Study Area (CDFW 2019a, eBird 2019).

5.5 Special-Status Species Habitat Assessment

The following describes the special-status plant and wildlife species that were observed or have been recorded in the vicinity of the Study Area during the surveys for the Project.

5.5.1 Special-Status Plant Species

No special-status plant species were documented in previous surveys of the Study Area. No special-status plants species were observed during Dudek's 2019 focused plant surveys, which were conducted during the blooming period and under conditions that would have allowed identification for species potentially present. Therefore, no special-status plant species were determined to have a moderate or high potential to occur in the Study Area. Appendix G of this BRTR, Special-Status Plant Species with Recorded Occurrences in the Project Vicinity, lists the special-status plants with

potential to occur at the Project site. Species that are either not expected to occur or have a low potential to occur are identified in Appendix G and are not analyzed further in this BRTR.

The dense canopy in Area 2 limits the understory development of herbaceous species. Area 3 has seen disturbances since at least 1952 related to the construction and maintenance of the spreading basins and parking lots for JPL (NETR 2019). This has removed much of the native habitats and disturbed the native soils and allowed for the introduction of numerous non-native plant species.

5.5.2 Special-Status Wildlife Species

One special-status wildlife species, yellow warbler (*Setophaga petechia*), was observed during the surveys in the Study Area. Four other species were recently observed during previous studies for the Project or adjacent projects: California newt (*Taricha torosa*), two-striped gartersnake (*Thamnophis hammondii*), southern California legless lizard (*Anniella stebbinsi*), and coastal whiptail (*Aspidoscelis tigris stejnegeri*) (BonTerra Psomas 2014a). One species has a moderate potential to occur in the Study Area: hoary bat (*Lasiurus cinereus*). Table 4, Special-Status Wildlife Species Present or with Medium or High Potential to Occur within the Study Area, summarizes the species that occur or have a moderate or high potential to occur. Species that are either not expected to occur or have a low potential to occur are indicated in Appendix H and are not analyzed further in this BRTR, with the exception of the subject fish, amphibians, and birds for which protocol or focused surveys were conducted for the project.

Table 4
Special-Status Wildlife Species Present or with Medium or High Potential to Occur within the Study Area

Scientific Name	Common Name	Status (Federal-State)	Habitat	Potential to Occur
		Amphibians		
Taricha torosa	California newt	None/SSC	Wet forests, oak forests, chaparral, and rolling grassland	Previously observed and assumed to be present. The species was observed during surveys for the Study Area in 2013 in the Arroyo Seco but was not observed in 2019. Suitable habitat is present within Area 2, and the species could be encountered on the Gabrielino Trail/Access Road to Area 2.

Table 4
Special-Status Wildlife Species Present or with Medium or High Potential to Occur within the Study Area

Scientific Name	Common Name	Status (Federal-State)	Habitat	Potential to Occur
Reptiles				
Anniella stebbinsi	Southern California legless lizard	None/SSC	Coastal dunes, stabilized dunes, beaches, dry washes, valley–foothill, chaparral, and scrubs; pine, oak, and riparian woodlands; associated with sparse vegetation and moist sandy or loose, loamy soils	Previously observed and assumed to be present. There are five recent (2017 and 2018) records from Study Area and adjacent areas of Hahamonga Park. Suitable habitat is present within Area 2 and Area 3, and it could be encountered on the Gabrielino Trail/Access Road to Area 2.
Aspidoscelis tigris stejnegeri	coastal whiptail	None/SSC	Hot and dry areas with sparse foliage, including chaparral, woodland, and riparian areas	Previously observed and assumed to be present. The species was observed during the 2013 surveys for the Study Area and suitable habitat for the species occurs throughout the Study Area and surrounding area.
Thamnophis hammondii	two-striped gartersnake	None/SSC	Streams, streams, pools, streams with rocky beds, ponds, lakes, vernal pools	Previously observed and assumed to be present. The species was observed during the 2013 surveys for the Study Area and suitable habitat for the species occurs throughout the Study Area and surrounding area.
Birds				
Setophaga petechia (nesting)	yellow warbler	None/SSC	Riparian plant associations in close proximity to water; frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders	Present. Observed during the 2019 surveys in the Study Area near Area 2.

Table 4
Special-Status Wildlife Species Present or with Medium or High Potential to Occur within the Study Area

Scientific Name	Common Name	Status (Federal-State)	Habitat	Potential to Occur
Mammals				
Lasiurus cinereus	hoary bat	None/None	Forest, woodland riparian, and wetland habitats; also juniper scrub, riparian forest, and desert scrub in arid areas; generally roosts in dense foliage of medium to large trees; preferred sites are hidden from above, with few branches below, and have ground cover of low reflectivity; females and young tend to roost at higher sites in trees	Medium potential to occur. Suitable associated day/night roosting, maternity roosts, and foraging habitat for the individuals of the species occurs within the Study Area, and there are records of the species from other watersheds within the San Gabriel Mountains that have similar habitat to Arroyo Seco.

Status:
State
SSC = Species of Special Concern

5.6 Potential Jurisdictional Waters

With respect to USACE-jurisdictional waters of the U.S., including wetlands, the USACE makes the jurisdictional determination. The USACE issues two types of jurisdictional determinations: preliminary and approved.[3] Both types of determinations require a submittal of a formal jurisdictional delineation report. CDFW and RWQCB also may request a site visit to review the jurisdictional delineation and may potentially change the limits of delineation. Therefore, the jurisdiction determinations provided in this technical report are preliminary and only identify the potential for jurisdictional areas to be affected by the Project in accordance with the CEQA thresholds.

[3] The USACE issues two types of JDs—preliminary and approved. A preliminary JD is an expedited process typically initiated at the time that a 404 permit is requested for impacts to federal jurisdictional waters; the preliminary JD is non-binding and does not involve USACE review. This process is used when the permittee does not wish to request a determination that some or all of the potentially jurisdictional waters on the Project site are isolated (under the Rapanos decision) or otherwise not subject to federal jurisdiction. An approved JD is requested through submittal of a JD report and the accompanying form. It requires USACE review of the report and application of the criteria used to request a non-federal JD.

As shown in Figure 7, Potential Jurisdictional Waters (Sheets 1 and 2), no wetlands were identified within the Study Area. Potential non-wetland jurisdictional waters identified in the Study Area include the Arroyo Seco, Millard Canyon Stream (a tributary to Arroyo Seco), and the spreading basins. The delineation of the Study Area identified a total of 0.79 acres of waters of the United States; 4.66 acres under RWQCB jurisdiction; and 6.44 acres under the jurisdiction of the CDFW present in the Study Area. Table 5, Potential Jurisdictional Waters Delineated within the Study Area, summarizes the jurisdictional waters in each portion of the Study Area.

Table 5
Potential Jurisdictional Waters Delineated within the Study Area

Area	USACE Jurisdiction Non- Wetland Waters of the U.S. (acres)	RWQCB Jurisdiction (acres)	CDFW Jurisdiction (acres)
Area 2	0.25	0.25	0.79
Area 3	0.42	4.29	4.64
Gabrielino Trail/Access Road	0.11	0.11	1.01
Travelling Screen Building Staging Area	—	—	<0.01
Behner Treatment Plant Staging Area	—	—	—
Total	**0.79**	**4.66**	**6.44**

Notes: Numbers may not sum due to rounding.

Non-wetland waters of the U.S. regulated by the USACE are drainage features that conduct water at some point during the year, evidenced by the presence of an OHWM, but do not satisfy the criteria to be considered a wetland (wetland soils and/or vegetation is absent). In the Study Area, there were areas of waters of the U.S. that had open water during the surveys and delineations. The limits of non-wetland waters of the U.S. are defined by the presence of the OHWM. Evidence of the OHWM in the survey area includes surface relief, scour lines, flowing water, and breaks in bank slopes.

The RWQCB jurisdictional boundaries are defined as those determined for the USACE under waters of the U.S. However, the RWQCB takes jurisdiction over both connected and isolated waters. Isolated features (those that do not have a direct connection to an already determined waters of the U.S.) are under the jurisdiction of the RWQCB, but not the USACE. The spreading basins in Area 3 are considered isolated waters since they have no downstream connection with the Arroyo Seco; therefore, they are under the jurisdiction of the RWQCB, but not the USACE.

The CDFW jurisdiction extends from the top of the bank to the top of the bank, except where there is adjacent riparian vegetation. CDFW jurisdictional areas include the Arroyo Seco and the spreading basins in Area 3. Riparian habitats in the Study Area under CDFW jurisdiction include white alder–California sycamore woodland Area 2 and along the norther portions of the Gabrielino

Trail/Access Road and arroyo willow–mulefat scrub associated with the Arroyo Seco adjacent to Area 3. Additionally, the portions of the coast live oak woodlands and California sycamore woodlands in Area 2 and along the northern portions of the Gabrielino Trail/Access Road that contain the top of banks of the Arroyo Seco are also included under CDFW jurisdiction. The spreading basins in Area 3 are primarily devoid of native vegetation.

5.7 Wildlife Corridors and Habitat Linkages

Wildlife corridors are linear features that connect large patches of natural open space and provide avenues for dispersal or migration of animals and dispersal of plants (e.g., through wildlife vectors). Wildlife corridors contribute to population viability by assuring continual exchange of genes between populations, which helps maintain genetic diversity; providing access to adjacent habitat areas representing additional territory for foraging and mating; allowing for a greater carrying capacity; and providing routes for colonization of habitat lands following local population extinctions or habitat recovery from ecological catastrophes (i.e., the rescue effect).

Habitat linkages are small patches that join larger blocks of habitat and help reduce the adverse effects of habitat fragmentation. They serve as connections between habitat patches and help reduce the adverse effects of habitat fragmentation. Although individual animals may not move through a habitat linkage, the linkage is a potential route for gene flow and long-term dispersal. Habitat linkages may serve as both habitat and avenues of gene flow for small animals such as reptiles, amphibians, and rodents. Habitat linkages may be represented by continuous patches of habitat or by nearby habitat "islands" that function as steppingstones for dispersal and movement (especially for birds and flying insects). Wildlife corridors and habitat linkages provide avenues for dispersal or migration of animals that also contribute to population viability in several ways, including (1) ensuring continual exchange of genes between populations to aid in maintaining genetic diversity, (2) providing habitat for some species, (3) providing access to adjacent habitat areas representing additional territory for foraging and mating, (4) allowing for a greater carrying capacity, and (5) providing routes for colonization of habitat lands following local population extinctions or habitat recovery from ecological catastrophes.

The Study Area does not reside within any designated wildlife corridors and/or habitat linkages identified in the South Coast Missing Linkages analysis project (South Coast Wildlands 2008) or California Essential Habitat Connectivity project (Spencer et al. 2010). On a regional level, the Study Area and Hahamongna Watershed Park form an open space area that is located just south of the ANF, which has large, continuous natural habitats. Urban development is located to the east, west, and south of this area, which includes the artificial channelization of Arroyo Seco. Larger, urban-adapted terrestrial wildlife (e.g., coyotes) are expected to pass through the Study Area and Hahamongna Watershed Park to the urban environment, but the Study Area is not part of a regional

corridor or habitat linkage between another large open space. On a local level, terrestrial wildlife would be expected to move between the ANF and the Hahamongna Watershed Park using the Study Area and the portions of the Arroyo Seco outside of the Study Area and downstream of the JPL bridge.

For potential aquatic species, the Study Area is in between two impassable barriers: Devil's Gate Dam downstream and Brown Mountain Dam upstream, which prohibits regional movement of fish in the Arroyo Seco. The majority of the Arroyo Seco Channel and Los Angeles River downstream of the Devil's Gate Dam consists of a concrete-lined channel and the majority of it does not provide suitable habitat for fish or other sensitive species (Chambers Group 2013). On a local level, the portion of the Arroyo Seco between the two dams, including Area 2, does provide habitat for fish, and if occupied by fish (no fish were detected during the focused fish survey conducted in 2019), it would be expected that there would be local movement between the two dams; however, the current diversion structure in Area 2, an abandoned stream gage at Bridge 3, and several concrete structures upstream of Area 2, including the headworks structure in the previous studied Area 1, would inhibit upstream movement.

Semi-aquatic species (western toad, California treefrog, Baja California treefrog, and California newts) can move overland, traveling in the uplands in upstream and downstream directions, as juveniles and adults after an aquatic larval phase. Downstream drift due to the stream current is the primary movement during the larval phase of amphibians. The existing artificial barriers within the Study Area are not expected to impede movement for these amphibian species.

5.8 City of Pasadena Trees and Tree Protection Ordinance

A total of 93 trees were inventoried within the Area 2 and Area 3 Study Areas, of which 49 are in Area 2, and 44 in Area 3. No tree in the project area meets the City definition of a "Landmark Tree." Figure 8, Protected Trees (Sheet 1 and 2), presents the location of the individual trees mapped and assessed for the proposed project. Overall, the trees exhibit growth and structural conditions that are typical of their location in a native riparian watershed setting prone to drought and wildfires. The trees include various trunk and branch maladies and health and structural conditions. As presented in Appendix I, Protected Tree Report, 34% of the individually mapped trees (32 trees) exhibit good health; 64% (59 trees) are in fair health; 2% (2 trees) are in poor health. Structurally, 5% (5 trees) of the individually mapped trees are considered to exhibit good structure, 88% (82 trees) exhibit fair structure, 7% (6 trees) poor structure. The trees in good condition exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Trees in fair condition are typical, with few maladies but declining vigor. Trees in poor condition exhibit declining vigor, unhealthy foliage, poor branch structure, and excessive lean. No pests or pathogens were observed on site.

6 PROJECT IMPACTS

This chapter addresses direct and indirect impacts to biological resources that would result from implementation of the proposed Project. The significance determinations for proposed or potential impacts are described in Chapter 7, Significant Impacts.

6.1 Definition of Impacts

6.1.1 Direct Permanent Impacts

Direct permanent impacts refer to the absolute and permanent physical loss of a biological resource due to clearing, grading, and/or construction of structures, which can be determined in four ways: (1) permanent loss of vegetation communities, land covers, and general wildlife and their habitat; (2) permanent loss of or harm to individuals of special-status plant and wildlife species; (3) permanent loss of suitable habitat for special-status species; and (4) permanent loss of wildlife movement and habitat connectivity.

6.1.2 Direct Temporary Impacts

Direct temporary impacts refer to a temporal loss of vegetation communities and land covers resulting from vegetation and land cover clearing. The main criterion for direct temporary impacts is that impacts would occur for a short period of time and would be reversible. Areas currently supporting native vegetation temporarily disturbed by construction activities would be restored and revegetated with a native species mix similar to that which existed prior to disturbance following completion of work in the area such that full biological function can be restored. Areas not currently supporting native vegetation would be adequately restored to prevent adverse effects such as erosion or establishment of invasive species following construction.

6.1.3 Indirect Impacts

Indirect impacts are reasonably foreseeable effects caused by Project implementation on remaining or adjacent biological resources outside the direct construction disturbance zone that may occur during construction (i.e., short-term construction related indirect impacts) or later in time as a result of the development (i.e., long-term, or operational, indirect impacts). Indirect impacts may affect areas within the defined Study Area, but outside the construction disturbance zone, including open spaces adjacent to the Gabrielino Trail/Access Road and to vegetation/wildlife habitats in downstream areas. Indirect impacts include short-term effects immediately related to construction activities and long-term or chronic effects related to the human occupation of

developed areas (i.e., development-related long-term effects) that are adjacent to naturalized areas.

For the proposed Project, it is assumed that the potential indirect impacts resulting from construction activities include fugitive dust from earthmoving activities, leaks or spills from construction equipment, noise from construction activities, and general human presence that may temporarily disrupt species and habitat vitality, as well construction-related soil erosion and runoff that could affect downstream resources.

6.1.4 Explanation of Findings of Significance

Impacts to sensitive vegetation communities or riparian habitat, special-status plant species, special-status wildlife species, wildlife corridors and habitat connectivity, and regional resource planning must be analyzed to determine whether such impacts are significant. CEQA Guidelines Section 15064(b) states that an ironclad definition of "significant" effect is not possible because the significance of an activity may vary with the setting. However, CEQA Guidelines Section 15065(a) lists impacts that are helpful in defining whether a project may have a significant effect on the environment. Mandatory findings of significance, which require preparation of an EIR, occur when there is substantial evidence that a project could: (1) substantially degrade the quality of the environment, (2) substantially reduce the habitat of a fish or wildlife species, (3) cause a fish or wildlife population to drop below self-sustaining levels, (4) threaten to eliminate a plant or animal community, or (5) reduce the number or restrict the range of a rare or endangered plant or animal.

The following are the significance thresholds for biological resources provided in the CEQA Appendix G environmental checklist, which states that a project would potentially have a significant effect if it:

- **Impact BIO-1**. Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as being a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by CDFW or USFWS?
- **Impact BIO-2**. Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by CDFW or USFWS?
- **Impact BIO-3**. Would the project have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including but not limited to marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

- **Impact BIO-4**. Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impedes the use of native wildlife nursery sites?
- **Impact BIO-5**. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?
- **Impact BIO-6**. Would the project conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?

The evaluation of whether or not an impact to a particular biological resource is significant must consider both the resource itself and the role of that resource in a regional context. Substantial impacts are those that contribute to, or result in, permanent loss of an important resource, such as a population of a rare plant or animal. Impacts may be important locally because they result in an adverse alteration of existing site conditions but considered not significant because they do not contribute substantially to the permanent loss of that resource regionally. The severity of an impact and the offsetting benefits of mitigation are the primary determinants of whether or not that impact can be mitigated to a less-than-significant level.

6.2 Impacts to Special-Status Species

No special-status plant species were observed during the focused surveys and none have a medium or high potential to occur. Therefore, neither direct temporary or permanent impacts, nor indirect impacts, are expected and impacts would be less than significant. No mitigation is required.

Appendix H indicates the special-status wildlife species that were detected or have high or moderate potential to occur within the Study Area. Direct impacts to special-status wildlife species were quantified by comparing the limits of the proposed Project footprint with suitable habitat for these wildlife species and are further discussed below.

6.2.1 Direct Impacts

Special-Status Amphibians and Reptiles

One special-status amphibian (California newt) and three reptiles (two-striped gartersnake, Southern California legless lizard, and coastal whiptail) have occurred in the Study Area. These species are all designated as CDFW SSC. Due to the presence of suitable habitat, and/or documented occurrences for these species within the vicinity of the Project site, there is potential for these species to occur on site. If these species are determined to occur on the Project site prior

to construction, Project-related impacts could be considered significant if the impact causes the greater population of either species to drop below self-sustaining levels. These species are vulnerable to mortality or injury if struck by moving vehicles or equipment if present on-site during construction. These species are also vulnerable to mortality or injury during vegetation and ground disturbing activities associated with construction because they tend to be cryptic, slow moving, and below ground or under rocks or debris during cooler periods. It is highly unlikely that short-term construction activities could cause the greater population of these special-status species to drop below self-sustaining levels due to the relatively small area of construction activity and the short-term nature of the construction schedule.

No direct temporary impacts would occur; however, because habitat loss and/or mortality or injury to individual species is a reasonable possibility, direct permanent impacts would be considered potentially significant.

Project implementation of **MM-BIO-1** (Pre-Construction Survey and Relocation Plan) would reduce potential direct impacts to special-status wildlife (California newt, two-striped gartersnake, Southern California legless lizard, and coastal whiptail) to a less-than-significant level through pre-construction surveys, avoidance, and potential relocation.

Special-Status and Nesting Birds

One special-status bird species (yellow warbler) has a moderate potential to nest and forage within the open shrublands throughout the Project site. This species is a CDFW SSC and there is a potential for this species to nest and/or forage within or immediately adjacent to the proposed development footprint. If this species is determined to occur on the Project site prior to construction, Project-related direct impacts would occur particularly if construction would result in direct impacts to nesting and foraging habitat for yellow warbler.

Additionally, the trees and shrubs within the Project site provide suitable nesting habitat for bird species (i.e., yellow warbler and raptors) protected under the Migratory Bird Treaty Act (MBTA; 16 USC 703-712) and California Fish and Game Code Sections 3503.5, 3503, and 3513. Trimming, pruning, and/or removal of trees and shrubs may occur as a result of construction of the project, and could disrupt breeding activity. There would be no direct temporary impacts; however, there may be a potential for a direct permanent impact to occur to nesting birds (i.e., direct impacts to individuals, active nests, eggs, or young), particularly during the general nesting season of February 1 through August 31. Construction activities that could result in direct impacts to nesting birds include vegetation and tree removal during grading activities. Project implementation of **MM-BIO-2** (i.e., seasonal recommendations, pre-construction survey, avoidance buffers, and monitoring) would reduce potential direct impacts to a less-than-significant level.

Special-Status Mammals

One special-status bat species (hoary bat) has a moderate potential for day/night roosting, maternity roosts, and foraging habitat within the Study Area. If this species is determined to occur on the Project site prior to construction, it is highly unlikely that short-term construction activities could cause the greater population of this special-status species to drop below self-sustaining levels due to the relatively small area of construction activity and the short-term nature of the construction schedule. No direct temporary impacts would occur; however, because habitat loss and/or mortality or injury to individual species is a reasonable possibility, direct permanent impacts would be considered potentially significant.

Project implementation of **MM-BIO-3** (i.e., seasonal recommendations, pre-construction survey, avoidance buffers, and monitoring) would reduce potential direct impacts to a less-than-significant level. Direct impacts to day roosts occupied by individual special-status bat species would be less than significant as the impact would not be expected to reduce populations to below self-sustaining levels.

6.2.2 Indirect Impacts

Potential short-term indirect impacts to special-status wildlife could result from fugitive dust and increased human activity. Noise generated by construction activities, including vegetation removal and grading, that would be conducted during the avian breeding season (February 1 through August 31), could result in indirect impacts to nesting birds. Noise related to these activities has the potential to disrupt reproductive and feeding activities. Nighttime construction is not expected for the Project, so indirect impacts on potentially foraging special-status bats is not expected. Potential temporary indirect impacts during construction may cause mortality due to the abandonment of an active nest and would be considered significant, absent mitigation. Project implementation of MM-BIO-3 (i.e., seasonal recommendations, pre-construction survey, avoidance buffers, and monitoring) would reduce these potential indirect impacts to a less-than-significant level. Long-term indirect impacts to special-status wildlife are not expected.

6.3 Impacts to Vegetation Communities and Land Covers

6.3.1 Direct Impacts

Direct permanent and temporary impacts to vegetation communities within the Study Area are summarized in Table 6a-6f and illustrated on Figure 9, Impacts to Vegetation Types (Sheets 1 and 2). Direct impacts were quantified by calculating the Project impact area, which was delineated

based on engineering plans that identified the limits of grading, within the boundaries of the vegetation communities mapped in the Study Area. Direct impacts to vegetation communities would occur as a result of earthwork and/or vegetation removal activities. There would be no direct permanent or temporary impacts to the use of the Gabrielino Trail/Access Road or North Arroyo Boulevard. There would only be temporary impacts to the Travelling Screen Building Staging Area and the Behner Treatment Plant Staging Area.

Table 6a
Total Permanent and Temporary Direct Impacts to Vegetation Communities and Land Covers within the Study Area

Vegetation Community/Land Cover Type	Direct Permanent Impacts (acres)	Direct Temporary Impacts (acres)	Not Impacted (acres)	Total (acres)
Native Vegetation Communities				
California sagebrush–California buckwheat–laurel sumac scrub association	0.22	0.47	9.72	10.41
Coast live oak woodland alliance	—	0.06	3.04	3.09
White alder–California sycamore woodland association[a]	0.39	0.11	0.38	0.88
California sycamore woodlands alliance[a]	0.01	0.01	0.23	0.24
Arroyo willow–mulefat scrub association[a]	—	—	0.10	0.10
Laurel sumac scrub alliance	0.11	0.06	0	0.17
California sagebrush–California buckwheat scrub alliance[a]	—	—	0.09	0.09
Subtotal	*0.72*	*0.59*	*13.69*	*14.98*
Non-Natural Land Cover Types				
Urban/developed	3.38	4.36	7.60	15.35
Disturbed habitat	3.10	1.78	1.94	6.83
Ornamental	—	—	0.22	0.22
Subtotal	*6.48*	*6.14*	*9.77*	*22.40*
Grand Total	**7.21**	**6.83**	**23.34**	**37.38**

Note: Numbers may not sum due to rounding.

[a] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

Table 6b
Area 2 Permanent and Temporary Direct Impacts to Vegetation Communities and Land Covers

Vegetation Community/Land Cover Type	Permanent Impacts (acres)	Temp. Impacts (acres)
Native Vegetation Communities		
California sagebrush–California buckwheat–laurel sumac scrub association	—	—
Coast live oak woodland alliance	—	—
White alder–California sycamore woodland association[a]	0.39	0.11
California sycamore woodlands alliance[a]	0.01	0.01
Arroyo willow–mulefat scrub association[a]	—	—
Laurel sumac scrub alliance	—	—
California sagebrush–California buckwheat scrub alliance[a]	—	—
Subtotal	*0.40*	*0.12*
Non-Natural Land Cover Types		
Urban/Developed	0.02	0.04
Disturbed Habitat	—	—
Parks and Ornamental Plantings	—	—
Subtotal	*0.02*	*0.04*
Area 2 Total	**0.41**	**0.16**

Note: Numbers may not sum due to rounding.

[a] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

Table 6c
Area 3 Permanent and Temporary Direct Impacts to Vegetation Communities and Land Covers

Vegetation Community/Land Cover Type	Perm. Impacts (acres)	Temp. Impacts (acres)
Native Vegetation Communities		
California sagebrush–California buckwheat–laurel sumac scrub association	0.22	0.45
Coast live oak woodland alliance	—	—
White alder–California sycamore woodland association[a]	—	—
California sycamore woodlands alliance[a]	—	—
Arroyo willow–mulefat scrub association[a]	—	—
Laurel sumac scrub alliance	0.11	0.06
California sagebrush–California buckwheat scrub alliance[a]	—	—
Subtotal	*0.33*	*0.50*

Vegetation Community/Land Cover Type	Perm. Impacts (acres)	Temp. Impacts (acres)
Non-Natural Land Cover Types		
Urban/Developed	3.36	3.51
Disturbed Habitat	3.10	1.78
Parks and Ornamental Plantings	—	—
Subtotal	*6.46*	*5.29*
Area 3 Total	**6.80**	**5.79**

Note: Numbers may not sum due to rounding.

[a] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

Table 6d
Gabrielino Trail/Access Road Permanent and Temporary Direct Impacts to Vegetation Communities and Land Covers

Vegetation Community/Land Cover Type	Perm. Impacts (acres)	Temp. Impacts (acres)
Native Vegetation Communities		
California sagebrush–California buckwheat–laurel sumac scrub association	—	—
Coast live oak woodland alliance	—	—
White alder–California sycamore woodland association[a]	—	—
California sycamore woodlands alliance[a]	—	—
Arroyo willow–mulefat scrub association[a]	—	—
Laurel sumac scrub alliance	—	—
California sagebrush–California buckwheat scrub alliance[a]	—	—
Subtotal	—	—
Non-Natural Land Cover Types		
Urban/Developed	—	—
Disturbed Habitat	—	—
Parks and Ornamental Plantings	—	—
Subtotal	—	—
Gabrielino Trail/Access Road Total	**—**	**—**

Notes: Numbers may not sum due to rounding.

[a] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

Table 6e
Travelling Screen Building Staging Area Permanent and Temporary Direct Impacts to Vegetation Communities and Land Covers

Vegetation Community/Land Cover Type	Perm. Impacts (acres)	Temp. Impacts (acres)
Native Vegetation Communities		
California sagebrush–California buckwheat–laurel sumac scrub association	—	—
Coast live oak woodland alliance	—	0.06
White alder–California sycamore woodland association[a]	—	—
California sycamore woodlands alliance[a]	—	—
Arroyo willow–mulefat scrub association[a]	—	—
Laurel sumac scrub alliance	—	—
California sagebrush–California buckwheat scrub alliance[a]	—	—
Subtotal	—	*0.06*
Non-Natural Land Cover Types		
Urban/Developed	—	0.04
Disturbed Habitat	—	—
Parks and Ornamental Plantings	—	—
Subtotal	—	*0.04*
Travelling Screen Staging Area Total	—	**0.09**

Note: Numbers may not sum due to rounding.

[a] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

Table 6f
Behner Treatment Plant Staging Area Permanent and Temporary Direct Impacts to Vegetation Communities and Land Covers

Vegetation Community/Land Cover Type	Perm. Impacts (acres)	Temp. Impacts (acres)
Native Vegetation Communities		
California sagebrush–California buckwheat–laurel sumac scrub association	—	0.02
Coast live oak woodland alliance	—	—
White alder–California sycamore woodland association[a]	—	—
California sycamore woodlands alliance[a]	—	—
Arroyo willow–mulefat scrub association[a]	—	—
Laurel sumac scrub alliance	—	—
California sagebrush–California buckwheat scrub alliance[a]	—	—
Subtotal	—	*0.02*

Vegetation Community/Land Cover Type	Perm. Impacts (acres)	Temp. Impacts (acres)
Non-Natural Land Cover Types		
Urban/Developed	—	0.82
Disturbed Habitat	—	—
Parks and Ornamental Plantings	—	—
Subtotal	—	*0.82*
Behner Treatment Plant Staging Area Total	**—**	**0.84**

Note: Numbers may not sum due to rounding.

[a] NatureServe Global and State rarity ranks per Faber-Langendoen et al. (2012). Natural communities with global or state ranks of 1–3 are considered Sensitive Natural Communities by CDFW and are to be addressed in the environmental review processes of CEQA (CDFW).

The proposed Project would have direct permanent impacts to two CDFW sensitive vegetation communities—white alder-California sycamore woodland association (0.39 acres) and California sycamore woodlands alliance (0.01 acres)—due to the construction of the diversion and intake replacement in Area 2. The Project would have direct temporary impacts to two CDFW sensitive vegetation communities—white alder-California sycamore woodland association (0.11 acres) and California sycamore woodlands alliance (0.01 acres)—due to the construction of the diversion and intake replacement in Area 2. This is due to potential encroachment into the dripline of the woodland without removal of the trees.

The white alder–California sycamore woodland and California sycamore woodlands alliance vegetation communities are considered sensitive by CDFW due to their relative rarity and therefore, the loss of these vegetation communities (both permanent and temporary) would be considered significant, absent mitigation. Project implementation of **MM-BIO-4** (i.e., preparation and implementation of a Habitat Restoration Plan; see Section 7 for the mitigation measures) would reduce potential direct impacts to a less-than-significant level.

Other vegetation communities and land cover types (California sagebrush–California buckwheat–laurel sumac scrub association, laurel sumac scrub alliance, urban/developed, and disturbed habitat) are not considered sensitive by CDFW because they are relatively common; therefore, the loss of these additional vegetation communities (both permanent and temporary) would be less than significant.

6.3.2 Indirect Impacts

Short-Term Indirect Impacts

Potential short-term or temporary indirect impacts to sensitive vegetation communities in the Study Area would primarily result from construction activities and include impacts related to or resulting from the generation of fugitive dust, increased human activity, and the introduction of

pollutants from construction equipment. Excessive dust can decrease the vigor and productivity of vegetation through effects on light, penetration, photosynthesis, respiration, transpiration, increased penetration of phytotoxic gaseous pollutants, and increased incidence of pests and diseases. Erosion and chemical pollution (releases of fuel, oil, lubricants, paints, release agents, and other project-related materials) may affect sensitive vegetation communities. The use of chemical pollutants can decrease the number of plant pollinators, increase the existence of non-native plants, and cause damage to and destruction of native plants. These potential short-term, construction-related indirect impacts could affect the sensitive vegetation communities in the Study Area.

Potential construction-related indirect impacts to sensitive vegetation communities would be less than significant with the implementation of **MM-BIO-5** (i.e., demarcation of disturbance limits and biological monitoring during construction).

Long-Term Indirect Impacts

The current operation of the diversion weir and intake allows for moderate flows in the stream to be diverted during the wet season; however, operations bypass the diversion of surface water during storm events where flows are generally greater than approximately 25 cfs to prevent excessive sediment from entering the spreading basins. During dry summer months, surface flows in the upper Arroyo Seco are sufficiently low to allow the City to divert virtually all surface flows in the stream.

Psomas conducted an analysis (Psomas 2018, provided as Appendix J, Arroyo Seco Canyon Diversions Biological Impacts Memorandum [Memo], to this BRTR) of the indirect Project impacts to downstream habitats due to the increase in the amount of water diverted to the spreading basins. The study took the conservative approach of analyzing project impacts by comparing it to a "without diversion" scenario, rather than the current diversion operations. This approach reflects the maximum possible change from existing conditions. This Memo included a hydraulics, sediment transport, and groundwater analysis, which provided the baseline for an analysis of potential ecological effects of flow diversions on downstream willow habitat (potential habitat occupied by least Bell's vireo) conducted by the Southern California Coastal Water Research Project (SCCWRP).

The study area for the analysis includes a portion of the upper Arroyo Seco from Devil's Gate Dam extending upstream to Area 2 (see Appendix J: Exhibit 1, Study Area). As the Arroyo Seco flows in a southerly direction past the existing diversion weir and past the JPL Bridge, the channel morphology changes from a narrow canyon to a wide alluvial plain. During high flow periods, surface flows can reach the Devil's Gate Reservoir, but during low flow periods in the drier months of the year, water infiltrates into the sandy sediment at the uppermost portion of the Reservoir.

Therefore, a lack of observed surface water doesn't necessarily correlate to insufficient moisture within the substrate for the riparian vegetation in the Reservoir (Psomas 2018).

During the wet periods or during episodic storms, surface water will flow from the upper Arroyo Seco into the Reservoir. Ongoing surface flows from the Arroyo Seco will result in standing water in the Reservoir. A review of historic aerial photos from Google Earth shows at least some surface water in the lower portion of the Reservoir in May 2003, January 2005, November 2005, March 2006, October 2007, January 2008, November 2009, and March 2011. Surface water is not observed in aerial photos subsequent to 2011, which corresponds to the severe drought conditions experienced in California from 2011 through 2016 (Psomas 2018).

The dominant vegetation community in the Devil's Gate Reservoir is Black Willow Series (Sawyer et al. 2009), in which Goodding's black willow *(Salix gooddingii*) is the dominant species (Chambers Group 2010). This vegetation type occurs throughout the lower portion of Devil's Gate Reservoir, correlated with the wettest conditions observed in an aerial photo analysis conducted. In general, the spatial distribution of vegetation in Psomas' study area is correlated to the hydrology of the area. Modest dry season surface flows occur immediately downstream of the diversion weir, which encourages establishment of facultative wetland species such as California sycamore and white alder. As less water is available further downstream in the dry season, the vegetation is dominated by upland-riparian transitional species, such as mule fat and coast live oak. The greatest density and extent of facultative wetland species such as Goodding's black willow occurs in the downstream portion of Devil's Gate Reservoir, where Devil's Gate Dam blocks surface and subsurface flows, resulting in more available water to vegetation behind the Dam (Psomas 2018).

Hydraulics, Sediment Transport, and Groundwater Analysis

A hydraulics, sediment transport, and groundwater analysis (Hydraulics Analysis) was prepared for the study area and is included as Attachment A to the Memo (Appendix J). The purpose of the Analysis was to evaluate the relative impact of the City's proposed management of diversions from the Arroyo Seco on riparian resources located downstream of the diversion structure. Hydraulic modeling assumed 100 percent efficiency in diversions in order to reflect the maximum reduced flow and thereby the maximum potential downstream habitat impacts (Psomas 2018).

The maximum depth of the pooled water within the Reservoir pool for the with-diversion scenario is reduced by approximately 1.3 feet in a dry year in comparison to the without-diversion scenario (Appendix J: Attachment A, Exhibit 7). A review of Exhibit 5 of Appendix J, Attachment A indicates that the cause of the decrease in maximum depth is likely due to the fact that the total runoff for the representative dry year without-diversions is approximately 2,480 acre-feet (af), while the hydrograph with diversions for the representative dry year is approximately 550 af.

Therefore, the difference in runoff volume accounts for the difference in maximum depths shown in Exhibit 7 of the Hydraulics Analysis (Appendix J: Attachment A). It is important to note that the area of inundation is approximately the same between the two scenarios owing largely to the shape of the Reservoir upstream of the Dam (Psomas 2018).

The maximum Reservoir pool water surface elevation for the representative average year without-diversion and representative average year with-diversions are approximately equal, with the WSE (water surface elevation) = 1,035 feet (Appendix J: Attachment A, Exhibit 9). In these scenarios, the factor that controls the depth and WSE is the operation of Devil's Gate Dam. Despite the same maximum depths, the with-diversion scenario has greater inundation durations at the Reservoir fringes because the depth reaches the operational curve elevation more slowly than does the without-diversion scenario (Psomas 2018).

Like the representative average year scenarios, the representative wet year maximum depth is the same in the with- and the without-diversion scenarios because the Dam operational curve is controlling the maximum depth in the Reservoir, approximately WSE=1,035 feet (Appendix J: Attachment A, Exhibit 11). Like the average year scenarios, the with-diversion scenario has greater inundation durations at the Reservoir fringes because the with-diversion scenario Reservoir depth reaches the operational curve elevation more slowly than does the without-diversion scenario (Psomas 2018).

A review of regional groundwater data indicates that the distance to groundwater within the Reservoir area is substantially greater than the depth of the tree root zones and consequently would not be expected to have an effect on rootzones of the riparian habitat within the Reservoir. Studies associated with the Devil's Gate Sediment Removal Project support the reported groundwater elevation with measured average depth to ground water of over 100 feet and depth to a subsection of a perched aquifer greater than 20 feet (Psomas 2018).

Within the upstream section of Psomas' study area, between the diversion point and the JPL bridge, the model showed little or no measurable change in hydraulic conditions (such as depth, velocity, inundation area, and shear) with project diversions. However, factors influencing the hydraulics are markedly different in this high gradient mountainous section versus the low gradient downstream areas. The stream is much narrower and does not expand with increasing flows due to the constrictions of the hardened canyon walls and granite boulders in the mountainous section. Increasing volume of water from storms have a greater effect on flow velocity as water exits the mountains and less of an effect on increasing area of pooling or the duration of pooling. This is consistent with the model findings showing little change with project diversions in the upstream segment (Psomas 2018).

The upstream area also behaves differently during low flows. The hydraulic model assumptions limit the lowest modeled flow to 1 cfs. Therefore, flows below 1 cfs are not included in the modeling analysis, but are considered here. During times of low flow, the role of groundwater is substantially different between the low gradient downstream area and the high gradient upstream area. Within the upstream section of the Arroyo Seco, subsurface water (i.e. groundwater) is very shallow and often just below the streambed surface, even in areas that appear dry on the surface. Due to the steep gradient, this groundwater moves downstream through the substrate as a subsurface flow beneath the streambed. Furthermore, this section of the Arroyo Seco is considered a "gaining" stream indicating that surface flows increase moving downstream due to upwelling of subsurface flows. Upwelling occurs when subsurface flows move around less permeable sections of substrate and reach the surface to become surface pools or flows for segments of the stream and may penetrate more permeable substrate further downstream and return to subsurface flow or continue downstream as surface flow for long distances. Evidence of the intermingling of surface and subsurface flowing can often be seen from just below the diversion point downstream to an A-frame bridge (Bridge 3) where subsurface upwelling occurs at low points in the stream (Psomas 2018).

Groundwater within the low gradient portion of the study area, downstream of the JPL bridge, is very deep. The extensive alluvial deposits allow water to readily migrate through and downward until reaching the water table approximately 100 feet below the surface. Low flows that make it downstream and past the JPL bridge are only visible on the surface for short distances before penetrating the sediment to become subsurface flow and quickly dropping vertically. Consequently, low flow in the Psomas study area is not expected to be influenced by groundwater to any measurable degree due to the distance between surface flows and the groundwater table (Psomas 2018).

Ecological Modeling Study

An Ecological Modeling Study was prepared for Psomas' study area and is included as Attachment B to the Memo (Appendix J). The ecological effects of flow diversions were assessed based on modeled relationships between hydraulic changes described in the Analysis and the probability that the resultant physical conditions can support southern willow riparian habitat conditions conducive to occupancy by least Bell's vireo.

All hydraulic variables tested showed significant statistical differences (p value <0.001) in willow occurrence between predicted future conditions and historic flow characteristics. However, given the small sample size of vegetation polygons, inherent to the relatively small size of the Project (see Appendix J: Exhibit 2, Excavation Limits of the LACDPW Devil's Gate Sediment Removal Project), and the high number of hydraulic observations (over 18,000), it is believed the

significance estimates may be overestimated. The significant overlap in distributions of occurrence and the large AIC[4] value substantiate this suspicion (Psomas 2018).

As depicted in Figure 4 of the Ecological Modeling Study (Appendix J: Attachment B), the model predicts a negative correlation between increasing velocity and willow habitat presence. Expected changes in velocity are illustrated in Exhibits 3a-3f, Modeled Change in Maximum Velocity Due to Proposed Project, of the Memo (Appendix J). This is because willow habitat favors areas where water infiltrates the soil; higher velocities mean lower infiltration, and thus do not favor willow presence. A similar result is predicted for shear stress, so that as shear stress increases, the model predicts a decreased probability in willow occurrence. Depth shows an increase in willow probability as water depth increases. Due to implementation of the Project, willows may increase in the channel (narrow linear flow upstream of the Reservoir pool) and decrease in the Reservoir pool as water recedes and depth decreases. This translates into an increase in the probability of willow occurrence in areas where occurrence was high and a decrease in the probability of willow occurrence where the occurrence was low. The most pronounced decrease predicted is a 13.8% decline in probability of occurrence in the lower basin, near the spillway, associated with a slight decrease in depth and duration of inundation. This is offset by a 6.6% increase in probability of occurrence at the margins of the basin, also associated with change in depth and duration of inundation. This gives a net change in the probability of willow occurrence of less than 10%. (Psomas 2018).

Impact of Diversions on Vegetation/Habitat

Changes in the hydrological regime of stream systems have been shown to result in changes in vegetation structure and composition. The shifts in vegetation related to changes in hydrology is based upon: (1) the degree of fluctuations in groundwater levels; (2) the depth of root systems of existing vegetation; and (3) the resulting potential of invasive species establishment to displace native vegetation. The concept behind this relationship is that minor fluctuations in groundwater levels will not affect the presence of phreatophytic vegetation if the root systems of those plants are deep enough to access water in the phreatic zone (zone of saturation) or the capillary fringe (zone above the saturation area where water fills soil pore spaces through capillary motion and is available for plant uptake). However, if groundwater levels drop below the maximum depth of the root zone for a sufficient amount of time, then those plants are susceptible to be displaced by other species. Factors that affect the depth of roots include the genetic ability of each plant to produce deep roots, the soil type and the depth to which gas exchange is possible, and available water and nutrients. Additionally, root depth has been shown to be affected by fluctuations in the water table

[4] The Akaike Information Criterion [AIC] is an estimator of the relative quality of statistical models and provides a measure of the relative information not well represented by the model. It represents the balance between goodness of fit and model complexity (Psomas 2018).

as significant fluctuations encourage species to elongate deep roots to access waters (Psomas 2018).

Therefore, the principal question is whether the proposed Project's diversions would cause an increase in the depth to groundwater that is available for willows and cottonwoods. As shown in Exhibit 4, Baseline Hydrology Example, of the Memo (Appendix J), changes to groundwater levels should not extend beyond the maximum depths to groundwater within the root zone of phreatophytic species to maintain their presence (Psomas 2018).

Willow habitat in the Reservoir is characterized by persistent coverage of mature willow trees, though aerial photo analysis indicates that the extent of willow coverage varies over time, likely in response to annual variability in precipitation and inflows from the upper Arroyo Seco. Little change is observed in the lowest portions of the Reservoir (downstream end) while coverage appears to vary slightly at the upper portions of the Reservoir. Because the accumulated sediment in the Reservoir is mainly comprised of sandy material, the willow tree rhizosphere likely reaches the maximum root depth of approximately seven feet below grade. The lack of a persistent herbaceous understory suggests that the depth to groundwater for much of the year is at least two feet, since herbaceous species roots generally extend less than two feet below grade. Therefore, the depth to groundwater likely fluctuates in the range of two to seven feet in the lower end of the Reservoir. It should be noted that the groundwater at these elevations does not represent the upper limit of the groundwater aquifer, which occurs approximately 300 feet below the surface in the Reservoir riparian areas as described previously. Based on topography, the shallower groundwater is expected to result from subsurface flows from the San Gabriel Mountains, which flow south off the mountains and on to the Montrose/La Canada valley floor then to the east flowing downhill, towards the Arroyo Seco, until eventually reaching the deposited sediments within the Reservoir (Psomas 2018).

Generally, surface flows will reach the Reservoir area during and after significant rain events during the winter months. Vegetation in the Reservoir will utilize this water as it ponds and saturates the uppermost soil layers. The presence of Devil's Gate Dam is the dominant influence to the hydrology of Psomas' study area because it blocks surface and subsurface flows to downstream areas thus increasing the time that subsurface water is available to trees in the Reservoir. Additionally, the Reservoir is a collection area for subsurface water that flows from the upper Arroyo Seco area, as well as from the Montrose/La Canada slope to the west. Some of these inflows support the riparian tree species that occupy the Reservoir area (Psomas 2018).

Due to the highly variable precipitation in the region and the resulting variability in surface flows in the upper Arroyo Seco, identifying the typical flow regime is difficult. As discussed above, surface flow rates in the wet season can range from approximately 1 cfs to more than 200 cfs. The Analysis (Appendix J: Attachment A) categorizes precipitation data for the Psomas' study area as

either wet, average, or dry years. The maximum inundation zone in the Reservoir was shown to minimally fluctuate during wet, average, or dry years, (see Appendix J: Exhibits 5a-5c, Modeled Change in Maximum Inundation Due to Proposed Project). The maximum flood zone for the Reservoir is determined by the management of Devil's Gate Dam, as any water that would exceed the maximum surface elevation of 1,035 feet is released downstream. Areas that would not be flooded during maximum inundation levels consist of a narrow band along the margins of the inundation footprint that measures 2.1 acres. As discussed in the Hydraulics Analysis, while the footprint of the inundated area during dry years is less than average or wet years, the duration of inundation along these fringes is increased in the with-diversions scenario. Inundation duration in dry years is increased by diversions because the amount of runoff required to initiate dam operations is increased. Overall, the hydraulics model indicates that any reduction to the inundation footprint is infrequent (occurring only during dry years) and duration period is slightly increased on the fringes (Psomas 2018).

The Hydraulic Analysis also discusses the effect on water velocities. The Ecological Modeling Study indicates that increasing water velocities result in lower water infiltration into the soil, and this reduces the probability of willow establishment. However, the Hydraulic Analysis indicates that the effects of water diversion on velocity are small overall and in some cases the change in velocity from diversions is a decrease from existing conditions (see Appendix J: Exhibit 3a-3f). Therefore, no changes to the extent of willow habitat is expected to occur from modelled velocity changes (Psomas 2018).

The Hydraulic Analysis also indicates that proposed stream diversions are expected to be an unimportant factor to overall sediment transport potential because the controlling elements of sediment transport are geologic factors. Large runoff events typically drive sediment movement in southern California streams; since no diversions are proposed during peak events, the Project is not expected to affect stream sediment yield to the Reservoir. In fact, the design of the proposed crest gate diversion weir is expected to enhance sediment transport because the gate will be placed in the down position during peak flow events to prevent impediments to sediment transport, which occur presently by the diversion weir (Psomas 2018).

As described above, the hydrology of the Arroyo Seco is highly variable. The Ecological Modeling Study indicates that water depth and duration of inundation correlate most highly with changes in the extent of willow riparian habitat in the Reservoir. Because the rainfall and resulting stream flows can vary so dramatically in the Arroyo Seco and because willow riparian habitat is dependent on available water, it stands to reason that the extent of willow habitat would mirror the dynamics of the site hydrology. Therefore, changes in the willow habitat that may result from proposed diversion changes during dry year conditions would likely be temporary (due to the high growth rate of the species and the likelihood that dry year conditions would be followed by average or wet year conditions) and within the normal range of variability of the system (Psomas 2018).

Changing Existing Conditions

The Memorandum considered the change in existing conditions downstream due to the LACDPW Devil's Gate Dam Sediment Removal Project, which began after the completion of the study. A large portion of the riparian vegetation within areas potentially affected by the Project is not expected to exist when hydraulic changes resulting from Project diversions would occur. Additionally, the surface elevation of a large portion of the Reservoir area will be lowered as the LACDPW's sediment removal project excavates accumulated sediments over the course of the coming years. As a result, a much greater volume of water will be contained within a deeper pool in a smaller area of the Devil's Gate Dam Reservoir. It is expected that pool margins will recess accordingly towards the center of the pool and away from riparian habitat occurring at and beyond current maximum pool margins. Therefore, small changes in hydraulics at the margins of the pooled areas of the Reservoir resulting from Project diversions are not likely to occur within or adjacent to existing riparian woodland habitat at pool margins. In summary, the minimal potential effects on riparian habitat resulting from future Project diversions, as described in previous sections, are further reduced due to changing existing conditions that would occur due to the Devil's Gate Sediment Removal Project (Psomas 2018).

Conclusion

Downstream reduced flows associated with Project diversions are not expected to result in any measurable effects on downstream riparian habitat. Project studies examining existing conditions within Psomas' study area and potential changes in hydraulics, sediment transport, and ground water coupled with ecological modeling and habitat requirements all provide support of this conclusion (Psomas 2018). Additionally, changing future conditions further reduce potential Project effects. Mitigation would therefore not be required because there would be no impacts to hydrology or biological resources in the context of the CEQA.

6.4 Impacts to Potential Jurisdictional Wetlands and Waters

6.4.1 Direct Impacts

There are no potential jurisdictional wetlands on the Project site. Arroyo Seco and the spreading basins are potentially regulated by the USACE, RWQCB, and/or CDFW. The proposed Project would result in direct temporary and/or permanent impacts to these potentially jurisdictional waters, as summarized below. Direct impacts include discharge of fill (i.e., grading and construction/reconstruction of structures) to potentially jurisdictional waters, which would alter the size, scope, and character of these aquatic resources and therefore would be significant, absent mitigation. Table 7, Permanent and Temporary Direct Impacts to Jurisdictional Waters, includes

the acres of permanent and temporary impact, which are illustrated in Figure 10, Impacts to Jurisdictional Resources (Sheets 1 and 2).

Table 7
Permanent and Temporary Direct Impacts to Potential Jurisdictional Waters

Jurisdictional Waters	Direct Permanent Impacts (acres)	Direct Temporary Impacts (acres)
Area 2		
USACE waters of the United States	0.17	0.03
RWQCB waters of the state	0.17	0.03
CDFW streambed, bank, and riparian vegetation	0.38	0.09
Area 3		
USACE waters of the United States	—	—
RWQCB waters of the state	1.79	0.59
CDFW streambed and bank	1.81	0.60
Gabrielino Trail/Access Road		
USACE waters of the United States	—	—
RWQCB waters of the state	—	—
CDFW streambed, bank, and riparian vegetation	—	—
Travelling Screen Building Staging Area		
USACE waters of the United States	—	—
RWQCB waters of the state	—	—
CDFW streambed, bank, and riparian vegetation	—	<0.01
Behner Treatment Plant Staging Area		
USACE waters of the United States	—	—
RWQCB waters of the state	—	—
CDFW streambed, bank, and riparian vegetation	—	—
Project Total		
USACE waters of the United States	**0.17**	**0.03**
RWQCB waters of the state	**1.96**	**0.62**
CDFW streambed and bank[a]	**2.19**	**0.69**

Note: Numbers may not sum due to rounding.
a. white alder–California sycamore woodland (0.45 acres) and coast live oak woodland (<0.01 acres)

Direct impacts to Area 3 as tabulated above include the existing spreading basins. However, the proposed Project design in Area 3 includes the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of stream flows for infiltration. The new spreading basins are expected to have the same function as the basins being impacted. As such, the Project would result in a net increase of 3.64 acres for in-kind waters of the State and a net increase of 3.61 acres for in-kind CDFW jurisdictional areas in Area 3, as shown in Table 8, Jurisdictional Waters Created by Project Design. Maintenance of the new spreading basins would continue to be accomplished by mechanically removing the top layer of soil and disking or

harrowing the exposed surface to loosen any soil compaction caused by cleaning, which is reflective of current maintenance activities.

Table 8
Jurisdictional Waters Created by Project Design in Area 3

Jurisdictional Waters	Direct Permanent Impacts (acres)	Direct Temporary Impacts (acres)	Total Impacts (acres)	Created Jurisdictional Waters (acres)	Net Difference (acres)
Area 3					
USACE waters of the United States	—	—	—	—	—
RWQCB waters of the State	1.79	0.59	2.38	6.02	+3.64
CDFW streambed, bank	1.81	0.60	2.41	6.02	+3.61

Potential permanent and/or temporary direct impacts to potential jurisdictional waters in Area 2 would be reduced to less than significant with the implementation of MM-BIO-5 and **MM-BIO-6** (i.e., on-site restoration and/or land acquisition, mitigation program funding, and/or mitigation bank credits). Consultation with, and permit issuance from, USACE, RWQCB, and CDFW may result in higher mitigation ratios and specific criteria for restoration beyond the minimum standards presented in this mitigation.

6.4.2 Indirect Impacts

Potential temporary indirect impacts to potential jurisdictional waters in the Study Area would primarily result from construction activities and would include impacts from the generation of fugitive dust and the introduction of chemical pollutants (including herbicides). Excessive dust can decrease the vigor and productivity of vegetation through effects on light, penetration, photosynthesis, respiration, transpiration, increased penetration of phytotoxic gaseous pollutants, and increased incidence of pests and diseases. Erosion and chemical pollution (releases of fuel, oil, lubricants, paints, release agents, and other construction materials) may affect wetlands/jurisdictional waters. The release of chemical pollutants can reduce the water quality downstream and degrade adjacent habitats. However, during construction, erosion-control measures would be implemented as part of the Storm Water Pollution Prevention Plan (SWPPP) for the Project. Prior to the start of construction activities, the Contractor is required to file a Permit Registration Document (PRD) with the State Water Resources Control Board (SWRCB) in order to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with the Construction and Land Disturbance Activities (Order No 2009-009-DWQ, NPDES No. CAS000002) or the latest

approved general permit. This permit is required for earthwork that results in the disturbance of one acre or more of total land area. The required SWPPP will mandate the implementation of best management practices (BMPs) to reduce or eliminate construction-related pollutants in the runoff, including sediment. Therefore, temporary indirect impacts would be less than significant due to compliance with regulations.

Please see the discussion in Section 6.2.2 regarding indirect long-term impacts to hydrology and vegetation due to the increased water diversion by the Project.

6.5 Impacts to Wildlife Corridors and Habitat Connectivity

Short-Term Construction Impacts

The proposed Project could potentially cause temporary direct and indirect impacts to the use of the Study Area by terrestrial wildlife moving from the ANF to the Hahamonga Watershed Park due to construction within Area 2 and Area 3. However, the impact would be less than significant since there are currently no fish within Arroyo Seco, as described in Section 5.3.1 of this BRTR, and semi-aquatic (amphibians) and terrestrial wildlife (reptiles and mammals) would still be able to use adjacent natural sloped areas along the Arroyo Seco and the Gabrielino Trail/Access Road to avoid construction areas. The Arroyo Seco wash would not be obstructed from Area 2 to Hahamonga Watershed Park, which would allow existing wildlife species to utilize the streambed and avoid the spreading basin construction in Area 3.

Long-Term Operational Impacts

Potential long-term operational impacts to movement of native resident or migratory fish or wildlife species or the use of native wildlife nursery sites may occur if the proposed Project includes substantial adverse effects, compared to current conditions, in one of the following areas:

1. Terrestrial species movement around the proposed diversion structure (in both upstream and downstream directions)

2. Aquatic and semi-aquatic movement over the diversion structure (in both upstream and downstream directions)

3. Aquatic and semi-aquatic movement through the diversion intake (in a downstream direction)

The proposed Project would not result in a substantial change to existing movement conditions for terrestrial wildlife, given that the proposed structures and other improvements are substantially similar in size and location to the existing condition.

Given that the current diversion structure does not include screens and the proposed Project includes a drum screen or vertical screen with automatic brush cleaning system at the intake structure, which would follow CDFW published design criteria to prevent aquatic and semi-aquatic wildlife from entering into the conveyance system, the proposed Project would not have an adverse effect on aquatic and semi-aquatic movement through the diversion intake.

Therefore, potential long-term operational impacts are related to aquatic and semi-aquatic movement over the diversion structure. Factors that affect suitability for movement include existing natural and proposed Project features such as, channel bank slope gradients, vegetative cover, surface flow conditions, subsurface (i.e., groundwater) conditions, the height of the diversion structure relative to stream elevations upstream and downstream of the diversion, and presence/absence of fish screens in the diversion intake.

Based on the data gathered from the USGS gaging station from 1990 through 2019, the average in-stream flows are 6,890 acre-feet/year (ft/yr). Using these years of data to represent the current condition of diverting when stream flows are 25 cubic feet per second (cfs) or less, the City diverts an average of 2,045 acre-ft/yr. Under the proposed Project, the City would be able to divert approximately 3,080 acre-ft/yr, resulting in approximately 1,035 acre-ft/yr of additional diverted flows into the spreading basins. These proposed increased diversions would result in a measurable increase in diversion only during larger wet-weather flows. There would be little to no difference in diversions between the current condition and the proposed Project during the drier periods of the year. Aquatic and semi-aquatic movement within surface waters would therefore only be affected during larger wet-weather flows. This impact is less than significant because the decreased wet-weather flow would remain sufficient to allow upstream and downstream movement by species currently occupying the Project Area (see additional discussion below regarding existing and future fish and amphibian species).

With regards to subsurface flows (i.e., groundwater), as previously described in Section 6.3.2 of this BRTR, within the upstream section of the Arroyo Seco, subsurface water is very shallow and often just below the streambed surface, even in areas that appear dry on the surface. Due to the steep gradient, this groundwater moves downstream through the substrate as a subsurface flow beneath the streambed. As such, although surface flows are not always present, subsurface flows can be assumed present. The present condition of subsurface flow below the diversion weir would be maintained by constructing a modified structure at similar depth to the current structure. Therefore, the proposed Project would not affect suitability of habitat for movement due to the lack of change the project would have to groundwater.

In addition, the current aged and ineffective diversion weir structure results in negligible seepage (or "weeping") of flows through the flashboards. During the drier periods of the year when low stream flows are fully diverted, the seepage has been estimated to be 0.1 to 0.2 cfs. While the current seepage is not sufficient to establish habitat for aquatic or semi-aquatic wildlife movement, the Project will allow for a similar release of flows through a valved bypass pipe from the intake structure. Therefore, there would be no change to this condition.

Fish Movement (Current Conditions)

As previously discussed in Section 5.3.1 of this BRTR, there are no fish present in the Arroyo Seco Canyon in the current condition. No fish were observed during the 2019 surveys for the Project, including the focused fish survey (see Appendix C) that included all waters from the surface water terminus at the southern end in the Arroyo Seco wash adjacent to Area 3 to the Brown Mountain Dam. There was an incidental sighting of rainbow trout during the focused amphibian surveys conducted in 2013, but its provenance was not determined (BonTerra Psomas 2014e). Therefore, the proposed Project replacement of the existing diversion structure and intake facility would not result in a substantial impediment to the movement of native resident or migratory fish species, because of the absence of fish in the current condition, and impacts would be less than significant.

If fish were present in the Study Area in the current condition, the current diversion operations which lacks a fish screen, would result in fish being transported downstream to be potentially stranded in isolated pools of water (the spreading basins or in the reach between the diversion and the JPL Bridge), or lost when passed into Devil's Gate Reservoir where flows spread out and habitat is unsuitable. The loss of connectivity and isolation of pools occurs primarily during the late summer/early fall months when there are periods of low to zero flows in the stream above the diversion (stream flows are below 1 cfs 35% of the year, and drop to zero about 10% of the time). This lack of water is the primary barrier for fish movement from about the JPL Bridge upstream where substrate and cover is good, but water is lacking. Below the JPL Bridge the flatter sediment load of the reservoir is open to solar heating, is dominated by finer substrates, and cover and pools are rare or absent. Also, the stream is subject to frequent dry conditions due to loss of aboveground flow as the channel emerges from the canyon into the alluvium, where water flow is primarily subterranean. During moderate flows, partial temporal barriers may be present in the canyon segment of the stream due to steep channel segments and step-pool or bedrock drops preventing upstream fish passage. Therefore, if fish were to be present, their movement would be restricted and they may perish due to isolation or stranding. The proposed Project will include fish screens to prevent isolation in the spreading basins and can be operated in a manner that excludes fish from the downstream reaches during diversion. The effects of the proposed Project related to downstream drift/movement are beneficial (i.e., no significant impact) due to inclusion of fish screens and proposed operations.

CDFW Coordination

The CDFW submitted a comment letter on the scope and content of the Draft EIR during the Notice of Preparation (NOP) public review period for this proposed Project and requested an evaluation to determine whether the Project would prevent or impede fish passage during low flow conditions. The cited Fish and Game Code section 5901 makes it unlawful to construct or maintain in any streams any device that prevents, impedes, or tends to prevent or impede the passing of fish up and downstream. In addition Fish and Game Code section 5937 is cited and requires the owner of any dam to allow sufficient water at all times to pass through a fishway or in the absence of a fishway, allow sufficient water to pass over, around or through the dam, to keep in good condition any fish that may be planted or existing below the dam.

While no fish are currently present, the City's general approach to the proposed Project is to plan for future conditions with the ability to operate the Project based on present conditions for fish. Under present conditions, an in-stream flow of about 0.5 cfs would be released to match the estimated leakage from the existing weir, and flows above this, up to the full 25 cfs water right, would be diverted when possible. The operation will exclude fish from the downstream reach under most conditions and from the diversion using fish screens designed to meet CDFW criteria for salmonid fry. Because, flows will pass over the crest gates when streamflow is greater than about 25 cfs and when the gates are lowered at higher flows, the City proposes that a monitoring program be developed to confirm that fish are not present in the reach downstream of the diversion after these conditions occur.

For a future condition where fish return or are reintroduced to the Arroyo Seco under present channel conditions, there are still several barriers to fish migration and survival that influence proposed operations. As such, operations would not be altered from those proposed under the present condition, i.e. fish would continue to be excluded from passing downstream the diversion and no minimum in-stream flows would be proposed. Under these conditions, the monitoring program would continue and would include a program to rescue fish between the diversion and JPL Bridge. During high flows when the gate is lowered, a roughened channel section downstream will allow upstream passage of future fish. Roughened channels are an accepted method of providing passage for steelhead trout in CDFW's Salmonid Stream Restoration Manual (CDFG 2010), requiring site specific design and review. The roughened channel configuration proposed is a channel approximately the width of the active channel in adjacent stream segments (upstream and downstream), with an asymmetric v-shaped cross section to concentrate lower flows and provide adequate depth. Compared to other potential types of upstream passage features, the roughened channel type has the advantage of providing a range of velocities and depths at a given flow rate. Thus, smaller or weaker swimming native fish and other aquatic organisms could pass along the margins of the channel or near the bottom, using spaces in the bed material for hydraulic cover. Additionally, revegetation for the Project would include biotechnical stabilization and

riparian planting on the west and east banks along the roughened channel providing coverage for wildlife. The combination of screening and monitoring/rescue would significantly reduce risk for any resident populations compared to existing diversion operations and would assist in maintaining populations upstream of the diversion

Under a future condition with restored anadromy, the City proposes to significantly alter diversion operations to allow for upstream and downstream fish passage (see Future Conditions for Fish section below).

Until such time, however, the proposed Project would result in an improvement to the existing condition and impacts related to potential aquatic and semi-aquatic species movement are less than significant.

Amphibian Movement (Current Conditions)

As discussed, in Section 5.3.2 of this BRTR, there are several amphibian species present in the Arroyo Seco, including western toad (*Anaxyrus boreas*), California treefrog (*Pseudacris cadaverina*), and Baja California treefrog (*Pseudacris hypochondriaca*). These amphibian species are primarily terrestrial and would not be hindered beyond the current condition with the implementation of the proposed Project. Importantly, amphibian populations would potentially benefit from the proposed Project due to the inclusion of the drum screen or a vertical screen with automatic brush cleaning system at the intake structure, which would follow CDFW published design criteria to prevent aquatic and semi-aquatic wildlife from entering into the conveyance system and becoming stranded in the spreading basins.

When the diversion is in operation during periods of low flow, downstream drift for larval amphibians would be prohibited and would prevent larva from being stranded downstream. When high flows spill over the raised gate, adult, juvenile, and larval amphibians would pass downstream, and adults and juveniles would be expected to move upstream along the western slope. The limits of the roughened channel would extend to the edge of the diversion structure to allow amphibians to pass along the side without leaving the stream corridor. When the weir is completely lowered its sill elevation will follow the stream's general profile, creating a smooth transition to the roughened channel section downstream and allowing for upstream passage. The maximum elevation of the weir when raised would not be higher in elevation than the existing diversion structure, and the elevation of the pool of water at the intake would not exceed existing levels. Therefore, the Project would not affect existing overland routes for semi-aquatic species in either upstream or downstream directions. Amphibians would continue to have the same routes for passage as in the existing condition.

Therefore, replacement of the existing diversion structure and intake facility with an enhanced facility in the same location would not result in a substantial change from existing conditions and would not substantially impede the movement of amphibians beyond the current pre-Project condition and impacts would be less than significant.

Future Conditions for Fish

The proposed Project has been designed in consideration of a future condition where fish are re-established in the Arroyo Seco. However, it is the City's position that under present conditions that includes periods of low to zero flows, the unsuitability of Devil's Gate Dam habitat and lack of passage, and barriers to upstream passage, downstream fish passage is undesirable. With the goal of excluding fish from the downstream reaches during diversions under present conditions, the proposed new diversion structure would be designed for the possibility that some future fish may pass downstream when the diversion is not operating (i.e., during periods of higher flows when the gate is lowered to allow flows to continue downstream without diversion) or when the diversion is operating and flows are high enough to spill over the crest gate. The roughened channel would allow for upstream passage when the weir crest gate is lowered.

A further condition for the future will occur when connectivity is re-established for passage through Devil's Gate Dam (i.e. removal of the dam or construction of a fish-ladder), connecting the upper and lower Arroyo Seco to the Los Angeles River and ultimately, the Pacific Ocean. This circumstance would potentially allow for the reintroduction of the southern steelhead (*Oncorhynchus mykiss irideus*), which is federally listed as endangered. In streams, the species uses habitat consisting of relatively cool, well-oxygenated water with adequate depth and cover. Steelhead require relatively clean unconsolidated gravel and cobble for spawning. Steelhead have an ecological or migratory life cycle called anadromy, in which adults mature in the ocean and must return to freshwater to spawn. However, until such time as safe connection to suitable downstream habitat or to the ocean can be provided, a bypass fishway is not proposed as part of the Project. If access for steelhead is re-established, however, the Project can accommodate a future bypass fishway and maintenance of minimum flow conditions to allow for upstream passage while the diversion is in operation.

As previously discussed, the Southern California Steelhead Recovery Plan (NOAA 2012) describes priority actions for recovery of steelhead in the region, including the Los Angeles River basin. The Arroyo Seco watershed has a low ranking in relative viability for recovery. The Recovery Plan lists removal of barriers at dams, diversions, roads, and other structures as a priority action in the biogeographic region (NOAA 2012). Southern steelhead recovery in Arroyo Seco would involve modification of multiple flood control facilities and removal of multiple barriers between the Project area and the ocean. Importantly, the removal of Devil's Gate Dam or modifications to allow fish passage both up and downstream would be a major undertaking.

Nevertheless, in this potential future scenario, the proposed Project design may not comply with Fish and Game Codes 5901 and/or 5937. Therefore, **MM-BIO-7** (Native Resident and Migratory Fish Monitoring Plan preparation and implementation) is recommended to be responsive to the CDFW comment letter received during the NOP review period for this Project to allow for the future use of the Study Area as a movement corridor for native resident or migratory fish species.

6.6 Impacts to City of Pasadena Protected Trees

6.6.1 Direct Impacts

Direct impacts to trees can be classified as a removal or encroachment. Trees are identified for removal when they are located within the permanent impact boundary. Trees are identified as encroachment if the tree canopy is within 5 feet of the permanent impact boundary, or if the tree trunk is within 15 feet of the permanent impact boundary. Direct impacts to encroachment trees include root damage, soil excavation and compaction, grade changes, loss of canopy, and trunk wounds, among others.

Direct tree impacts would result in the removal of 19 protected trees in total, of which all are located in Area 2. A total of 15 protected trees are expected to be encroached upon (11 trees in Area 2 and 4 trees in Area 3). No trees are anticipated to be removed in Area 3. See Table 9, Area 2 - Protected Trees Direct Permanent Impacts, Table 10, Area 3 - Protected Trees Direct Permanent Impacts, and Figure 11, Impacts to Protected Trees (Sheets 1 and 2) for direct permanent impacted protected tree locations.

Table 9
Area 2 - Protected Trees Direct Permanent Impacts

Native Tree Species		**Number of Trees**	
Scientific Name	*Common Name*	*Removal*	*Encroachment*
Alnus rhombifolia	white alder	15	5
Platanus racemosa	California sycamore	0	2
Populus trichocarpa	*black cottonwood*	0	1
Quercus agrifolia	coast live oak	3	2
Quercus chrysolepis	canyon live oak	0	1
Salix nigra	black willow	1	0
Total		**19**	**11**

Table 10
Area 3 - Protected Trees Direct Permanent Impacts

Native Tree Species		Number of Trees	
Scientific Name	*Common Name*	*Removal*	*Encroachment*
Platanus racemosa	California sycamore	0	1
Quercus agrifolia	coast live oak	0	3
Total		**0**	**4**

Impacts to these trees would be significant, absent mitigation, in accordance with the City's Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code). Project implementation of **MM-BIO-8** (i.e., i.e., tree replacement and protection) would reduce potential direct impacts to a less-than-significant level. Additionally, the City will follow the City's Tree Protection Guidelines established for projects subject to Chapter 8.52 and prepared by the City Manager (City of Pasadena 2019b). Applicable mandatory measures from the Guidelines that would be applied to construction of the proposed Project are generally summarized below to include, but not be limited to:

P-313-1.5 Protection of Trees on City Property

> (1) A tree protection zone (TPZ) shall be defined as the drip line of the tree plus four (4) radial feet;
>
> (2) Protective (6-foot high minimum) chain-link fencing with an access gate of minimal width should be installed around the TPZ to the extent practicable subject to approval by staff prior to the commencement of any grading, construction, or demolition. Fencing must also include 8 ½" x 11" (minimum) signage that includes the following information: Tree Protection Zone; name and contact information of project owner or authorized representative; and "Please contact the Pasadena Citizen Service Center to report any concerns (626) 744-7311;
>
> (3) All work conducted in the ground within the TPZ of any protected tree should be accomplished with hand tools, unless an air spade is utilized. Trenches in the TPZ should be tunneled or completed with an air spade to avoid damage to roots within the TPZ.
>
> (4) Any required trenching should be routed in such a manner as to minimize root damage. Radial trenching (radial to the tree trunk) is preferred as it is less harmful than tangential trenching. Construction activity should be diverted from the TPZ. Cutting of roots should be avoided (i.e. place pipes and cables below uncut roots). Wherever possible and in

accordance with applicable code requirements, the same trench should be used for multiple utilities.

(5) No construction staging or disposal of construction materials or byproducts including but not limited to paint, plaster, or chemical solutions is allowed in the TPZ.

6.7.2 Indirect Impacts

Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Site-wide changes affecting trees include diverting runoff and stormwater, creating retention and detention ponds, relocating streams or making improvements to streams, lowering or raising water tables, altering the capacity for soil moisture recharge, removing vegetation, or damming underground water flow (Matheny and Clark 1998). Indirect tree impacts may potentially occur to 13 additional protected trees.

Indirect impacts could potentially result in tree mortality adjacent to the Project work areas, which would be significant, absent mitigation, under the City's Tree Ordinance. Project implementation of MM-BIO-7 would reduce potential indirect impacts to a less-than-significant level.

6.7 Impacts to Regional Resource Planning

6.7.1 Direct Impacts

The Study Area does not occur within any proposed or approved HCPs or NCCPs, and outside the ANF boundaries. Therefore, the proposed Project would not result in a significant direct temporary or permanent impacts to any HCPs/NCCPs or other biological resources protected by regional resource planning. No impacts would occur and no mitigation is required.

6.7.2 Indirect Impacts

Due to the lack of mapped HCPs/NCCPs, within and immediately adjacent to the Study area, there would be no significant indirect temporary or permanent impacts to any HCPs/NCCPs. The Study Area is located near the ANF, which is managed by the Angeles National Forest Land Management Plan (ANF 2005), but since the Study Area is downstream, no indirect impacts to the ANF are expected and no mitigation is required.

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7 MITIGATION

The following mitigation measures shall be implemented during the proposed Project to reduce the significant impacts identified in Chapter 6 to a less-than-significant level.

7.1 Impact BIO-1: Special-Status Species

Significant direct and indirect impacts to special-status species can be mitigated to less than significant with implementation of the following measures:

MM-BIO-1 Direct Impacts to Terrestrial Special-Status Wildlife.

Special-Status Wildlife Relocation Plan. Prior to commencement of any earthmoving activities or the pre-construction staging of equipment on the Project site, the City shall develop a Preconstruction Survey and Relocation Plan for terrestrial reptiles, including the California newt, two-striped gartersnake, Southern California legless lizard, and coastal whiptail. The Preconstruction Survey and Relocation Plan shall be submitted to the California Department of Fish and Wildlife (CDFW) for review prior to any ground-disturbing activities within potentially occupied habitat.

The Plan shall include at a minimum, the following: (1) protocols for pre-construction surveys to flush out and/or move identified special status wildlife within the study area, as feasible; (2) the timing, frequency, and locations where surveys should be conducted; (3) the habitat and conditions in the proposed relocation site(s); (4) the methods that would be used for trapping and relocating identified species; (5) protocols for documentation/recordation of the species and number of animals relocated; and (6) protocols for notifying CDFW in the event that identified species cannot be relocated.

The Plan shall require that a Biological Monitor be present during initial vegetation clearance activities within Areas 2 and 3, as well as twice weekly until ground disturbing activities are completed. The Biological Monitor shall also be familiar with least Bell's vireo and shall conduct pre-clearing non-protocol surveys for this species while onsite. If a least Bell's vireo or other State of federally listed species is detected, work activity within 200 feet of the detected occupied habitat will be temporarily halted and the City will consult with the appropriate wildlife agencies. With authorization from these agencies, which may include a 'take' permit, the project will proceed in accordance with conditions developed in the consultation. Conditions will include avoidance and

minimization measures to prevent or minimize impacts on the listed species(s) occurring on or adjacent to the site.

The Plan shall require that any individual special-status terrestrial wildlife species observed within the study area during the pre-construction survey(s) shall be flushed out and/or moved out of harm's way to avoid direct impacts to these species, and if special-status species are detected, the Biological Monitor shall capture and relocate individuals to nearby undisturbed areas with suitable habitat outside of the construction area, but as close to their origin as possible. The final recordation/documentation of any wildlife relocated during Project activities shall be made available to CDFW for confirmation that construction activities were executed in compliance with the approved Preconstruction Survey and Relocation Plan.

MM-BIO-2 Direct and Indirect Impacts to Special-Status and Nesting Birds.

Nesting Bird Avoidance. Project construction shall be conducted in compliance with the conditions set forth in the Migratory Bird Treaty Act (MBTA) and California Fish and Game Code with methods approved by California Department of Fish and Wildlife (CDFW) to protect active bird/raptor nests. To the maximum extent feasible, vegetation removal shall occur during the non-breeding season for nesting birds (generally late September to early March) and nesting raptors (generally early July to late January) to avoid impacts to nesting birds and raptors. If the Project requires that work be initiated during the breeding season for nesting birds (March 1–September 30) and nesting raptors (February 1–June 30), in order to avoid direct impacts on active nests, a pre-construction survey shall be conducted by a qualified Biologist for nesting birds and/or raptors within 3 days prior to clearing of any vegetation and/or any work near existing structures (i.e., within 300 feet for nesting birds and within 500 feet for nesting raptors). If the Biologist does not find any active nests within or immediately adjacent to the impact areas, the vegetation clearing/construction work shall be allowed to proceed.

If the Biologist finds an active nest within or immediately adjacent to the construction area and determines that the nest may be impacted or breeding activities substantially disrupted, the Biologist shall delineate an appropriate buffer zone around the nest depending on the sensitivity of the species and the nature of the construction activity. Any nest found during survey efforts shall be mapped on the construction plans. The active nest shall be protected until

nesting activity has ended. To protect any nest site, the following restrictions to construction activities shall be required until nests are no longer active, as determined by a qualified Biologist: (1) clearing limits shall be established within a buffer around any occupied nest (the buffer shall be 100–300 feet for nesting birds and 300–500 feet for nesting raptors), unless otherwise determined by a qualified Biologist and (2) access and surveying shall be restricted within the buffer of any occupied nest, unless otherwise determined by a qualified Biologist. Encroachment into the buffer area around a known nest shall only be allowed if the Biologist determines that the proposed activity would not disturb the nest occupants. Construction can proceed when the qualified Biologist has determined that fledglings have left the nest or the nest has failed.

MM-BIO-3 Direct and Indirect Impacts to Special-Status Bats

Bat Roost Avoidance. A Biological Monitor shall conduct a pre-construction bat habitat assessment of buildings and trees marked for potential removal. Potential for roosting shall be categorized by 1) potential for solitary roost sites, 2) potential for colonial roost sites (10 bats or more). If the potential for colonial roosting is determined, those trees shall not be removed during the bat maternity roost season (March 1 – July 31). Trees potentially supporting colonial roosts outside of maternity roost season, and trees potentially supporting solitary roosts may be removed via a two-step removal process, whereby some level of disturbance (such as trimming of lower branches) (at the direction of Biological Monitor) is applied to the tree on day one to allow bats to escape during the darker hours, and the roost tree shall be removed two days later (i.e., there shall be no less or more than two nights between initial disturbance and the grading or tree removal). When feasible, trees will be dropped slowly and a Biological Monitor will monitor the activity. If buildings are determined to be occupied, one-way exclusionary devices will be placed over bat access points and left in place for two nights prior to building removal.

7.2 Impact BIO-2: Sensitive Vegetation Communities

Significant direct and indirect impacts to sensitive vegetation communities can be mitigated to less than significant with implementation of the following measures:

MM BIO-4 Direct Impacts to Sensitive Vegetation Communities.

Direct impacts to sensitive communities (white alder–California sycamore woodland association and California sycamore woodlands alliance) shall be mitigated through a combination of on-site and/or off-site measures. Mitigation for impacts to sensitive vegetation communities shall consider and overlap with compensation for jurisdictional waters (MM-BIO-6) since the sensitive vegetation is associated with the jurisdictional limits of Arroyo Seco. Mitigation for direct impacts to sensitive vegetation communities shall be implemented through on-site creation/enhancement, program funding, mitigation bank credits, and/or creation/enhancement of native vegetation communities on City lands. Mitigation acreages shall be implemented as shown in Table 11, Mitigation for Direct Impacts to Sensitive Vegetation Communities.

Table 11
Mitigation for Direct Impacts to Sensitive Vegetation Communities

Sensitive Vegetation Community	Direct Impacts (acres)	Mitigation Ratio	Mitigation (acres)
white alder–California sycamore woodland association	0.47	3:1	1.41
California sycamore woodlands alliance	0.04	3:1	0.12
Totals:	**0.51**	**—**	**1.53**

On-site Mitigation. Prior to the issuance of a grading permit or any earthwork on the Project site, PWP shall prepare a Habitat Mitigation and Monitoring Plan (HMMP) for habitat enhancement and creation activities. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. The HMMP shall include restoration of the following habitats:

Riparian Woodlands. Impacted areas of white alder–California sycamore woodland association and California sycamore woodlands alliance shall be created/restored within and adjacent to the same on-site areas that the woodland currently existed prior to Project implementation, as well as other areas deemed to have appropriate soils and topography for successful establishment. Understory areas shall be revegetated with a diversity of locally collected seeds.

Temporary irrigation shall be established and maintained, with irrigation suspensions in times of rainfall. Successful establishment of the woodland shall be determined only after removal of irrigation system and confirmed ability of the woodland to survive in the absence of irrigation.

It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the City, CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the City and the three agencies.

Off-site Mitigation. If mitigation is implemented through mitigation program funding and/or mitigation bank credits, the Project Applicant shall work with the City, CDFW, USACE, and RWQCB to ensure the mitigation program funding and/or mitigation bank credits are appropriate to offset permanent impacts. Mitigation lands shall be comprised of similar or higher quality riparian woodland and preferably located in the vicinity of the site or watershed.

If mitigation is implemented through offsite enhancement of City-owned lands, PWP shall prepare a HMMP that details the location and existing conditions of the offsite lands. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the City, CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the City and the three agencies.

MM-BIO-5 Indirect Impacts to Sensitive Vegetation Communities.

Demarcation of Disturbance Limits. To prevent inadvertent disturbance to sensitive vegetation communities outside the limits of work, the construction limits shall be clearly demarcated (e.g., installation of flagging or temporary high visibility construction fence) prior to ground disturbance activities. All construction activities including equipment staging and maintenance shall be conducted within the marked disturbance limits.

Monitoring. A qualified biologist shall be present during initial ground-disturbing activities within the Project Site to ensure that Project activities stay within the demarcated limits.

7.3 Impact BIO-3: Jurisdictional Wetlands and Waters

Significant direct and indirect impacts to jurisdictional waters can be mitigated to less than significant with implementation of the following measures and MM-BIO-5:

MM-BIO-6 Direct and Indirect Impacts to Jurisdictional Waters

Mitigation for direct impacts to jurisdictional waters shall be implemented through on-site enhancement of remaining jurisdictional waters and/or off-site acquisition, program funding, and/or mitigation bank credits. Mitigation ratios for each type of jurisdictional waters is shown in Table 12, Mitigation for Direct Impacts to Potential Jurisdictional Waters. Mitigation for temporary and permanent impacts to jurisdictional wetlands and waters shall consider and overlap with compensation for sensitive vegetation communities (MM-BIO-4).

Table 12
Mitigation for Direct Impacts to Potential Jurisdictional Waters

Jurisdictional Waters Type	Direct Impacts (acres)	Mitigation Ratio	Mitigation (acres)[a]
USACE waters of the United States	0.18	1:1	0.18
RWQCB waters of the state	2.57	1:1	2.57
CDFW streambed and bank, with riparian vegetation[b]	0.48	3:1	1.35
CDFW streambed and bank, with non-riparian habitat[c]	2.41	1:1	2.41

Notes:

a Mitigation areas for each jurisdictional type may overlap

b white alder–California sycamore woodland (0.48 acres) and coast live oak woodland (<0.01 acres)

c California sagebrush–California buckwheat–laurel sumac scrub (<0.001 acres); urban/developed (0.03 acres); disturbed habitat (2.38 acres); laurel sumac scrub (<0.01 acres)

On-site Mitigation. Prior to the issuance of a grading permit or any earthwork on the Project site, PWP shall prepare a HMMP for habitat enhancement and creation activities. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. The HMMP shall include restoration of the following habitats:

Riparian Woodlands. Impacted areas of white alder–California sycamore woodland association and coast live oak woodland shall be created/restored within and adjacent to the same on-site areas that the woodland currently

existed prior to Project implementation, as well as other areas deemed to have appropriate soils and topography for successful establishment. Understory areas shall be revegetated with a diversity of locally collected seeds. Temporary irrigation shall be established and maintained, with irrigation suspensions in times of rainfall. Successful establishment of the woodland shall be determined only after removal of irrigation system and confirmed ability of the woodland to survive in the absence of irrigation.

It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the three agencies.

Off-site Mitigation. If mitigation is implemented through mitigation program funding and/or mitigation bank credits, PWP shall work with the CDFW, USACE, and RWQCB to ensure the mitigation program funding and/or mitigation bank credits are appropriate to offset permanent impacts. Mitigation lands shall be comprised of similar or higher quality riparian woodland and preferably located in the vicinity of the site or watershed.

If mitigation is implemented through offsite enhancement of City-owned lands, PWP shall prepare a HMMP that details the location and existing conditions of the offsite lands. The HMMP shall at a minimum include a feasible implementation structure, salvage/seeding details, invasive species eradication methods, irrigation system and schedule, a monitoring schedule, performance standard of success, estimated costs, and identification of responsible entities. It is anticipated that a one-time restoration effort followed by monitoring and invasive weed removal for a minimum of five (5) years would be required. The HMMP shall be submitted to the CDFW, USACE, and RWQCB for review and comment, and revised to the satisfaction of the three agencies.

7.4 Impact BIO-4: Habitat Linkages and Wildlife Corridors

Project design features in Area 2 would improve the ability of existing aquatic and semi-aquatic species to move up and downstream at the location from the current conditions. To determine if there are changes to future use of the Study Area as a movement corridor for native resident or migratory fish species, the following measure would be implemented:

MM-BIO-7 Direct and Indirect Impacts to Habitat Linkages and Wildlife Corridors

Native Resident and Migratory Fish Monitoring Plan. Prior to the commencement of earthmoving within Area 2 for the demolition of the existing diversion/weir structure, the City shall develop a Native Resident and Migratory Fish Monitoring Plan (Monitoring Plan), in consultation with CDFW. This Monitoring Plan shall set forth annual monitoring requirements to determine if native fish species or migratory fish populations are present within an approximate 3,500-foot section of the stream (about 1,500 feet upstream of the diversion/weir structure to the abandoned headworks (Area 1) and 2,000 feet downstream to the JPL Bridge at the mouth of the canyon). Annual survey protocols shall be established to the satisfaction of CDFW and set forth in the Monitoring Plan. If the results of the annual surveys reveal a positive presence of native fish, the Monitoring Plan shall set forth thresholds for determining the permanency of the population, and whether or not connectivity both upstream and downstream of the diversion structure is appropriate and in the best interest of the long-term survival of an established native or migratory fish population, given hazards associated with stranding downstream. Until passage for steelhead is restored to the Arroyo Seco, the City shall implement a program to rescue fish between the diversion structure and the JPL Bridge. If rescue is determined to be ineffective or impractical, then the City shall modify its operations to accommodate passage. At such time as steelhead passage is restored, the City shall alter either the design of the diversion/weir structure, the operational methods of the diversion/weir structure, or both to satisfy Fish and Game Code Sections 5901 and 5937.

7.5 Impact BIO-5: Local Policies or Ordinances

Significant direct and indirect impacts to City protected trees can be mitigated to less than significant with implementation of the following measures:

MM-BIO-8 Direct and Indirect to City of Pasadena Protected Trees

Tree Replacement and Protection. A qualified biologist shall be present during initial ground-disturbing activities within the Project site to ensure that Project activities stay within the demarcated limits, as required in MM-BIO-5. This qualified biologist shall identify the number of City-protected trees that are removed as a result of Project construction activities, as well as trees that would be encroached upon. This inventory of trees shall be used to determine an appropriate tree replacement program that shall be, at a minimum, consistent with the City's

Tree Ordinance (Chapter 8.52 of the Pasadena Municipal Code) and the Ordinance's administrative guideline replacement matrix, as it relates to tree replacement of protected trees. as it relates to tree replacement of protected trees.

Trees within approximately 15 feet of proposed construction activity shall be temporarily fenced with chain-link fencing in accordance with the City's Tree Ordinance and Tree Protection Guidelines. The fencing shall be installed to the extent of the tree's dripline plus four (4) radial feet and be minimum six (6) feet high with an access gate of minimal width. The fenced area shall be considered the TPZ unless proximate construction required temporary removal.

All trees that have been substantially root pruned (30% or more of their root zone) during construction within the TPZ shall be monitored by an International Society of Arboriculture Certified arborist for the first five years after construction completion. The arborist shall submit an annual report, photograph each tree and compare tree health and condition to the original, pre-construction baseline. For trees that do not survive the five-year monitoring period, such trees shall be replaced in accordance with the requirements of this measure.

7.6 Impact BIO-6: Habitat Conservation Plan

Because no significant impacts would occur as a result of the proposed project (see Section 6.7), no mitigation is required.

7.7 Level of Significance After Mitigation

Implementation of these mitigation measures will reduce potential impacts to biological resources to below a level of significance.

One special-status amphibian (California newt) and three special-status reptiles (two-striped gartersnake, Southern California legless lizard, and coastal whiptail) have occurred in the Study Area. Construction activities associated with the proposed Project could cause direct mortality of these species. MM-BIO-1 requires the development of a special-status wildlife relocation plan, pre-construction focused special-status wildlife surveys, and monitoring during initial ground-disturbing activities. Potential direct impacts to California newt, two-striped gartersnake, Southern California legless lizard, and coastal whiptail would be less than significant with implementation of MM-BIO-1.

Construction activities associated with the proposed project could result in a loss of suitable habitat or direct take of birds, and are considered less than significant. MM-BIO-2 requires nesting bird surveys within 300 feet (500 feet for raptors) of the proposed impact areas and if active nests are found, the biologist shall establish buffers and/or implement monitoring to avoid impacting avian nesting success. Potential direct impacts to protected nesting birds would be less than significant with implementation of MM-BIO-2.

One special-status bat (hoary bat) has a moderate potential to occur in the Study Area. Construction activities associated with the proposed Project could cause direct mortality of these species. MM-BIO-3 requires seasonal avoidance, pre-construction roost survey, and roost monitoring. Potential direct impacts to hoary bat would be less than significant with implementation of MM-BIO-3.

Significant direct and indirect temporary and permanent impacts to sensitive vegetation communities (coast live oak woodland alliance and white alder–California sycamore woodland association) would occur due to implementation of the Project. MM-BIO-4 requires that temporary impacts to sensitive vegetation communities be completed through on-site rehabilitation. MM-BIO-4 requires that permanent impacts sensitive vegetation communities be completed by the purchase of credits from a mitigation bank, the purchase of in lieu credits from an in-lieu fee program, and/or through the enhancement of native vegetation communities on City lands. MM-BIO-5 avoids indirect impacts to sensitive vegetation communities by requiring the demarcation of the disturbance limits. Impacts to sensitive vegetation communities and jurisdictional waters would be less than significant with implementation of MM-BIO-4 and MM-BIO-5.

Significant direct and indirect temporary and permanent impacts to potential jurisdictional waters would occur due to implementation of the Project. MM-BIO-6 requires that temporary impacted jurisdictional waters be restored and permanent impact compensation be completed by the purchase of credits from an agency-approved mitigation bank or purchase of in lieu credits from an in-lieu fee program and/or through the preparation and implementation of habitat restoration plan. MM-BIO-5 avoids indirect impacts to jurisdictional waters by requiring the demarcation of the disturbance limits. Impacts to jurisdictional waters would be less than significant with implementation of MM-BIO-5 and MM-BIO-6.

Significant direct and permanent impacts to potential wildlife corridors for fish if fish are ever reestablished within the Arroyo Seco. MM-BIO-7 would require the preparation and implementation of a Native Resident and Migratory Fish Monitoring Plan. Impacts to fish movement would be less than significant with implementation of MM-BIO-7.

Direct impacts would occur, and indirect impacts may occur, to trees protected by the City of Pasadena Trees and Tree Protection Ordinance. MM-BIO-8 requires the replacement of the removed trees per a City-defined ratio and the fencing to shield protected trees located in close

proximity to construction activities and requires monitoring of trees that have sustained substantial root zone pruning. Impacts to protected trees would be less than significant with implementation of MM-BIO-8.

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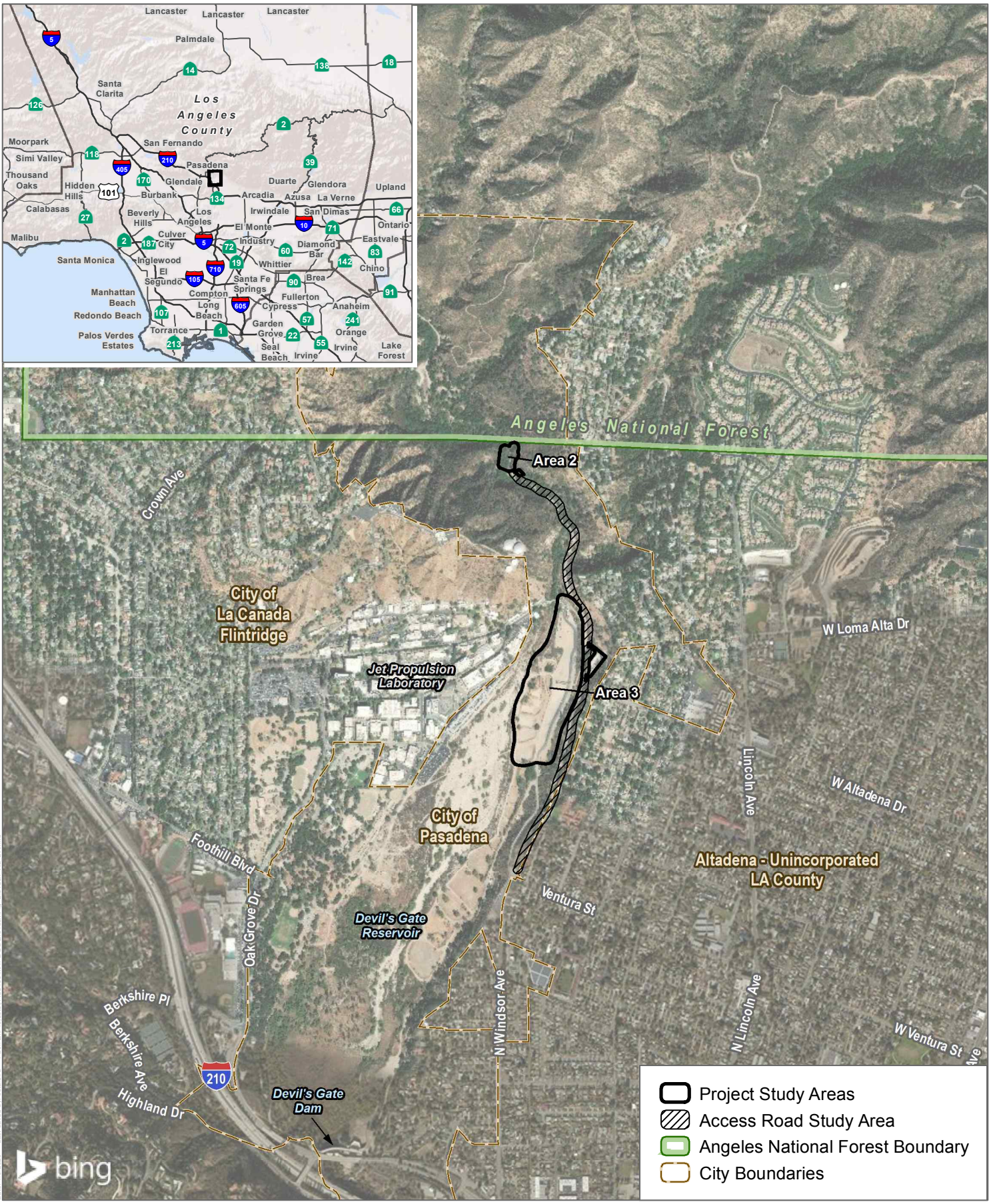
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SOURCE: Bing 2019, Open Street Map 2019

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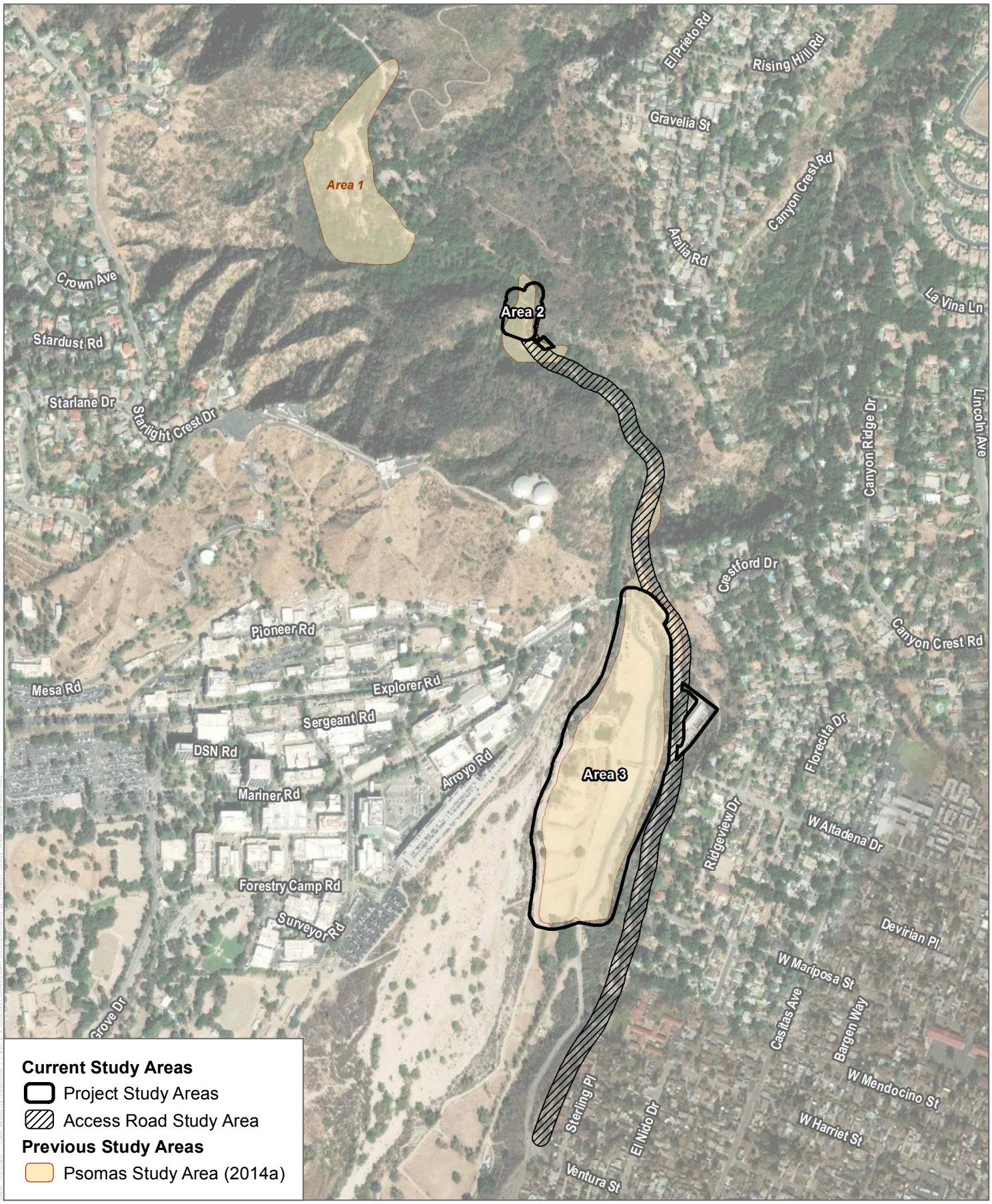
0 700 1,400 Feet

FIGURE 1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014a)

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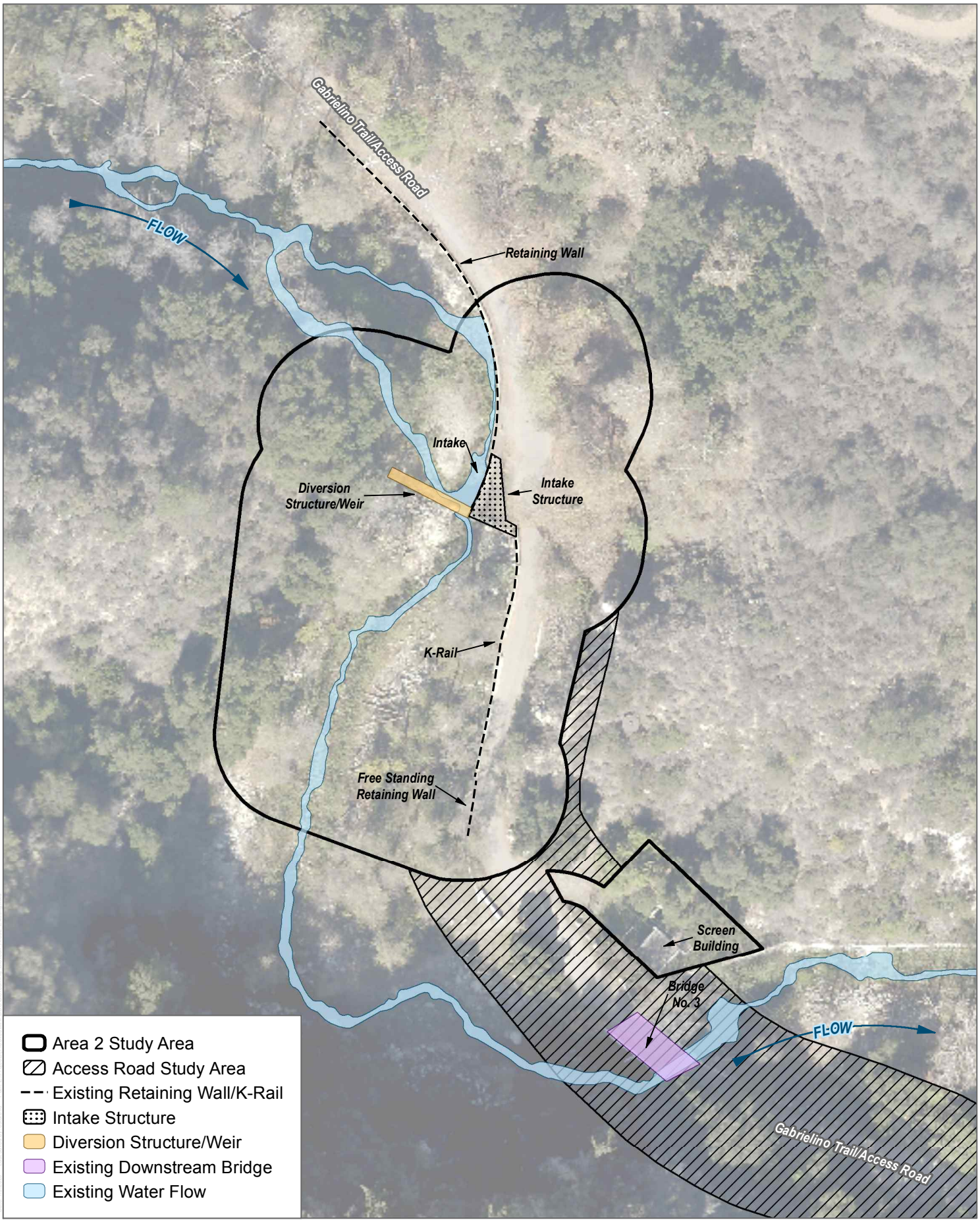
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FIGURE 2

Project Study Area Comparison

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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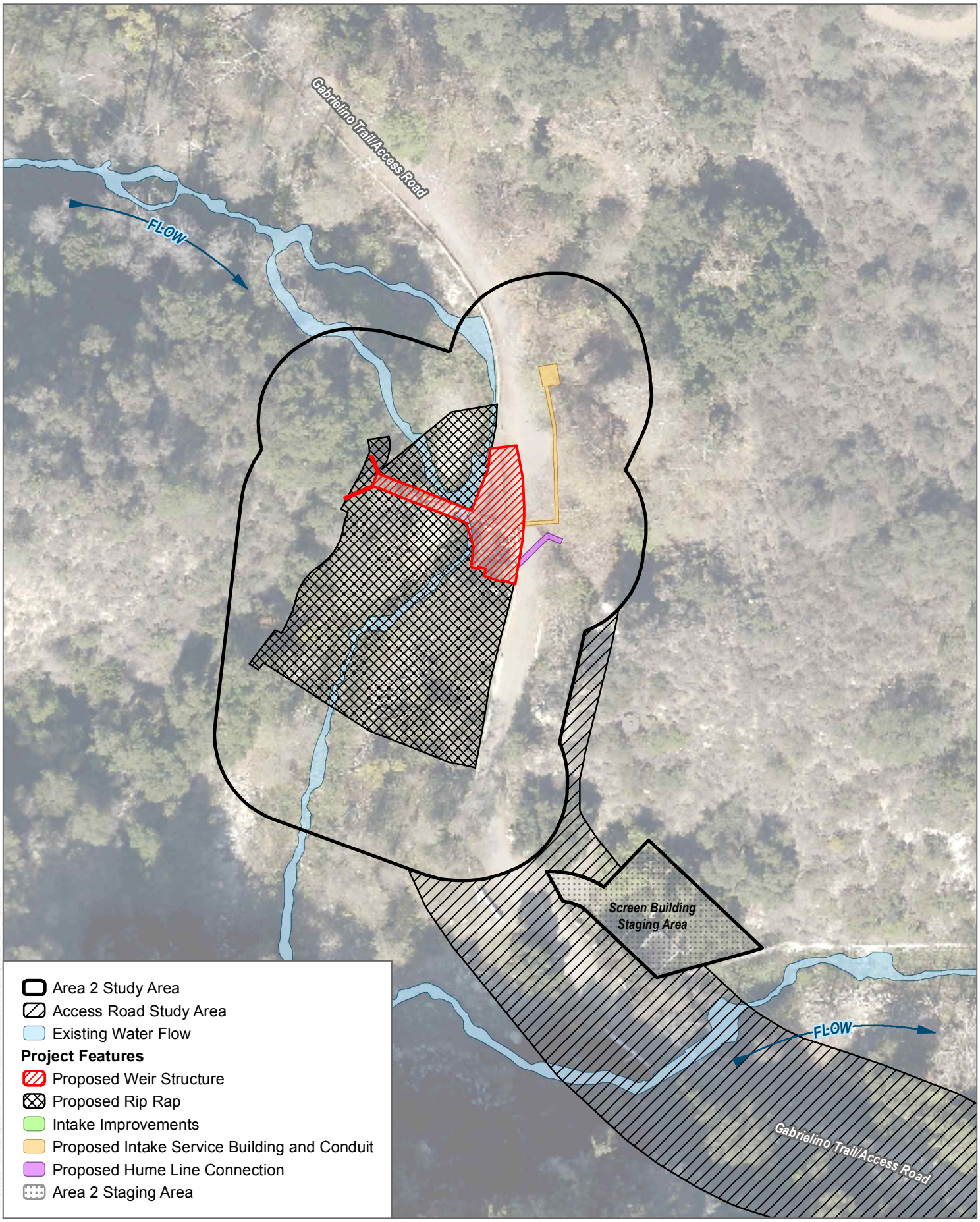
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FIGURE 3A

Area 2 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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FIGURE 3B

Area 2 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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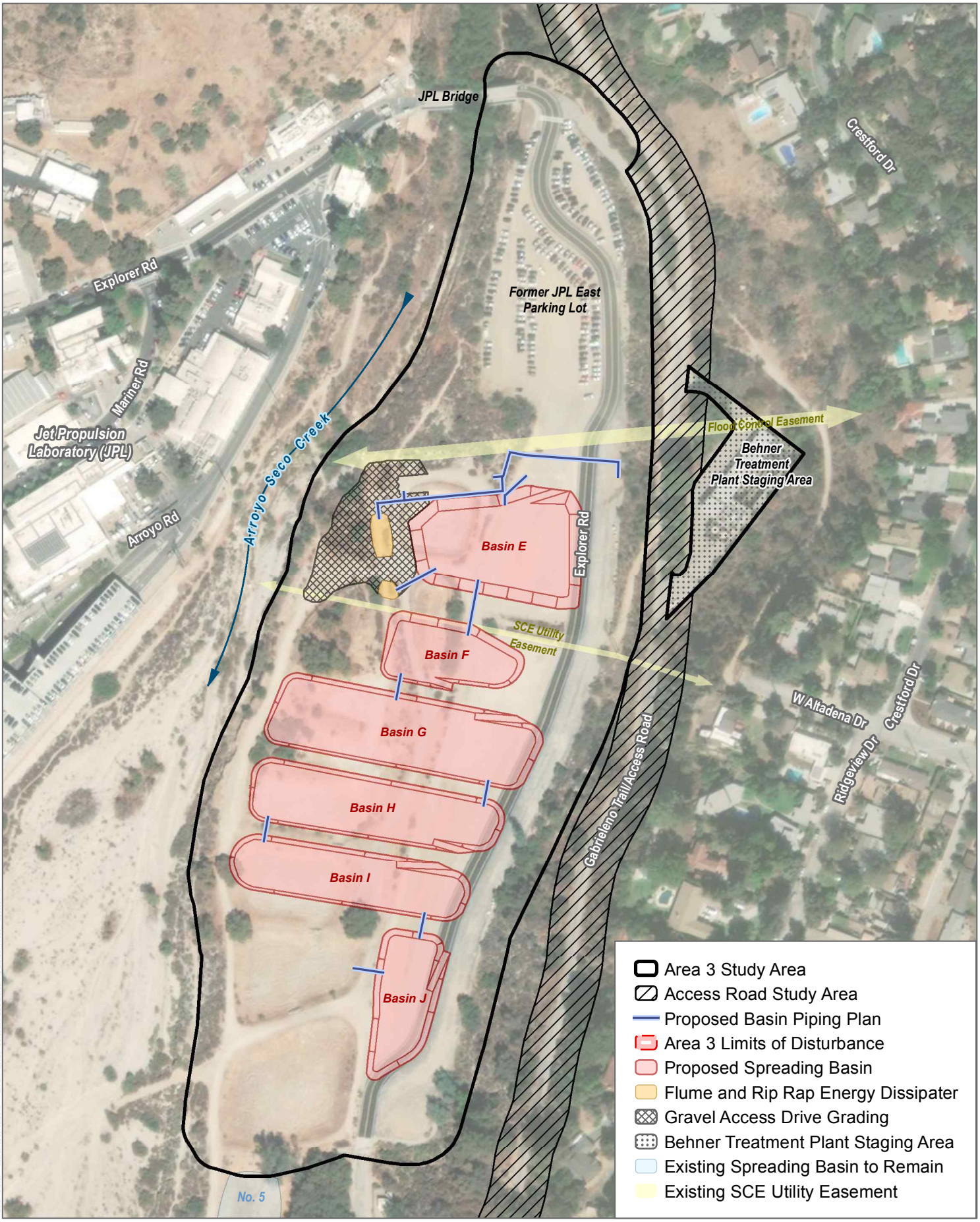
0 112.5 225 Feet

FIGURE 4A

Area 3 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

DUDEK

0 112.5 225 Feet

FIGURE 4B

Area 3 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019, LA County 2004 (soils)

DUDEK

0 175 350 Feet

FIGURE 5

Soil Types

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 87.5 175 Feet

FIGURE 6 - SHEET 1

Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 87.5 175 Feet

FIGURE 6 - SHEET 2

Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

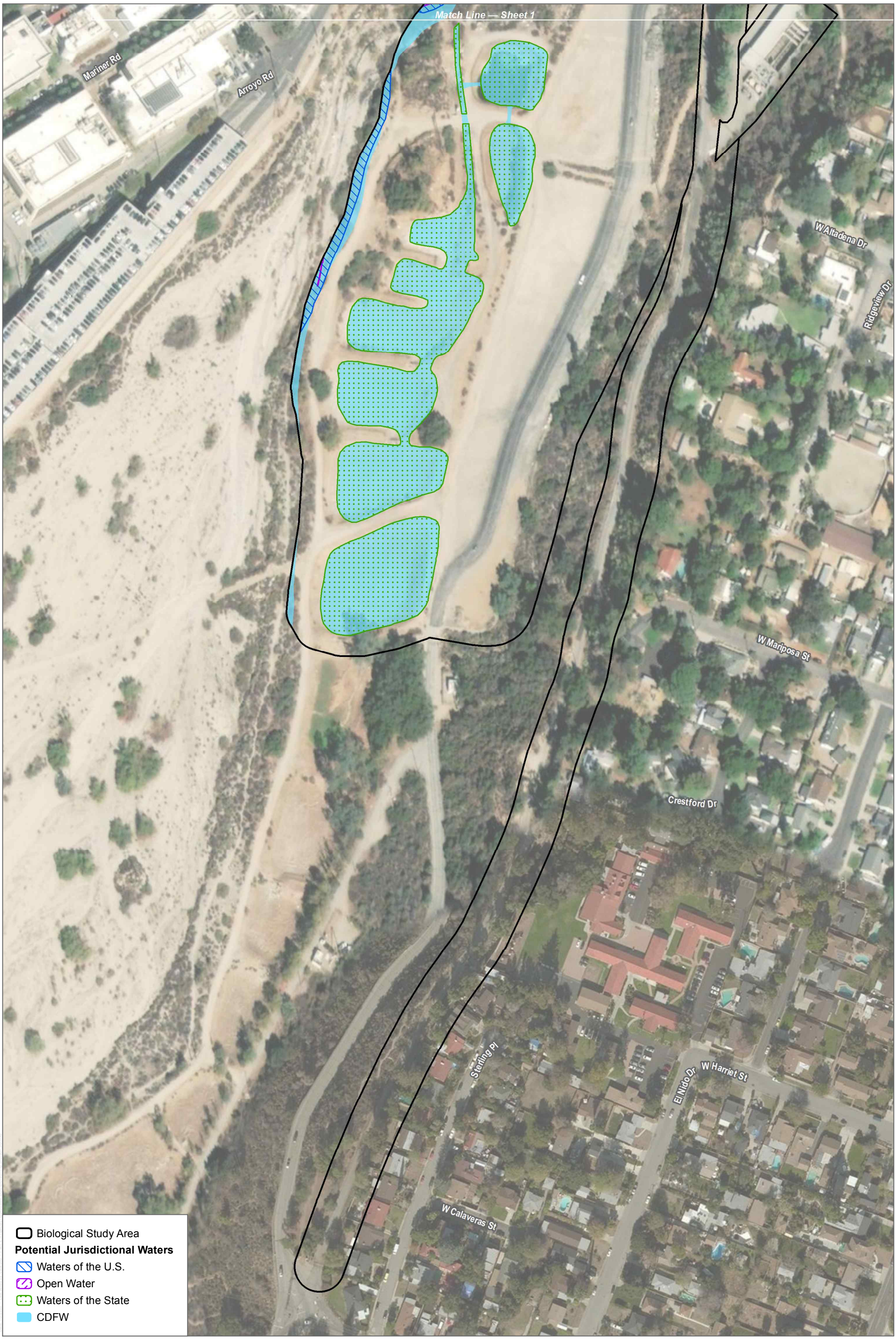
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FIGURE 6 - SHEET 1

Potential Jurisdictional Waters

Biological Resources Technical Report for the Arroyo Seco Canyon Project



SOURCE: Bing 2019, Open Street Map 2019

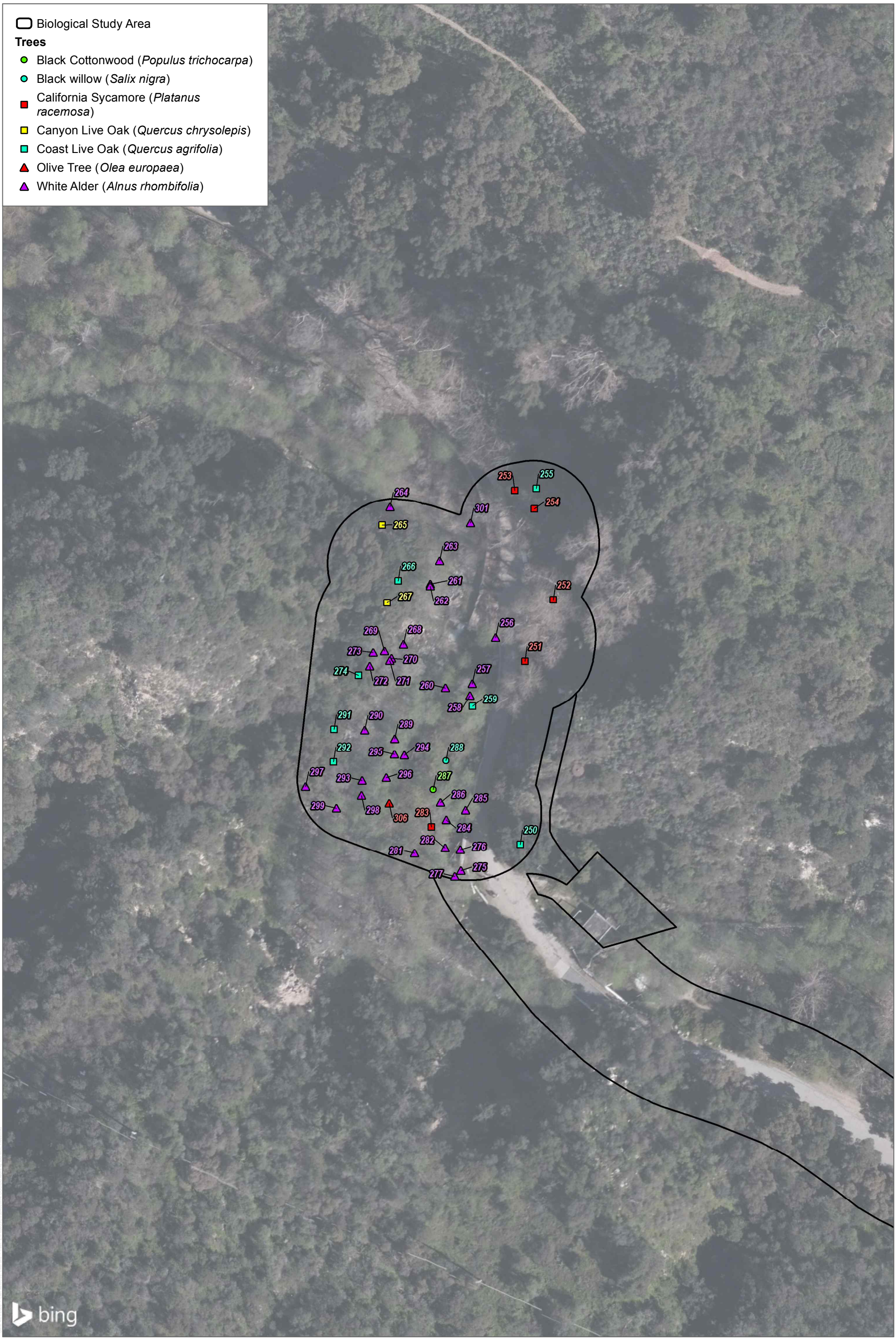
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FIGURE 6 - SHEET 2

Potential Jurisdictional Waters

Biological Resources Technical Report for the Arroyo Seco Canyon Project



SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

DUDEK

0 35 70 Feet

FIGURE 8 - SHEET 1

Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

Biological Study Area

Trees

- American Elderberry (*Sambucus canadensis*)
- Bailey Acacia (*Acacia baileyana*)
- Black Cottonwood (*Populus trichocarpa*)
- Black willow (*Salix nigra*)
- Box Elder (*Acer negundo*)
- California Sycamore (*Platanus racemosa*)
- Coast Live Oak (*Quercus agrifolia*)
- Evergreen Ash (*Fraxinus uhdei*)
- Southern California Black Walnut (*Juglans californica*)
- Spotted Gum (*Corymbia maculata*)
- Sugar Gum (*Eucalyptus cladocalyx*)
- White Alder (*Alnus rhombifolia*)
- White Ironbark (*Eucalyptus leucoxylon*)



SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

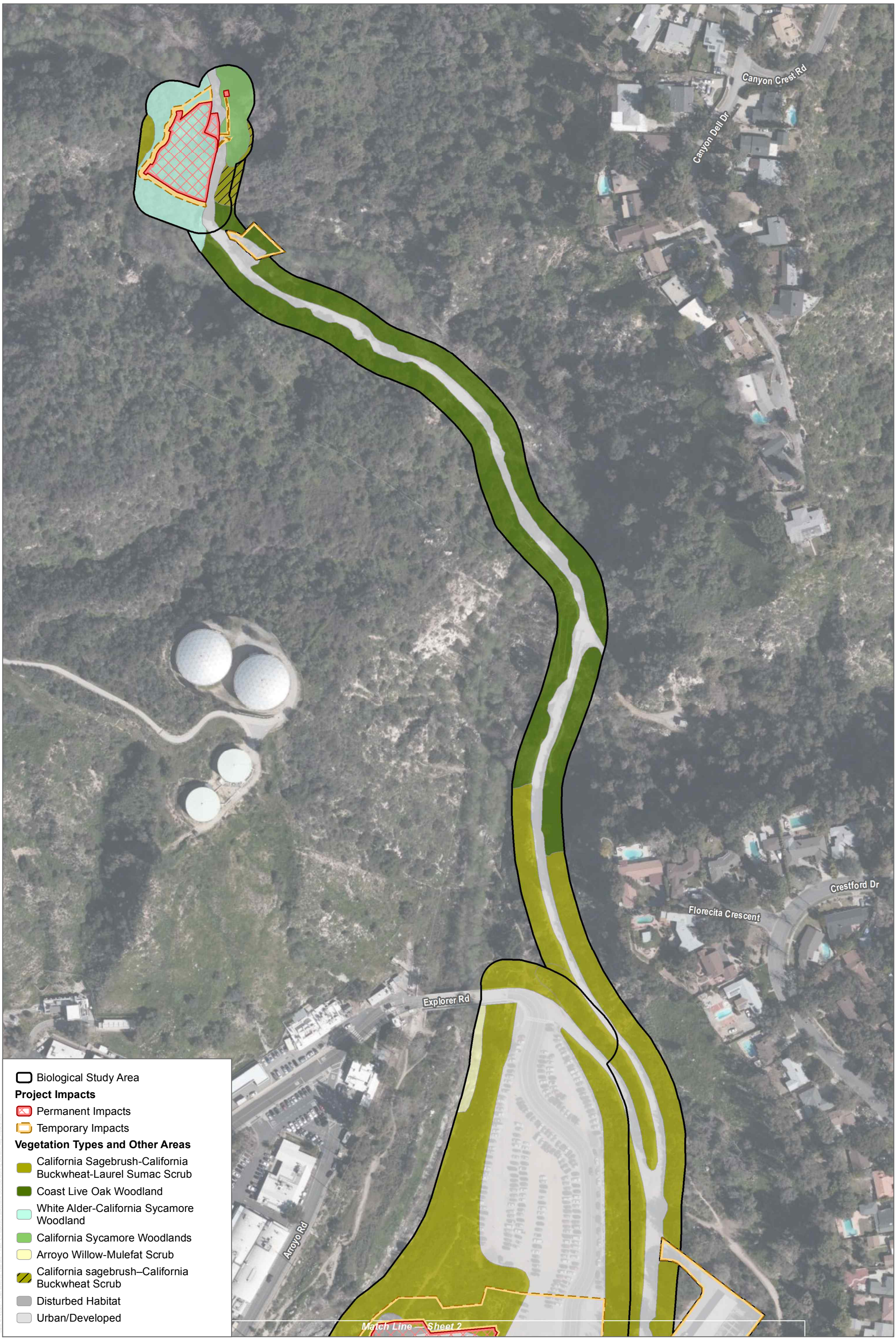
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0 75 150 Feet

FIGURE 8 - SHEET 2

Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 87.5 175 Feet

FIGURE 9 - SHEET 1

Impacts to Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

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0 87.5 175 Feet

FIGURE 9 - SHEET 2

Impacts to Vegetation Types

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

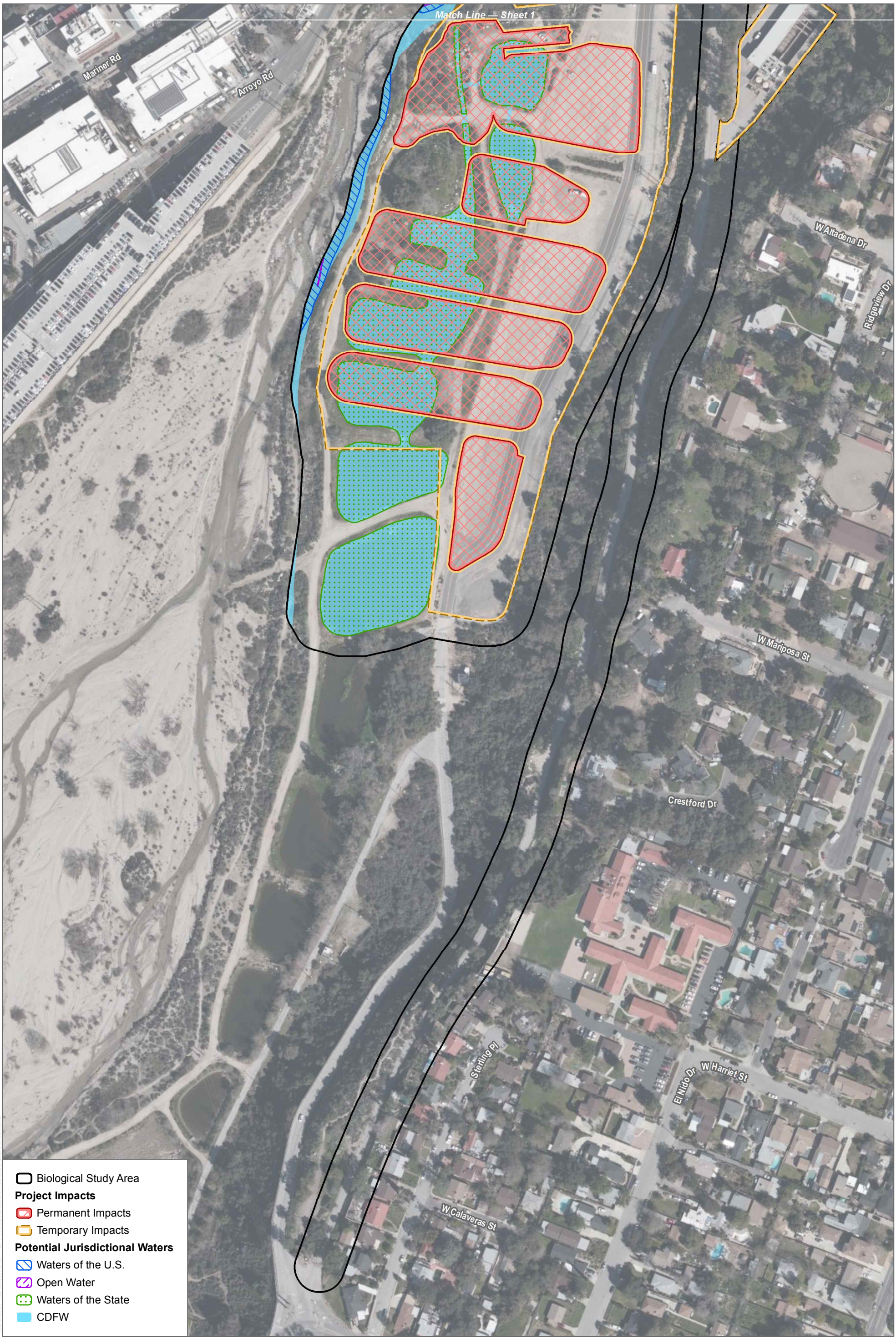
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FIGURE 10 - SHEET 1

Impacts to Potential Jurisdictional Waters

Biological ResourcesArroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

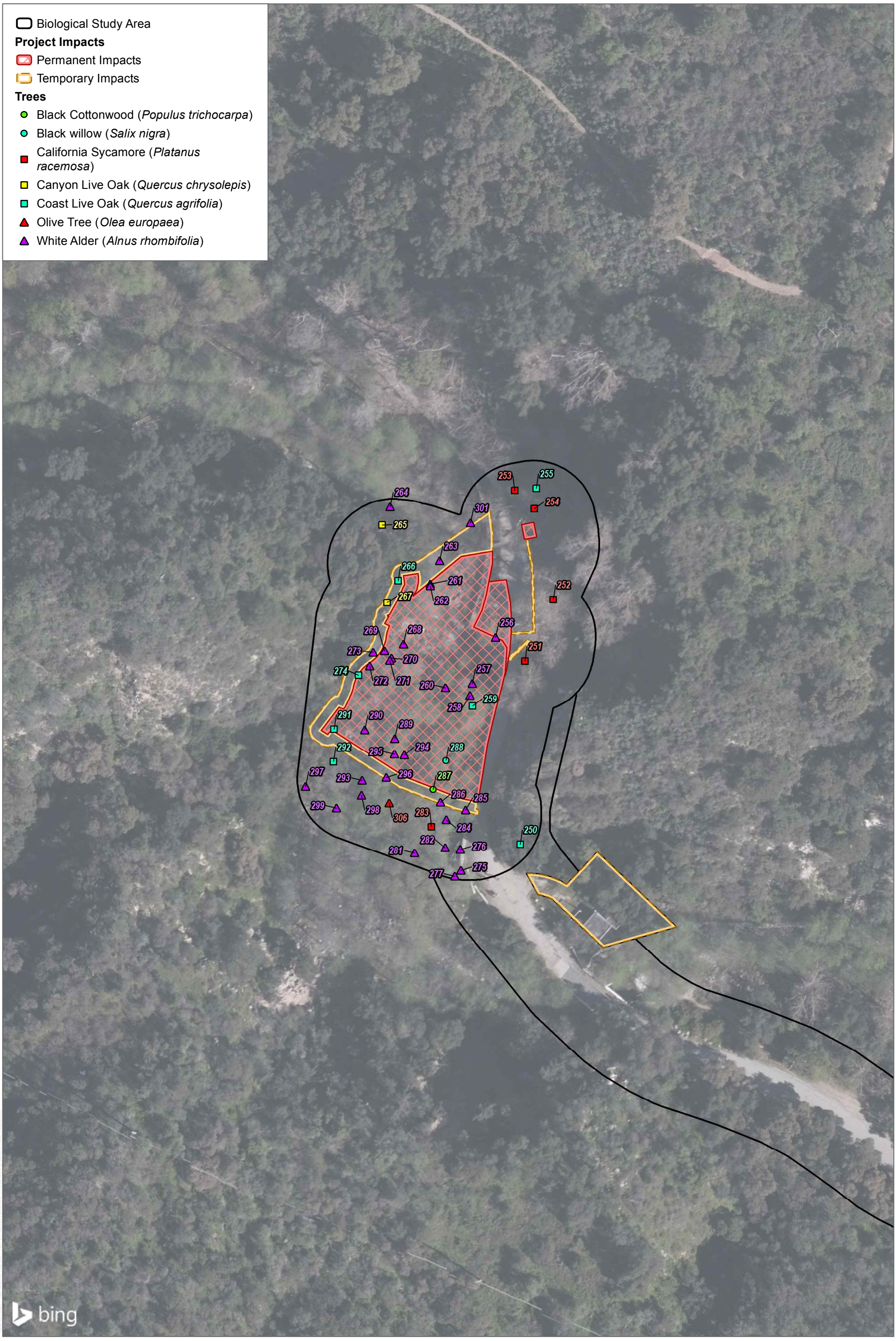
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0 87.5 175 Feet

FIGURE 10 - SHEET 2

Impacts to Potential Jurisdictional Waters

Biological ResourcesArroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

DUDEK

0 35 70 Feet

FIGURE 11 - SHEET 1

Impacts to Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

Biological Study Area

Project Impacts

Permanent Impacts

Temporary Impacts

Trees

- American Elderberry (*Sambucus canadensis*)
- Bailey Acacia (*Acacia baileyana*)
- Black Cottonwood (*Populus trichocarpa*)
- Black willow (*Salix nigra*)
- Box Elder (*Acer negundo*)
- California Sycamore (*Platanus racemosa*)
- Coast Live Oak (*Quercus agrifolia*)
- Evergreen Ash (*Fraxinus uhdei*)
- Southern California Black Walnut (*Juglans californica*)
- Spotted Gum (*Corymbia maculata*)
- Sugar Gum (*Eucalyptus cladocalyx*)
- White Alder (*Alnus rhombifolia*)
- White Ironbark (*Eucalyptus leucoxylon*)



SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

DUDEK 0 75 150 Feet

FIGURE 11 - SHEET 2

Impacts to Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

APPENDIX A

Least Bell's Vireo/Southwestern Focused Surveys Memorandum

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621 CHAPALA STREET
SANTA BARBARA, CALIFORNIA 93101
T 805.963.0651 F 805.963.2074

September 4, 2019 11884

U.S. Fish and Wildlife Service
Attn: Recovery Permit Coordinator
Carlsbad Fish and Wildlife Office
2177 Salk Avenue, Suite 250
Carlsbad, California 92008

Subject: 2019 Southwestern Willow Flycatcher and Least Bell's Vireo Survey Results for Arroyo Seco Canyon Project, Pasadena, California

Dear Recovery Permit Coordinator,

This report documents the results of five protocol-level presence/absence surveys for the state- and federally-listed endangered southwestern willow flycatcher (*Empidonax traillii extimus*; flycatcher) and eight protocol-level presence/absence surveys for the state- and federally-listed endangered least Bell's Vireo (*Vireo bellii pusillus*; vireo). The surveys were conducted in all areas of suitable flycatcher and vireo habitat within and surrounding the proposed Arroyo Seco Canyon Project (proposed project), located in the City of Pasadena, California (Figure 1).

The flycatcher and vireo are closely associated with riparian habitats, especially densely vegetated willow scrub and riparian forest vegetation. These species are threatened primarily by loss, degradation, and fragmentation of riparian habitats. Brown-headed cowbird (*Molothrus ater*) nest parasitism also poses an important threat. As per U.S. Fish and Wildlife Service (USFWS) permit requirements, a notification to conduct surveys for the southwestern willow flycatcher was submitted electronically to the Carlsbad USFWS Office on May 2, 2019 and flycatcher surveys commenced on May 22, 2019.

PROJECT BACKGROUND

On October 9, 2014, Pasadena Water and Power (PWP) circulated the Arroyo Seco Canyon Project (ASCP) Initial Study/Mitigated Negative Declaration (IS/MND) and associated technical studies, State Clearinghouse Number 2014101022, for a 30-day public review period from October 9, 2014, to November 8, 2014. The PWP was seeking approval of a Conditional Use Permit (CUP) No. 6222 for the ASCP, which involved improvements to three areas, including Area 1, Arroyo Seco Headworks; Area 2, Arroyo Seco Intake; and Area 3, JPL East Parking Lot. The 2014 IS/MND included the following biological studies to support the analysis of the ASCP:

- Biological Technical Report, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014)
- Results of the 2013 Least Bell's Vireo/Southwestern Willow Flycatcher Survey for the Arroyo Seco Canyon Project Dated September 2013 (BonTerra Consulting 2013)

Figure 1 shows a comparison of the areas studied in 2013 and 2014, and the areas surveyed for the 2019 flycatcher and vireo surveys. As described below, the study areas are different to reflect the direction given through a Court judgement and associated Settlement Agreement related to the environmental review requirements of the proposed project.

On January 12, 2015, the City's Hearing Officer made findings to approve the ASCP IS/MND for CUP No. 6222. On January 20, 2015, Spirit of the Sage Council, Project Soliton, and Hugh Bowles submitted an appeal of the Hearing Officer's decision to the Board of Zoning Appeals. The Board of Zoning Appeals hearing took place on March 4, 2015, and upheld the Hearing Officer's decision by a unanimous vote. The approval was again appealed to the City Council, and on June 1, 2015, the City Council voted to uphold the Board of Zoning Appeals decision by unanimous vote.

On July 2, 2015, a lawsuit (Court Case No. BS156207) was filed against the City by petitioners Spirit of the Sage Council and Project Soliton challenging the approval of the ASCP. On March 20, 2017, the Los Angeles Superior Court issued its decision and on June 26, 2017, entered a judgment that partially favored the petitioners. The Court found that the elements of the ASCP that related to increased diversions of surface water (i.e., greater taking of stream water from the Arroyo Seco beyond its current withdrawal) were inadequately analyzed under CEQA and required the preparation of an Environmental Impact Report (EIR).

The Court also ruled that the elements of the ASCP that did not relate to increased diversions were severable from the remainder of the ASCP and complied with CEQA. As such, the Court determined that CUP #6222 and its related findings and conditions of approval, and the ASCP IS/MND shall remain intact for these components, and would be allowed to move forward without any additional environmental review pursuant to CEQA. These components include the following:

- Area 1, Arroyo Seco Headworks: All ASCP elements
- Area 2, Arroyo Seco Intake: Access road improvements and related slope reconstruction and protective riprap elements, except the diversion dam and intake replacement

- Area 3, JPL East Parking Lot: All ASCP elements, except the expansion of four existing spreading basins and the construction of two new spreading basins

As stated above, for Area 2, the demolition and replacement of the diversion dam and intake structure were required to be analyzed in an EIR. For Area 3, components of the ASCP IS/MND that would be allowed to proceed include the parking lot, access road, sedimentation basin, demolition of existing structures and pipelines, new pipelines, new public restroom, new security booth, and associated utility services (water, sewer, power, and communication lines), while the expansion of four existing spreading basins and the construction of two new spreading basins were required to be analyzed in an EIR.

In addition, a Settlement Agreement was negotiated, which stated that the City shall have the right to perform maintenance activities, including tilling and grading of the existing spreading basins to reestablish historical percolation rates and maintenance activities that involve negligible or no expansion of use as described in CEQA Guidelines Section 15301 for a Class 1 Categorical Exemption. The Settlement Agreement further clarified that the City may perform excavation and grading necessary for the temporary bridges as described in the ASCP IS/MND.

In accordance with the terms and provisions of the Writ of Mandate and Judgment, as modified by the Settlement Agreement, the City is preparing an EIR for the proposed Project in accordance with CEQA and the CEQA Guidelines. Because several components of the ASCP were allowed to proceed without any additional environmental review pursuant to CEQA, the proposed project boundaries of Area 2 and Area 3 have been refined from those shown in the ASCP IS/MND to reflect the activities subject to review under the EIR.

LOCATION AND EXISTING CONDITIONS

The proposed project is located in Pasadena, California beginning at the spreading basins adjacent to the Devil's Gate Reservoir and continues intermittently upstream along the Arroyo Seco within the San Gabriel Mountains. The proposed project consists of three areas: Area 1 (Headworks), Area 2 (Diversion and Intake Replacement) and Area 3 (Spreading Basin Improvements). These areas are connected by the Gabrielino Trail/Access Road, which serves as a recreational trail and the access road for City of Pasadena and United States Forest Service vehicles heading into the Arroyo Seco Canyon. The proposed project would involve construction activity and facility improvements in both areas, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The proposed project will increase the utilization of surface water rights held by the City of Pasadena Water and Power Department by restoring and improving the intake facilities (Area 2), modifying the existing sediment removal

mechanism (Area 1 and Area 3), naturalizing the Arroyo Seco streambed (Area 1), and expanding recharge operations by creating additional spreading basins (Area 3). In addition, the project is planned to include a new public restroom facility, recreational and educational amenities near the Headworks structure (Area 1), and a new reduced-size parking lot at the former Jet Propulsion Laboratory parking site for those using the Arroyo Seco Canyon and Hahamongna Watershed Park area (Area 3).

Elevation of the Survey Area ranges from approximately 1,095 feet above mean sea level (amsl) in the southern portion of Survey Area 3 to approximately 1,250 feet amsl at the top of the Survey Area. Human disturbance in the Survey Area is moderate in the southern portion and light in the north. Human disturbance includes foot traffic and light recreation with most recreational activities (e.g., equestrian, hiking, vehicle access) occurring on the Gabrielino Trail/Access Road. Four soil types occur in the Survey Area: Hanford gravelly sandy loam, Ramona loam, Ramona sandy loam, and upper Los Angeles River.

VEGETATION COMMUNITIES

Vegetation communities and land uses within the Survey Area were mapped in the field directly onto a 200-scale (1 inch = 200 feet) color digital orthographic map of the property (Bing 2018). Following completion of the fieldwork, all vegetation polygons were digitized using ArcGIS software and GIS coverage was created. Vegetation communities within the Survey Area were mapped using A Manual of California Vegetation, Second Edition (MCV2; Sawyer et al. 2009).

A total of 12 vegetation communities and land covers were mapped by Dudek in the Survey Area (Figure 2) including California sagebrush-California buckwheat-laurel sumac scrub association, California sagebrush-ashy buckwheat scrub association, coast live oak woodland alliance, white alder-California sycamore woodland association, California sycamore woodlands alliance, arroyo willow-mulefat scrub association, arroyo willow thicket alliance, laurel sumac scrub alliance, California sagebrush-California buckwheat scrub alliance, urban/developed, disturbed habitat, and parks and ornamental plantings.

The following five vegetation communities in the Survey Area potentially provide suitable habitat for flycatcher and vireo: arroyo willow-mulefat scrub association, arroyo willow thicket alliance, white alder-California sycamore woodland association, California sycamore woodlands alliance, and coast live oak woodland alliance (where associated with the Arroyo Seco). The acreage for these vegetation communities are listed in Table 1, mapped on Figure 2, and described below.

Table 1
Summary of Suitable Riparian Vegetation Communities in the Survey Area

Vegetation Community or Land Cover	Acres
Arroyo Willow Thicket Alliance	5.44
Arroyo Willow-Mulefat Scrub Association	0.17
White Alder-California Sycamore Woodland Association	4.32
California Sycamore Woodlands Alliance	0.69
Coast Live Oak Woodland Alliance (where associated with Arroyo Seco)	7.03
Total	**17.65**

Suitable Riparian Vegetation

Arroyo willow thicket alliance (61.201.01) is dominated by arroyo willow (*Salix lasiolepis*) Arroyo willow is a riparian tall shrub or tree that grows up to 26 feet in height. Arroyo willow thickets occur along stream banks and on stream benches throughout much of California except the desert regions. This alliance is also associated with slope seeps and stringers along drainages (Sawyer et al. 2009). Arroyo willow thicket alliance is considered a sensitive vegetation community by CDFW (CDFW 2018).

In the Survey Area, this alliance is located in the northern portion of the survey (Figure 2). Some species associated with arroyo willow thickets include coyotebrush (*Baccharis pilularis*), mule-fat (*B. salicifolia*), redosier dogwood (*Cornus sericea*), California sycamore (*Platanus racemosa*), and cottonwoods (*Populus* spp.) (Sawyer et al. 2009).

Arroyo willow-mulefat scrub association is dominated by arroyo willow and mulefat. The association is part of the arroyo willow thickets alliance (61.201.00). Arroyo willow is a riparian tall shrub or tree that grows up to 26 feet in height. Mulefat is an evergreen shrub with willow-like leaves that have widely spaced, fine teeth and shiny upper surfaces. The canopy is open to continuous and the herbaceous layer is variable. The community is typically found on stream banks and benches, slope seeps, and stringers along drainages.

In the Survey Area, this association is located within the wash of the Arroyo Seco, adjacent to Survey Area 3. Additional common shrubs found in the community in the Study Area include blue elderberry (*Sambucus nigra*), lemonade berry (*Rhus integrifolia*), deerweed (*Acmispon glaber*), white sage (*Salvia apiana*), black sage (*Salvia mellifera*), bush monkeyflower (*Diplacus aurantiacus*), hoary leaf ceanothus (*Ceanothus crassifolius*), California coffee berry (*Frangula californica*).

White alder-California sycamore woodland association is dominated by white alder (*Alnus rhombifolia*) and California sycamore. The association is part of the white alder groves alliance (61.420.00). White alder is a deciduous hardwood that attains 115 feet in height. California sycamore is a fast-growing, deciduous tree that attains 80 feet in height and is well adapted to intermittent flooding conditions. The community typically occurs in inland foothills and lower montane zones, usually as narrow strips along perennial stream courses throughout cismontane California. It is well adapted to many flood regimes. White alder-California sycamore woodland is considered a sensitive vegetation community by CDFW (2018).

In the Survey Area, white alder-California sycamore woodland is found in Area 2. The understory was very sparse and native herbaceous species include California blackberry (*Rubus ursinus*), and scarlet monkeyflower (*Erythranthe cardinalis*).

California sycamore woodlands alliance (61.310.00) is dominated by California sycamore, but it may include other tree species with less frequency. California sycamore is a fast-growing, deciduous tree that attains 80 feet in height and is well adapted to intermittent flooding conditions. The canopy structure can be open to continuous, the shrub layer is sparse to continuous, and the herbaceous layers is variable. California sycamore woodlands are found in gullies, intermittent streams, springs, seeps, stream banks, and terraces adjacent to floodplains that are subject to high-intensity flooding. Soils are typically rocky or cobbly alluvium with permanent moisture at depth (CNPS 2019). California sycamore woodlands is considered a sensitive vegetation community by CDFW (CDFW 2018)

In the Survey Area, California sycamore woodlands are found within the Area 2 portion of the Survey Area, on the west side of the Gabrielino Trail/Access Road and at the base of a steep slope. The understory consisted of poison oak and the non-native English ivy (*Hedera helix*).

Coast live oak woodland alliance (71.060.02) is dominated by coast live oak (*Quercus agrifolia*), but it may include other tree species with less frequency. Coast live oak is a drought-resistant evergreen tree that grows to 80 feet in height. The canopy structure can be open to continuous and the shrub and herbaceous layers are sparse to intermittent. Coast live oak woodland are found on alluvial terraces, canyon bottoms, stream banks, slopes, flats. Soils are typically deep, sandy, or loamy with high organic matter (CNPS 2019). In the Survey Area, coast live oak woodland is found along Gabrielino Trail/Access Road and Arroyo Boulevard.

Although the understory of this vegetation community would provide little to no opportunities for vireo nesting, flycatchers have been known to nest in oak woodlands associated with the upper San Luis Rey River in San Diego County. As a conservative approach, the oak woodlands

associated with the Arroyo Seco were included in the surveys for flycatcher for this proposed project.

Additional tree species found in the community include canyon live oak (*Quercus chrysolepis*), California sycamore, and bigleaf maple (*Acer macrophyllum*). The shrub component is sparse and consists of species also found in California sagebrush-California buckwheat-laurel sumac scrub. The understory was also sparse and common native herbaceous species include poison oak (*Toxicodendron diversilobum*), American black nightshade (*Solanum americanum*), golden currant (*Ribes aureum*), miner's lettuce (*Claytonia perfoliata*), and California polypody (*Polypodium californicum*).

METHODS

Approximately 17.65 acres of suitable habitat within the approximately 50.67 acre Survey Area were surveyed for the flycatcher and vireo (Figures 2). The areas within the Survey Area were surveyed five times by Dudek biologist Melissa Blundell (#TE-97717A) and three times by Dudek senior biologist Michael Cady (Table 2). Focused surveys for these species was initiated on May 3, 2019 and completed on July 29, 2019. Weather conditions, time of day, and season were appropriate for the detection of flycatcher and vireo (see Table 2).

Table 2
Survey Conditions

Date	Hours	Personnel[1]	Focused Species[2]	Conditions
5/03/2019	0700–1000	MC	LBVI	59–68 degrees Fahrenheit (°F), 100% cc (cloud cover), 1 mile per hour (mph) winds, hazy/overcast
5/22/2019	0558–0825	MB	SWFL	52–54.5°F, 0% cc, 0–4 mph wind
	0825–1004		LBVI	54.5–64°F, 0–45% cc, 0–4 mph wind
6/04/2019	0630–0840	MB	SWFL	58–60°F, 100% cc, 0–2 mph wind
	0840–1018		LBVI	60–63°F, 100% cc, 0–1 mph wind
6/14/2019	0614–0815	MB	SWFL	63–64°F, 100% cc, 0–2 mph wind
	0815–0934		LBVI	64–65°F, 100% cc, 0–3 mph wind
6/26/2019	0649–0853	MB	SWFL	61°F, 100% cc, 0–3 mph wind, light drizzle
	0853–1003		LBVI	61–62°F, 100% cc, 0–1 mph wind
7/08/2019	0642–0840	MB	SWFL	62°F, 100% cc, 0 mph wind
	0840–0935		LBVI	62–66.5°F, 100% cc, 0–1 mph wind
7/18/2019	0630–0900	MC	LBVI	65–72°F, 0–100% cc, 1 mph wind
7/29/2019	0630–0900	MC	LBVI	64–70°F, 5–50% cc, 1 mph wind

Notes:
[1]Biologists' Initials: MAB = Melissa Blundell; MC = Michael Cady
[2]LBVI = least Bell's vireo; SWFL = southwestern willow flycatcher

On days when surveys were conducted for both flycatcher and vireo, these surveys were conducted separately, with the initial pass through the habitat surveying for flycatcher and the return pass surveying for vireo. All surveys consisted of slowly walking a methodical transect within and adjacent to all suitable riparian habitat (Figure 2). An electronically based project map projected on an iPhone of the Survey Area was available to record the locations of any special-status species detected. Binoculars (8×40) were used to aid in detecting and identifying wildlife species. Biologists did not survey more than 3 linear kilometers of habitat on any given survey day.

A Section 10(a)(1)(A) permit is not required to conduct presence/absence surveys for vireo. The eight surveys for vireo followed the currently accepted *Least Bell's Vireo Survey Guidelines* (USFWS 2001), which states that a minimum of eight survey visits should be made to all riparian areas and any other potential vireo habitats during the period from April 10 to July 31. The site visits are required to be conducted at least 10 days apart to maximize the detection of early and late arrivals, females, non-vocal birds, and nesting pairs. Tape playback of vireo vocalizations were not used during the surveys. Surveys were conducted between dawn and 11:00 a.m. and were not conducted during periods of excessive or abnormal cold, heat, wind, rain, or other inclement weather.

The five surveys conducted for flycatcher followed survey methods described in accordance with *A Natural History Summary and Survey Protocol for the Southwestern Willow Flycatcher* (Sogge et al. 2010). Surveys within a site with a potential or foreseeable impact to the habitat due to a potential project or change in site management require five surveys. Since there is a project planned at this site, a total of five surveys were conducted, with one visit between May 15 and May 31, two visits between June 1 and June 24, and two visits between June 25 and July 17. The surveys during the final period were separated by more than 5 days, per protocol requirements. Recorded flycatcher vocalizations were played every 50–100 feet within suitable habitat, to induce flycatcher responses. If a flycatcher had been detected, playing of the tape would have ceased to avoid harassment.

RESULTS

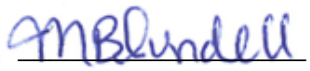
No southwestern willow flycatchers or least Bell's vireos were observed during the focused surveys. One male brown-headed cowbird was detected near retention ponds in Survey Area 3 on June 4, 2019 (Figure 2 and 3). Five special-status species were observed during the surveys: Cooper's hawk (*Accipiter cooperii*, California Department of Fish and Wildlife [CDFW] Watch List [WL] for nesting), oak titmouse (*Baeolophus inornatus*, USFWS Bird of Conservation Concern [BCC] for nesting), yellow warbler (*Setophaga petechia,* CDFW Species of Special

Concern, USFWS BCC for nesting), and Lawrence's goldfinch (*Spinus lawrencei*, USFWS BCC for nesting). No evidence of reproduction (CDFW 2019) was documented for these species. Therefore, no California Natural Diversity Database (CNDDB) forms were submitted for these occurrences.

Overall, 59 bird species were observed during the focused surveys (Attachment A). Data forms (Sogge et al. 2010) for willow flycatcher surveys are included as Attachment B. Photo documentation of the Survey Area is provided in Attachment C.

I certify that the information in this survey report and attached exhibits fully and accurately represent my work. Please feel free to contact me at mblundell@dudek.com or (760) 214-1878 (cell) with questions or if you require additional information regarding this survey.

Sincerely,



Melissa Blundell
Biologist/#TE-97717A

Att: *Figures 1-3*
Attachments A–C

cc: *Elisa Ventura, P.E., Pasadena Water & Power*
Mike Cady, Dudek

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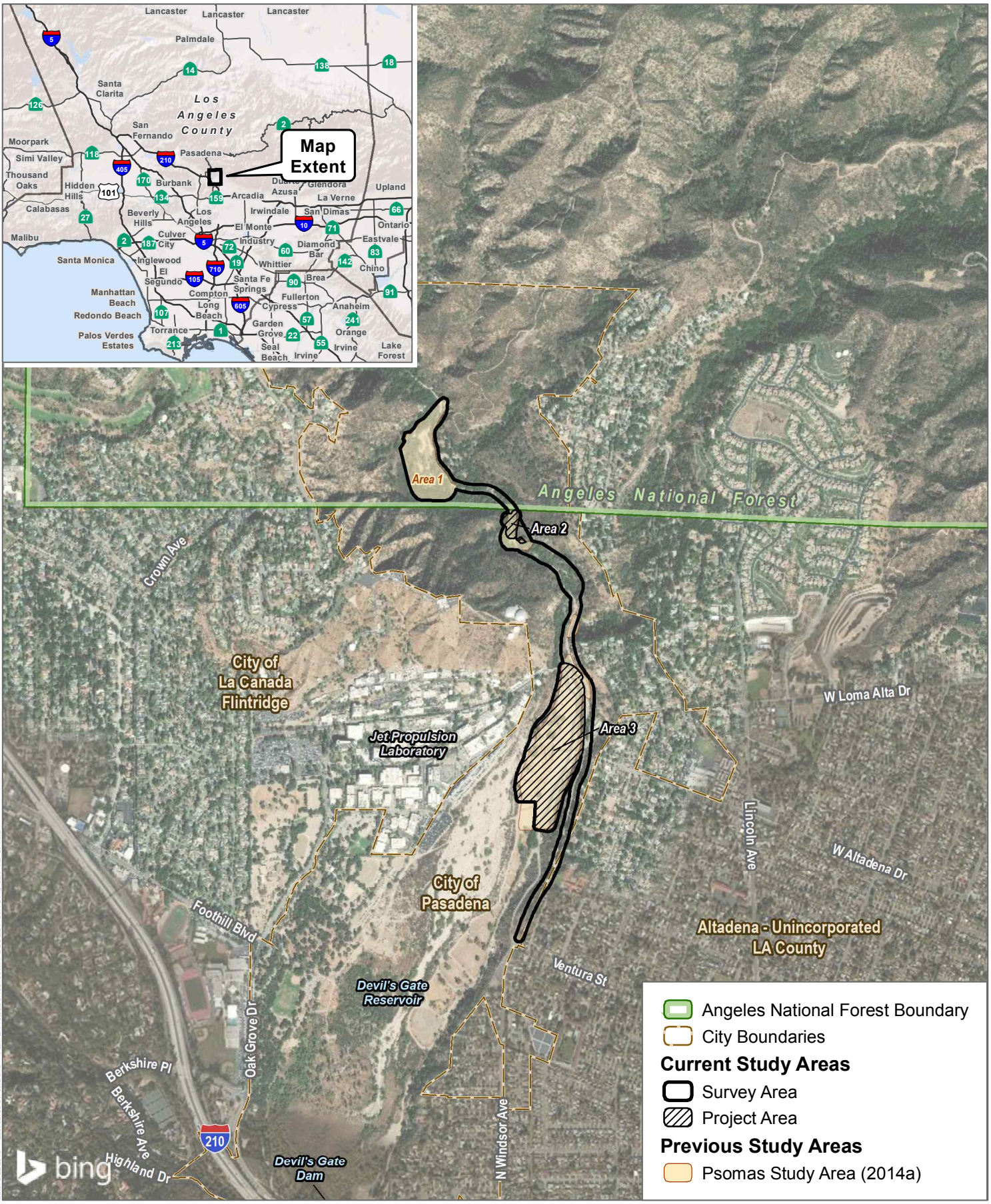
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SOURCE: Bing 2019, Open Street Map 2019

DUDEK

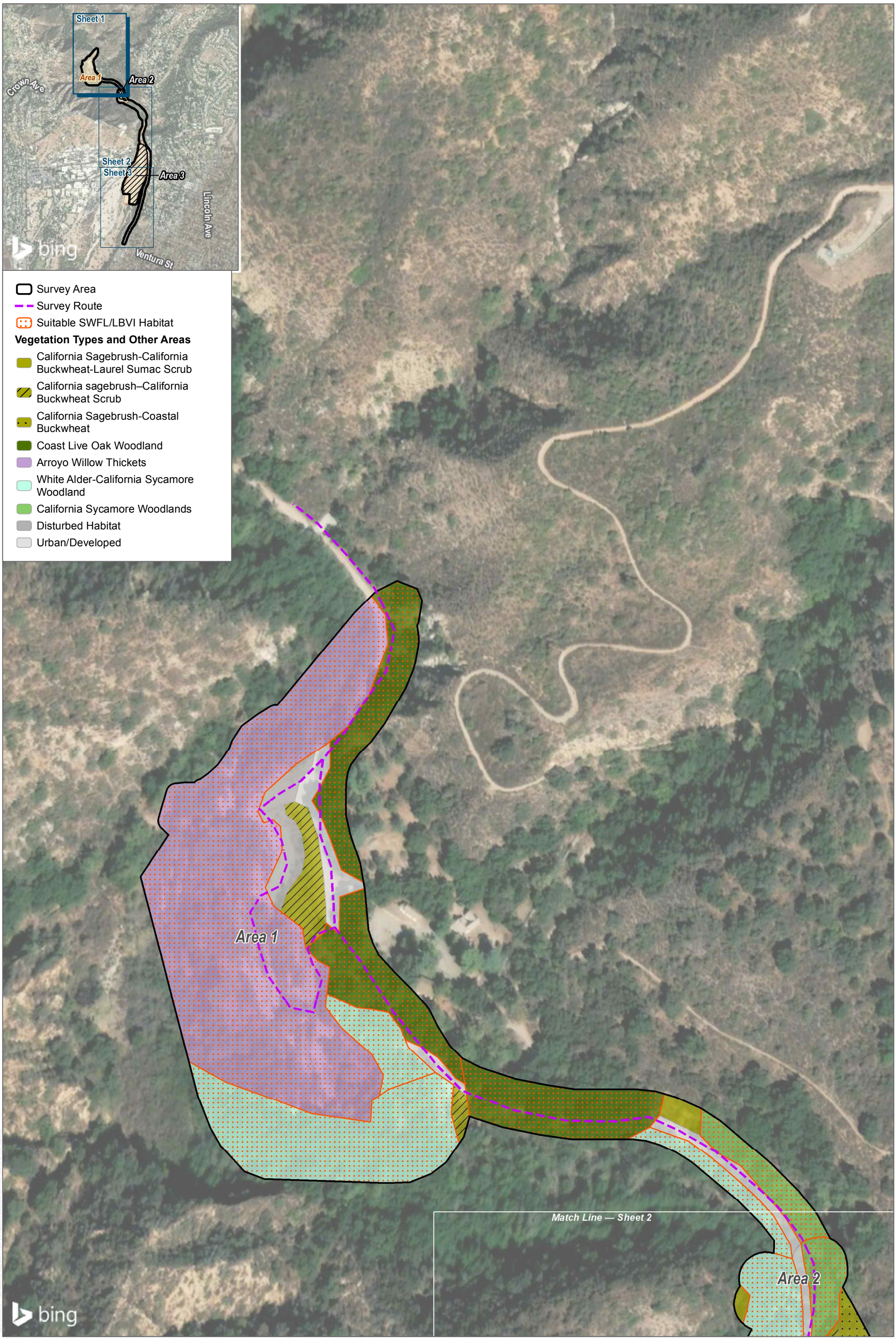
0 700 1,400 Feet

FIGURE 1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Bing 2019, Open Street Map 2019

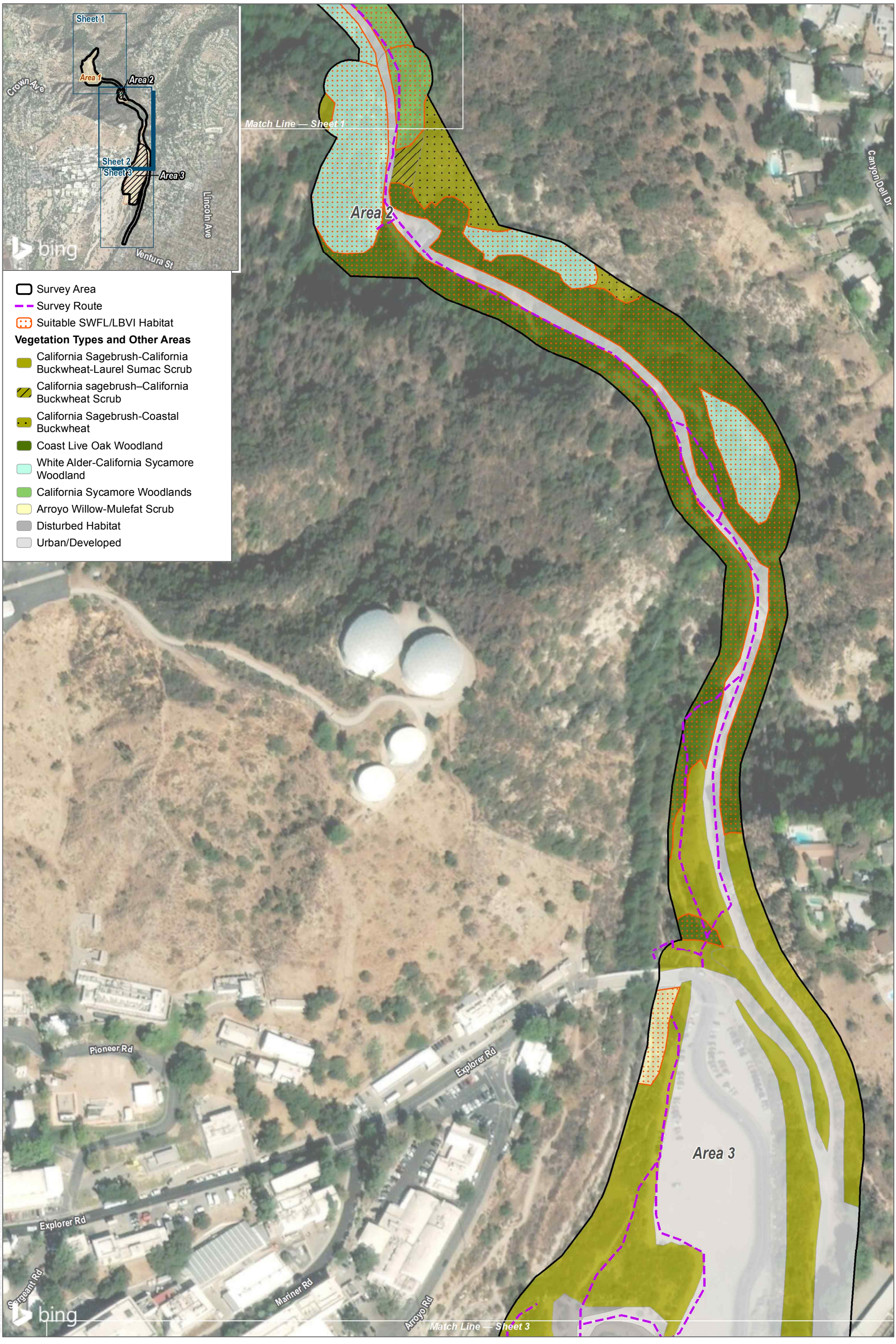
DUDEK

0 87.5 175 Feet

FIGURE 2 - SHEET 1

Project Survey Routes

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

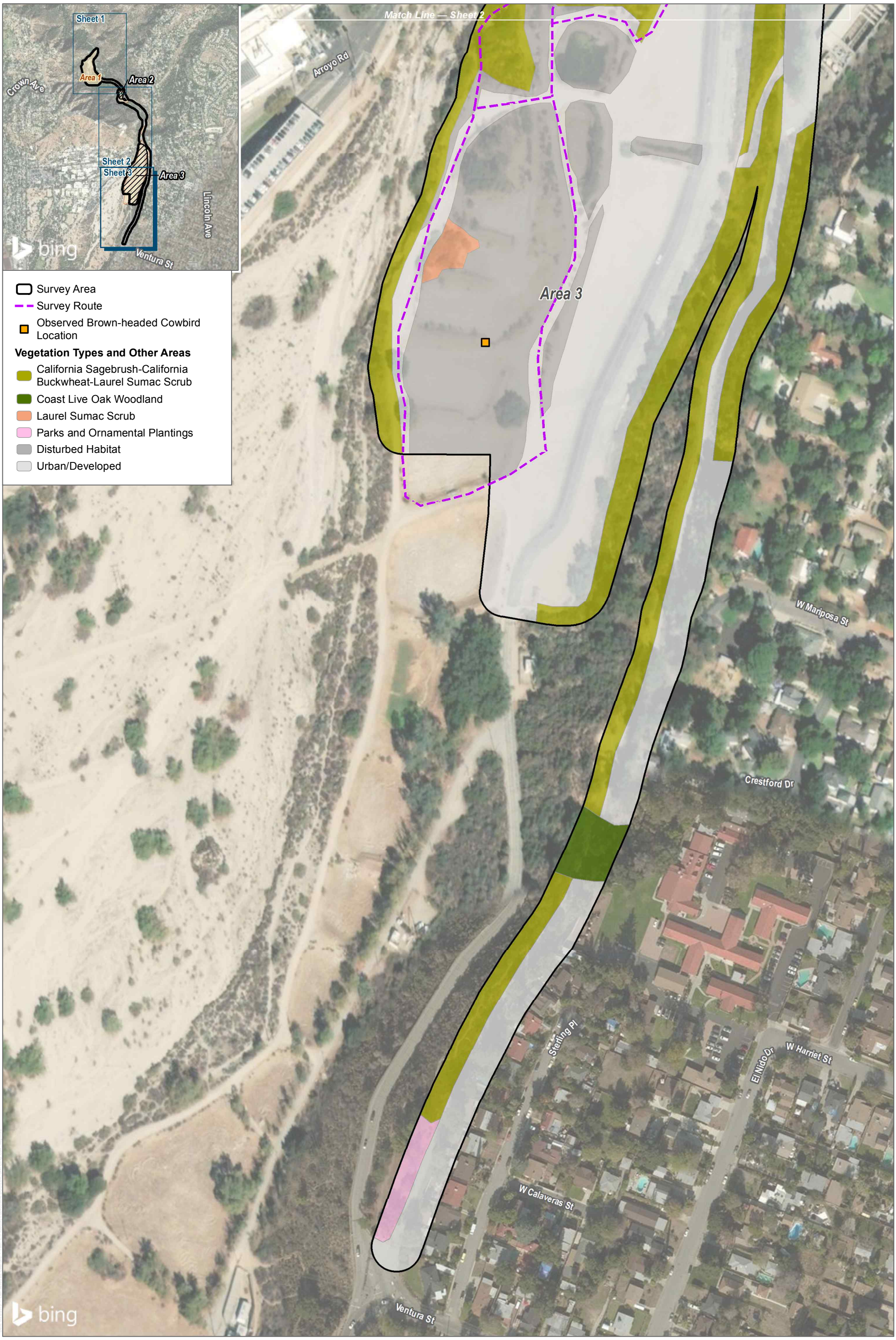
DUDEK

0 87.5 175 Feet

FIGURE 2 - SHEET 2

Project Survey Routes

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Bing 2019, Open Street Map 2019

DUDEK

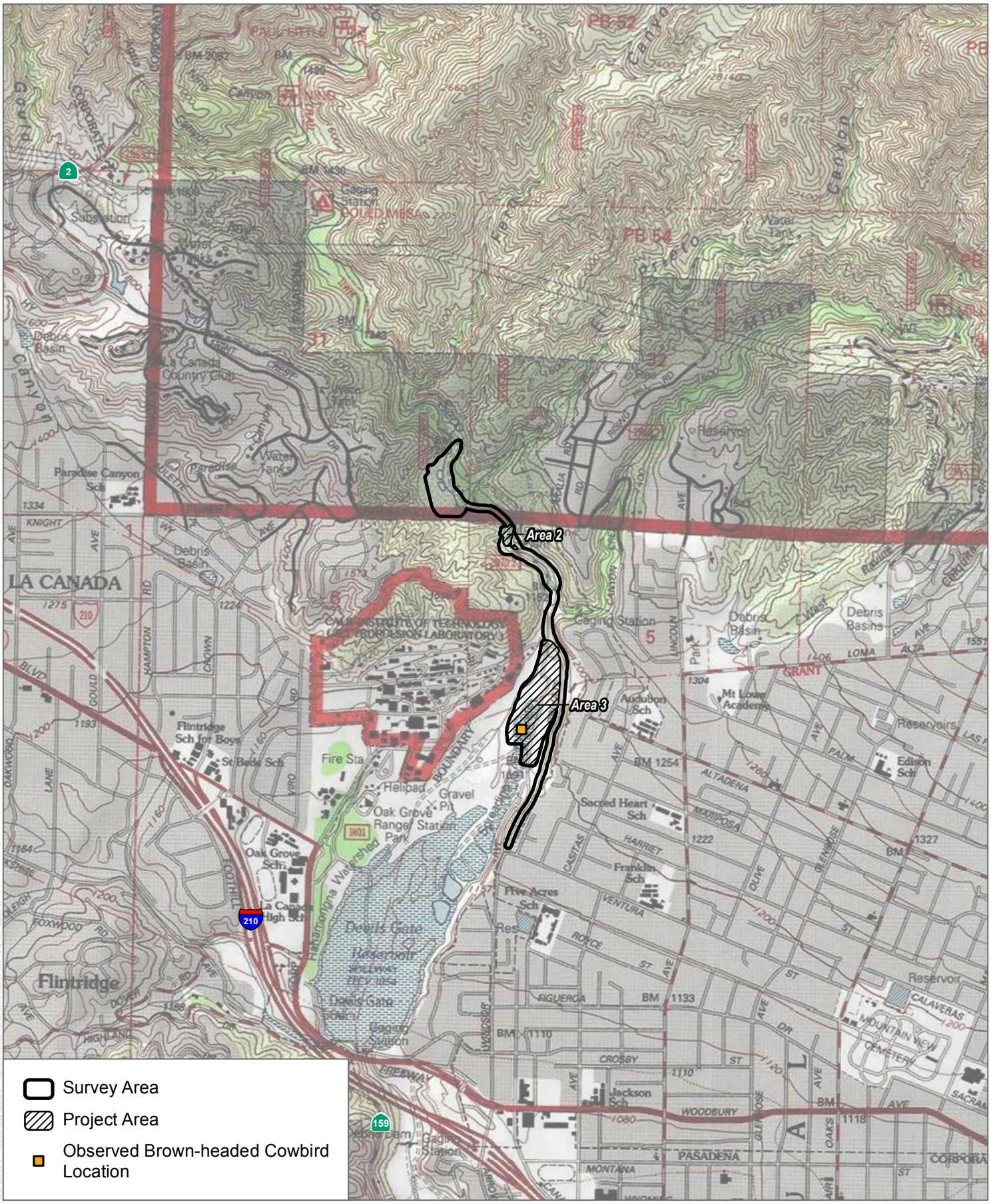
0 87.5 175 Feet

FIGURE 2 - SHEET 3

Project Survey Routes

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: USGS 7.5 Minute Quadrangle
Pasadena, CA

DUDEK

0 1,000 2,000 Feet

FIGURE 3

Project Survey Areas

Arroyo Seco Canyon Project Areas 2 and 3

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ATTACHMENT A

Cumulative List of Bird Species Observed

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ATTACHMENT A
Cumulative List of Bird Species Observed

BIRDS

ACCIPITRIDAE—HAWKS, KITES, EAGLES, & ALLIES

Accipiter cooperii—Cooper's hawk
Buteo jamaicensis—red-tailed hawk
Buteo lineatus—red-shouldered hawk

AEGITHALIDAE—LONG-TAILED TITS & BUSHTITS

Psaltriparus minimus—bushtit

ANATIDAE—DUCKS, GEESE, & SWANS

Anas platyrhynchos—mallard

APODIDAE—SWIFTS

Aeronautes saxatalis—white-throated swift

CARDINALIDAE—CARDINALS & ALLIES

Pheucticus melanocephalus—black-headed grosbeak
Piranga ludoviciana—western tanager

CATHARTIDAE—NEW WORLD VULTURES

Cathartes aura—turkey vulture

CHARADRIIDAE—LAPWINGS & PLOVERS

Charadrius vociferus—killdeer

COLUMBIDAE—PIGEONS & DOVES

Patagioenas fasciata—band-tailed pigeon
Zenaida macroura—mourning dove
Streptopelia decaocto—Eurasian collared-dove*

CORVIDAE—CROWS & JAYS

Aphelocoma californica—California scrub-jay
Corvus brachyrhynchos—American crow
Corvus corax—common raven

FRINGILLIDAE—FRINGILLINE & CARDUELINE FINCHES & ALLIES

Haemorhous mexicanus—house finch
Spinus lawrencei—Lawrence's goldfinch
Spinus psaltria—lesser goldfinch

Spinus tristis—American goldfinch

HIRUNDINIDAE—SWALLOWS

Hirundo rustica—barn swallow
Petrochelidon pyrrhonota—cliff swallow
Stelgidopteryx serripennis—northern rough-winged swallow
Tachycineta thalassina—violet-green swallow

ICTERIDAE—BLACKBIRDS

Icterus bullockii—Bullock's oriole
Icterus cucullatus—hooded oriole
* *Molothrus ater*—brown-headed cowbird

MIMIDAE—MOCKINGBIRDS & THRASHERS

Mimus polyglottos—northern mockingbird
Toxostoma redivivum—California thrasher

ODONTOPHORIDAE—NEW WORLD QUAIL

Callipepla californica—California quail

PARIDAE—CHICKADEES & TITMICE

Baeolophus inornatus—oak titmouse

PARULIDAE—WOOD-WARBLERS

Cardellina pusilla—Wilson's warbler
Oreothlypis celata—orange-crowned warbler
Setophaga petechia—yellow warbler

PASSERELLIDAE—NEW WORLD SPARROWS

Junco hyemalis—dark-eyed junco
Melospiza melodia—song sparrow
Melozone crissalis—California towhee
Pipilo maculatus—spotted towhee

PICIDAE—WOODPECKERS & ALLIES

Colaptes auratus—northern flicker
Melanerpes formicivorus—acorn woodpecker
Dryobates nuttallii—Nuttall's woodpecker
Dryobates pubescens—downy woodpecker
Dryobates villosus—hairy woodpecker

ATTACHMENT A
Cumulative List of Bird Species Observed

PSITTACIDAE—AFRICAN AND NEW WORLD PARROTS

* *Amazona viridigenalis*—red-crowned parrot

PTILOGONATIDAE—SILKY-FLYCATCHERS

Phainopepla nitens—phainopepla

STURNIDAE—STARLINGS

Sturnus vulgaris—European starling*

SYLVIIDAE—SYLVIID WARBLERS

Polioptila caerulea—blue-gray gnatcatcher

TIMALIIDAE—BABBLERS

Chamaea fasciata—wrentit

TROCHILIDAE—HUMMINGBIRDS

Calypte anna—Anna's hummingbird
Selasphorus sasin—Allen's hummingbird

TROGLODYTIDAE—WRENS

Catherpes mexicanus—canyon wren
Thryomanes bewickii—Bewick’s wren
Troglodytes aedon—house wren

TYRANNIDAE—TYRANT FLYCATCHERS

Contopus sordidulus—western wood-pewee
Empidonax difficilis—Pacific-slope flycatcher
Myiarchus cinerascens—ash-throated flycatcher
Sayornis nigricans—black phoebe
Tyrannus vociferans—Cassin's kingbird

VIREONIDAE—VIREOS

Vireo gilvus—warbling vireo

* signifies introduced (non-native) species

ATTACHMENT A
Cumulative List of Bird Species Observed

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ATTACHMENT B

Willow Flycatcher Data Form

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Willow Flycatcher (WIFL) Survey and Detection Form (revised April, 2010)

Site Name: **Arroyo Seco Canyon Project, Pasadena** State: **CA** County: **Los Angeles**

USGS Quad Name: **Pasadena** Elevation: **381** (meters)

Creek, River, or Lake Name: **Arroyo Seco**

Is copy of USGS map marked with survey area and WIFL sightings attached (as required)? ***Yes*** **X** ***No*** ____

Survey Coordinates: Start: E **392,402** N **3,784,768** UTM Datum: **WGS84** (See instructions)

Stop: E **392,073** N **3,786,298** UTM Zone: **11**

If survey coordinates changed between visits, enter coordinates for each survey in comments section on back of this page.

*****Fill in additional site information on back of this page*****

Survey # Observer(s) (Full Name)	Date (m/d/y) Survey Time	Number of Adult WIFLs	Estimated Number of Pairs	Estimated Number of Territories	Nest(s) Found? Y or N If Yes, number of nests	Comments (e.g., bird behavior; evidence of pairs or breeding;-potential threats [livestock, cowbirds, *Diorhabda* spp.]). If *Diorhabda* found, contact USFWS and State WIFL coordinator.	GPS Coordinates for WIFL Detections (this is an optional column for documenting individuals, pairs, or groups of birds found on each survey). Include additional sheets if necessary.			
							# Birds	Sex	UTM E	UTM N
Survey # 1	Date:	0	-	-		Potenital threats include brown-headed cowbirds. No WIFL detected.				
Observer(s):	5/22/2019									
Melissa Blundell	Start: 5:58									
	Stop: 8:25									
	Total hrs: 2.5									
Survey # 2	Date:	0	-	-		Potenital threats include brown-headed cowbirds. No WIFL detected.	# Birds	Sex	UTM E	UTM N
Observer(s):	6/4/2019									
Melissa Blundell	Start: 6:30									
	Stop: 8:40									
	Total hrs: 2.2									
Survey # 3	Date:	0	-	-		Potenital threats include brown-headed cowbirds. No WIFL detected.	# Birds	Sex	UTM E	UTM N
Observer(s):	6/14/2019									
Melissa Blundell	Start: 6:14									
	Stop: 8:15									
	Total hrs: 2.0									
Survey # 4	Date:	0	-	-		Potenital threats include brown-headed cowbirds. No WIFL detected.	# Birds	Sex	UTM E	UTM N
Observer(s):	6/26/2019									
Melissa Blundell	Start: 6:49									
	Stop: 8:53									
	Total hrs: 2.0									
Survey # 5	Date:	0	-	-		Potenital threats include brown-headed cowbirds. No WIFL detected.	# Birds	Sex	UTM E	UTM N
Observer(s):	7/8/2019									
Melissa Blundell	Start: 6:42									
	Stop: 8:40									
	Total hrs: 2.0									

Overall Site Summary	Total Adult Residents	Total Pairs	Total Territories	Total Nests	
Totals do not equal the sum of each column. Include only resident adults. Do not include migrants, nestlings, and fledglings. Be careful not to double count individuals.	0	0	0	0	Were any WIFLs color-banded? Yes ____ No **X**
Total survey hrs: 10.6					If yes, report color combination(s) in the comments section on back of form and report to USFWS.

Reporting Individual: **Melissa Blundell** Date Report Completed: **8/12/2019**

US Fish & Wildlife Service Permit #: **TE-97717A** State Wildlife Agency Permit #: **SC-10212**

Submit ***form to USFWS and State Wildlife Agency by September 1st. Retain a copy for your records.***

Fill in the following information completely. Submit form by September 1st. Retain a copy for your records.

Reporting Individual **Melissa Blundell** Phone # **805-308-8539**

Affiliation **Dudek** E-mail mblundell@dudek.com

Site Name **Arroyo Seco Canyon Project, Pasadena** Date report Completed **8/12/2019**

Was this site surveyed in a previous year? Yes_**X**_ No____ Unknown____

Did you verify that this site name is consistent with that used in previous yrs? Yes **X** No ____ Not Applicable ____

If name is different, what name(s) was used in the past? **N/A**

If site was surveyed last year, did you survey the same general area this year? Yes ____ No ____ If no, summarize below.

Did you survey the same general area during each visit to this site this year? Yes **X** No ____ If no, summarize below.

Management Authority for Survey Area: Federal ____ Municipal/County **X** State ____ Tribal ____ Private ____

Name of Management Entity or Owner (e.g., Tonto National Forest) **City of Pasadena**

Length of area surveyed: **1.9** (km)

Vegetation Characteristics: Check (only one) category that best describes the predominant tree/shrub foliar layer at this site:

____ Native broadleaf plants (entirely or almost entirely, > 90% native)

X Mixed native and exotic plants (mostly native, 50 - 90% native)

____ Mixed native and exotic plants (mostly exotic, 50 - 90% exotic)

____ Exotic/introduced plants (entirely or almost entirely, > 90% exotic)

Identify the 2-3 predominant tree/shrub species in order of dominance. Use scientific name.

Salix sp., *Alnus rhombifolia*

Average height of canopy (Do not include a range): **10** (meters)

Attach the following: 1) copy of USGS quad/topographical map (REQUIRED) of survey area, outlining survey site and location of WIFL detections;
2) sketch or aerial photo showing site location, patch shape, survey route, location of any detected WIFLs or their nests;
3) photos of the interior of the patch, exterior of the patch, and overall site. Describe any unique habitat features in Comments.

Comments (such as start and end coordinates of survey area if changed among surveys, supplemental visits to sites, unique habitat features. Attach additional sheets if necessary.

The Arroy Seco Canyon Project was last surveyed for southwestern willow flycatchers in 2013 and for least Bell's vireos in 2016. Surveys in 2019 included the same survey area boundaries (i.e., Survey Areas 1, 2, and 3; as in 2013 and 2016) plus additional study areas along access roads between these sites. The Arroyo Seco Canyon Project was last surveyed for southwestern willow flycatchers in 2013 and for least Bell's vireos in 2016. Surveys in 2019 included the same survey area boundaries (i.e., Survey Areas 1, 2, and 3) as in 2013 and 2016 plus additional study areas along access roads between these sites. The riparian habitat is dominated by willow species, including *Salix lasiolepis* and *Alnus rhombifolia* . Additional species included, but was not limited to, *Artemisia californi*a , *Artemisia douglasiana* , *Baccharis salicifolia, Eriogonum sp., Juglans californica, Malosma laurina, Platanus racemosa, Populus trichocarpa,Quercus agrifolia, Rubus* sp., *Salix gooddingii, Salix laevigata, Sambucus nigra* , and *Toxicodendron diversilobum* . Non-native species included, but was not limited to, *Delairea odorata, Hirschfeldia incana, Nicotiana glauca, Ricinus communis* , *Ulmus parvifolia* and non-native grasses.

Territory Summary Table. Provide the following information for each verified territory at your site.

Territory Number	All Dates Detected	UTM E	UTM N	Pair Confirmed? Y or N	Nest Found? Y or N	Description of How You Confirmed Territory and Breeding Status (e.g., vocalization type, pair interactions, nesting attempts, behavior)

Attach additional sheets if necessary

ATTACHMENT C

Photo Documentation

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ATTACHMENT C
Photo Documentation



Photo 1. Example of riparian habitat in the northern portion of the Survey Area. Photo facing north. May 22, 2019.



Photo 2. Example of riparian habitat in Survey Area 2. Photo facing west. May 22, 2019.



Photo 3. Example of riparian habitat in Survey Area 2. Photo facing west. May 22, 2019.



Photo 4. Example of riparian in Survey Area 3. Photo facing northwest. May 22, 2019.

APPENDIX B

California Red-Legged Frog/Arroyo Toad Survey Memorandum

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38 NORTH MARENGO AVENUE
PASADENA, CALIFORNIA 91101
T 626.204.9800 F 626.204.9834

MEMORANDUM

To:	Elisa Ventura
From:	Michael Cady
Subject:	Arroyo Seco Canyon – Non-Protocol California Red-Legged Frog and Arroyo Toad Survey
Date:	12/10/2019
Attachment(s):	A) Project and Survey Area Location; B) California Red-Legged Frog and Arroyo Toad Species Accounts

Dudek conducted a non-protocol survey for arroyo toad (*Anaxyrus californicus*) and California red-legged frog (*Rana draytonii*) for Pasadena Water and Power (PWP) in support of the proposed Arroyo Seco Canyon Project (proposed Project or Project). The Project is located in the in the northwest corner of the City of Pasadena in Los Angeles County, California, as shown in Attachment A, Project and Survey Area Location. For the proposed Project's Environmental Impact Report analysis, the proposed Project consists of two primary action areas: a diversion dam and intake replacement in Area 2, and the spreading basin expansion in Area 3. An additional area (Area 1; Arroyo Seco Headworks) was previously allowed under an Initial Study/Mitigated Negative Declaration for the project. This area was included in the non-protocol amphibian survey in support of the permits needed for impacts to jurisdictional waters for the project that will be for all three areas. These areas are connected by the Gabrielino Trail/Access Road, which serves as a recreational trail and the access road for City of Pasadena and U.S. Forest Service vehicles heading into and out of the Angeles National Forest.

Species accounts for arroyo toad and California red-legged frog are included in Attachment B, California Red-Legged Frog and Arroyo Toad Species Accounts.

Methods

Desktop Analysis

Prior to conducting the field investigation, a literature review was conducted to evaluate the environmental setting of the Project site and identify potential special-status biological resources that may be found on the site. The following reports that encompass the Project site were reviewed:

- Biological Technical Report, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014a)
- Results of the 2013 Amphibian Surveys for the Arroyo Seco Canyon Project, dated February 4, 2014 (BonTerra Psomas 2014b)

The following online databases and reports were reviewed:

- California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) (CDFW 2019)

- U.S. Fish and Wildlife Service's (USFWS) Critical Habitat and Species Occurrence Data (USFWS 2019)
- Arroyo southwestern toad (*Bufo microscaphus californicus*) Recovery Plan (USFWS 1999)
- Arroyo Toad (*Bufo californicus* (=*microscaphus*)) 5-Year Review (USFWS 2009)
- Recovery Plan for the California Red-Legged Frog (*Rana aurora draytonii*) (USFWS 2002)

The CNDDB was queried based on the U.S. Geological Survey 7.5-minute quadrangle on which the Project site is located (*Pasadena, California*) and the eight surrounding quadrangles (*Sunland*, *Condor Peak*, *Chilao Flat*, *Burbank*, *Mount Wilson*, *Hollywood*, Los *Angeles*, and *El Monte*). The USFWS occurrence data and critical habitat databases were queried using geographic information system (GIS) software based on a 5-mile buffer around the Project site.

Field Survey

The purpose of the survey was to look for individuals of the two species and identify potential habitat. The survey was conducted on May 3, 2019 by Dudek Senior Biologist Michael Cady, as shown in Table 1, Survey Conditions. The survey was focused on the spreading basins with water and the Arroyo Seco from adjacent to Area 3 and upstream to Area 2, as shown in Attachment A. The focused survey passes were conducted by walking along the stream. Any pools, if present, where California red-legged frog could be present would be examined from a distance using binoculars before being approached.

Table 1
Survey Conditions

Date	Hours	Personnel	Conditions
5/3/2019	1000–1200	Michael Cady	68°F–71°F, 0% cc, 1–2 mph

Notes: cc = cloud cover; mph = miles per hour.

Results

No arroyo toad or California red-legged frog were observed during the survey of the survey area. No breeding habitat, overflow pools, old flood channels, and pools with shallow margins on streams with relatively open canopies (USFWS 1999), for the species was observed. No pools with substantial depth or with refugia (undercuts in banks or masses of tree roots were observed) that could support California red-legged frog were observed. Three common amphibian species were observed in the survey area: western toad (*Anaxyrus boreas*), California treefrog (*Pseudacris cadaverina*), and Baja California treefrog (*Pseudacris hypochondriaca*). Numerous immature western toads were observed associated with the northern spreading basins in Area 3. Treefrog tadpoles were observed in the Arroyo Seco between Area 2 and the JPL Bridge.

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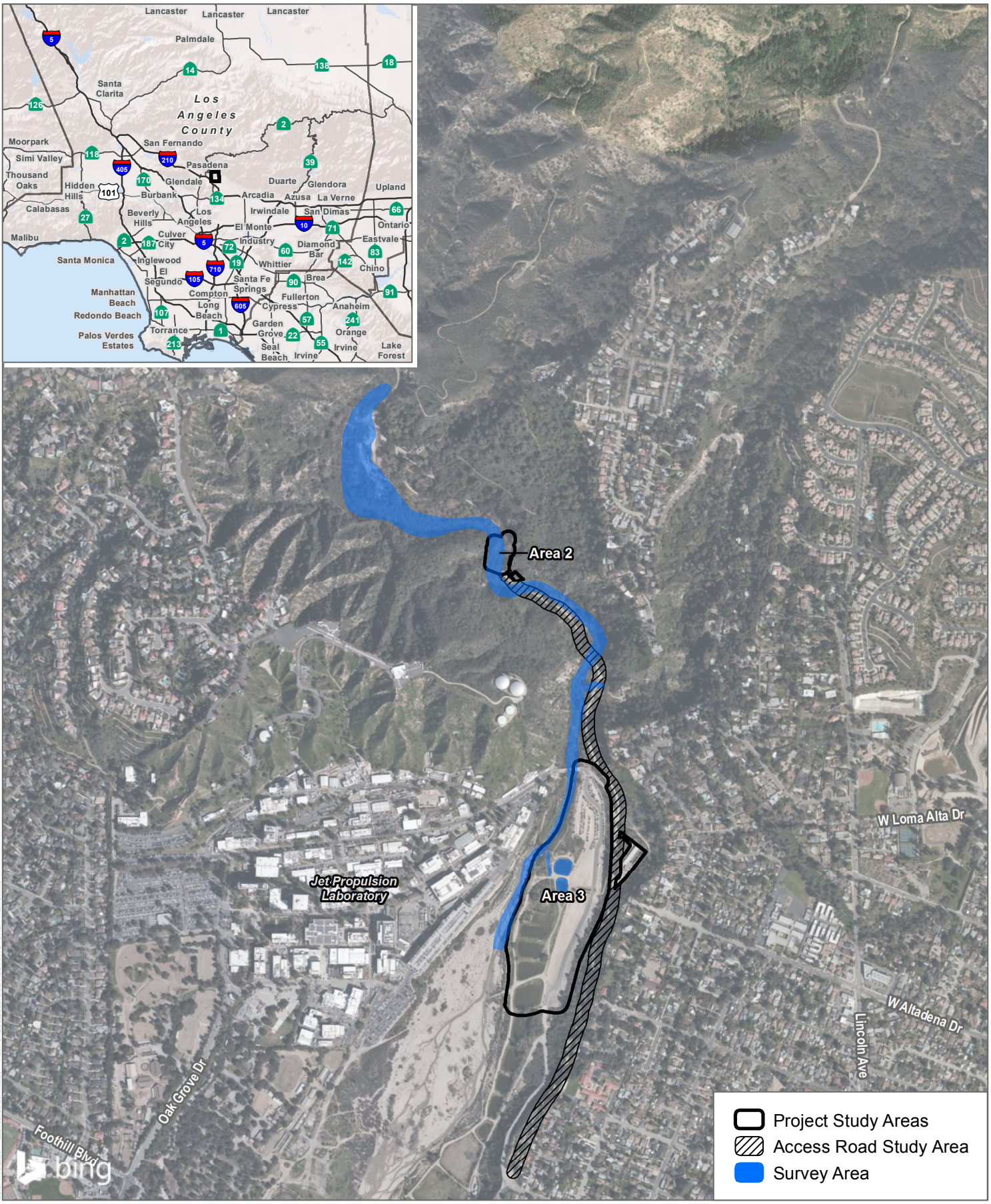
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Attachment A

Project and Survey Area Location

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SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 490 980 Feet

Project and Survey Area Location

Arroyo Seco Canyon – Non-Protocol California Red-Legged Frog and Arroyo Toad Survey

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Attachment B

Arroyo Toad and California Red-legged Frog Species Accounts

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Arroyo Toad (Anaxyrus (=Bufo) californicus)

State: California Department of Fish and Game Species of Special Concern
Federal: Endangered

Status and Taxonomy

The arroyo toad was federally listed as endangered on December 16, 1994 (59 FR 64589–64867). Critical habitat for arroyo toad was designated on February 7, 2001 (66 FR 9414–9474). On October 30, 2002, the federal court of the District of Columbia set aside the 2001 critical habitat designation on the basis of a lawsuit challenging the designation of arroyo toad critical habitat, citing errors by the U.S. Fish and Wildlife Service (USFWS) in promulgating the rule (69 FR 23254–23328). On April 28, 2004, the USFWS proposed a new rule designating critical habitat that differed from the previous designation in regard to mapping grid size and new survey information for the arroyo toad. On April 13, 2005, the USFWS issued the final critical habitat designation for the arroyo toad (70 FR 19562–19633). The USFWS reduced the critical habitat area from the 95,655 acres proposed in February 2004 to 11,695 acres in the 2005 final designation (70 FR 19562–19633). Due to concerns about the scientific integrity of the 2005 designation the USFWS published a revised final critical habitat designation on February 9, 2011 that would include 98,366 acres of critical habitat for the arroyo toad (76 FR 7245–7467). This revised proposed designation incorporates new information for the arroyo toad collected since 2004 and uses a revised and more detailed mapping method. A 5-year review completed by the USFWS in 2009 recommended that the arroyo toad be reclassified to threatened (75 FR 28636–28642). Although not state-listed as threatened or endangered, arroyo toad is considered a California Department of Fish and Game Species of Special Concern.

At the time the arroyo toad was federally listed in 1994, it was classified as a subspecies (*Bufo microscaphus californicus*) of the southwestern toad (*B. microscaphus*). Based on the results of genetic studies, Gergus (1998) reclassified the arroyo toad as a separate species, *Bufo californicus* (66 FR 9414–9474). In addition, the long-standing genus *Bufo* in North America was replaced with *Anaxyrus* (Crother 2008), and therefore, the arroyo toad *Bufo californicus* was renamed *Anaxyrus californicus*.

The arroyo toad is a small (4.6 to 8.6 centimeters (1.8 to 3.4 inches)), stocky, dark-spotted toad, usually with a "V"-shaped, light-colored stripe across its head between the eyes (Stebbins 2003; USFWS 2009) and lacking a light-colored mid-dorsal stripe down its back. A detailed description of the species' physical characteristics can be found in USFWS (1999).

Habitat Description

The arroyo toad is found along low-gradient streams in coastal and desert drainages as well as high-elevation valleys in Southern California and northern Baja California, Mexico. It uses aquatic, riparian, and upland habitats to different degrees, depending on an individual's stage of development, the time of year, and the weather. Breeding and larval development occur within aquatic habitats; foraging may occur within drying stream beds, terraces adjacent to breeding sites, and nearby uplands, where aestivation and overwintering also occur. Breeding habitat for the arroyo toad is created and maintained by the fluctuating hydrological, geological, and ecological processes operating in riparian ecosystems and the adjacent uplands. Periodic flooding that modifies stream channels, redistributes channel sediments, and alters pool location and form, coupled with upper terrace stabilization by

vegetation, is required to keep a stream segment suitable for all life stages of the arroyo toad (66 FR 9414–9474). Periodic flooding helps maintain areas of open, sparsely vegetated, sandy stream channels and terraces (Sweet 1992; Griffin and Case 2001). During the day and other periods of inactivity, arroyo toads seek shelter by burrowing into sand (Sweet 1992). Thus, areas of sandy or friable (readily crumbled) soils are the most important habitat for the species, and these soils can be interspersed with gravel or cobble deposits (70 FR 19562–19633). Radiotelemetry studies at near-coastal locations (Griffin 1999) and montane sites (Ramirez 2002) documented extensive instream movements of adult and juvenile toads during their extended activity season. Arroyo toads may also seek temporary shelter under rocks or debris and have occasionally been found in mammal burrows (Griffin 1999). However, the use of burrows is not well understood and is believed to be an uncommon event (Haas 2005a).

Outside of the breeding season, juvenile and adult arroyo toads are terrestrial and spend most of their lives on open terraces and in riparian habitats, typically adjacent to breeding locations and, less commonly, moving into upland habitats. Riparian areas used by juveniles and adults for foraging and burrowing include sand bars, alluvial terraces, and streamside benches that lack vegetation or are sparsely to moderately vegetated (Sweet 1992; Holland and Sisk 2001). Upland habitats occupied by the arroyo toad include alluvial scrubs, sage scrubs, open chaparral, grassland, and oak woodland (Griffin and Case 2001). Friable sandy soils used for burrowing are the common factor in these occupied habitats. Arroyo toads also have been found in agricultural fields (Griffin 1999), but these lands may be habitat sinks (areas where mortality rates are higher than reproduction rates, and thus lead to population declines over the long term) due to soil type, tilling, pesticide and fertilizer applications, and heavy equipment use (Griffin and Case 2001).

Life History

Breeding generally occurs from late March until mid-June (Sweet 1989); however, depending on climatological and hydrologic conditions, breeding may commence as early as mid-February (Haas 2004) and extend into July. Arroyo toads move within streams and rivers to find suitable breeding and foraging habitats, as well as potential mates. In years when breeding conditions are poor, male advertisement may persist for extremely short periods, and the species' presence may be difficult to detect in the absence of frequent, early season surveys (Haas 2005a). Females rarely choose breeding sites under closed canopies; heavily shaded pools are generally unsuitable for eggs and larval arroyo toads because of lower water and soil temperatures and poor algal mat development (66 FR 9413–9474). Eggs are deposited in shallow aquatic habitats characterized by sandy and/or gravelly substrates and where silt deposition is minimal. These hatch in 4 to 5 days, and the immobile larvae sit for another 5 to 6 days before dispersing through the water (USFWS 2009). The filter-feeding arroyo toad tadpoles require algal mats for development. Breeding sites are typically located adjacent to sandy terraces (59 FR 64589–64866); at or near the edge of shallow pools, low-flow stream channels, and ox-bows; and along in-stream sand bars with minimal current (0 to 2 kilometers (1.24 miles) per hour) and little or no emergent vegetation. After metamorphosis, which typically occurs after 10 weeks (USFWS 2009) in the period from May to July, neonate toads remain along or very near breeding sites, in order to take advantage of available forage and ambient moisture—especially the moist, sandy substrate of drying pools. Over a period of 8 to 12 weeks, the neonates mature in size, and they leave wet or moist stream areas and river edges once they are physically capable of burying themselves in local substrates (Sweet 1992).

In many drainages, the arroyo toad does not breed annually, and metapopulations may persist for 7 years or more between breeding events (Haas 2005b). Moreover, early season breeding attempts may be unsuccessful if surface flows do not persist for the approximately 60 to 75 days necessary to support larvae to metamorphosis.

Thus, early season surveys are necessary to determine presence/absence status of the arroyo toad, especially in years of below-average rainfall (Haas 2004). In years when heavy rains (or planned water releases) affect breeding sites, arroyo toad larvae may swim or be flushed downstream due to heavy currents (Griffin 1999). Survivorship of these individuals has never been documented; thus, the effects of such events are unknown.

Subadults and adults may range widely into the surrounding uplands; however, most individuals remain on sandy terraces adjacent to breeding habitat. Smaller numbers of juveniles and adults range widely into surrounding upland habitats, and may move up to 1 kilometer (0.6 mile) or more from breeding sites (Holland and Sisk 2001). In some cases, adults have been found at distances greater than 1 kilometer from riparian areas, such as in upper Cristianitos Canyon in southern Orange County, where at least one individual was detected 3.4 kilometers (2.1 miles) from the nearest breeding population (Bloom Biological 2007). The distance traveled from a breeding site depends on topography (e.g., mild slopes are more easily traversed than steeper slopes) and presence of navigable pathways (e.g., roads, game trails, open habitats). Movements into uplands may facilitate foraging and dispersal; however, areas with extremely compact soils may act as habitat sinks, the use of which may result in desiccation and increased predator pressure.

Range and Distribution

The arroyo toad is endemic to the coastal plains, coastal slopes, mountains, and desert slopes of California and northern Baja California in habitats ranging in elevation from near sea level to 8,000 feet. Historically, the species was known to occur in coastal drainages in Southern California, from San Luis Obispo County to San Diego County, and in Baja California. According to the USFWS (2009), populations of arroyo toad are now reported in Monterey, San Luis Obispo, Santa Barbara, Ventura, Los Angeles, Orange, San Bernardino, Riverside, and San Diego Counties. Arroyo toads may also occur in Imperial County; however, this singular population needs verification (USFWS 2009).

Within the Plan Area, arroyo toads were historically found in the upper Salinas River basin near Santa Margarita, San Luis Obispo County. However, surveys during the 1980s and 1990s did not detect arroyo toads at this site. The habitat was potentially negatively affected by the construction of Santa Margarita Dam, approximately 16 kilometers (10 miles) upstream from the site (USFWS 1999). A Recovery Plan for the arroyo toad was published by the USFWS in 1999, establishing three recovery units for the species, with the Plan Area being included in the Northern Recovery Unit (USFWS 1999). The Northern Recovery Unit identifies seven populations or metapopulations on federal lands including one population at Fort Hunter Liggett Army Reserve Training Center, four populations within the Los Padres Nationals Forest and two populations within Angeles National Forest (USFWS 2009). However, none of these seven populations fall within the Plan Area. There are no historic or recent California Natural Diversity Database (CNDDB) records for arroyo toad within the Plan Area (Figure A-2) (CDFG 2012).

Population Status and Trends

Arroyo toads have disappeared from approximately 75% of the species' historically occupied habitat in California (USFWS 2009). Arroyo toads now survive primarily in the headwaters of coastal streams as small, isolated populations, having been extirpated from much of their historic habitat (USFWS 2009). At the time the arroyo toad was federally listed in 1994, only 22 populations of the species in the coastal and desert areas of nine counties were thought to remain in California. Since the listing of the arroyo toad, new locations in areas that were not previously known to be occupied by arroyo toads have been discovered as a result of site-specific surveys including a new population at Fort Hunter Liggett Army Reserve Training Center in Monterey County. Presently, there are 23

known populations of arroyo toad in California, and the area known to be occupied by the original 22 populations has expanded as a result of new arroyo toad localities (USFWS 2009).

Threats

In addition to the direct loss of aquatic, riparian, and upland habitat, other factors associated with urban development that contribute to declining arroyo toad populations were identified in the 2001 final designation of critical habitat (66 FR 9414–9474). The natural flow of streams can be altered by surface runoff from urban development and agricultural uses. Water pollution, in the form of fertilizers, biocides, chlorine, and other pollutants, adversely affects amphibian development, survival, and habitat. Further, the introduction of exotic predators (e.g., bullfrog (*Lithobates catesbeiana*), African clawed frog (*Xenopus laevis*), and green sunfish (*Lepomis cyanellus*)) and increases in mesopredators (e.g., raccoons (*Procyon lotor*) and skunks (*Mephitis mephitis*)) often associated with urban development can threaten or eliminate toad populations (69 FR 23254–23328). Exotic plant species (e.g., tamarisk, giant reed (*Arundo donax*), iceplant (Hottentot fig) (*Carpobrotus edulis*), and pampas grass (*Cortaderia selloana*)) may also degrade arroyo toad habitat by contributing to altered hydrology, eliminating sandbars and breeding pools, and restricting access to and quality of upland habitats (69 FR 23254–23328). Other factors that may adversely affect the species include livestock grazing and recreational activities in riparian areas and human-related increases in fire frequency and light and noise levels that may affect the species' nocturnal foraging and breeding behavior (Barrass and Cohn 1984). Increased water flow rates have been shown to negatively affect arroyo toad larvae swimming ability when compared to more common toad species (Wilson 2012). Feral pigs have been shown to negatively affect arroyo toads (76 FR 7245–7467). Additional threats include water management activities (including dams), road construction, maintenance and use, and mining.

Within the Northern Recovery Unit, the main threats to arroyo toad are non-native species, feral pigs, recreation, water management activities and diversions. The nearest known populations of arroyo toad to the Plan Area are on Fort Hunter Liggett Military Reservation on the Sisquoc River, Santa Maria River Basin, Santa Barbara. On Fort Hunter Liggett Military Reservation, the habitat in which the population exists is in a relatively natural state, but there are bullfrogs present. In addition, non-native beavers (*Castor canadensis*) are present, which are also considered a threat to arroyo toads because they build dams that alter the natural stream flow, which can impact breeding habitat for arroyo toad (USFWS 2009). Additionally, the resulting ponds are more likely to be occupied by bullfrogs. On the Sisquoc River, there is inadequate survey information available to determine the main threats (USFWS 2009).

Conservation and Management

The Arroyo Southwestern Toad Recovery Plan was published by the USFWS on July 24, 1999 (USFWS 1999). The recovery strategy for the arroyo toad consists of five parts: (1) stabilize and maintain populations through the range of the arroyo toad in California by protecting sufficient breeding and nonbreeding habitat; (2) monitor the status of existing populations to ensure recovery actions are successful; (3) identify and secure, by appropriate management and monitoring, additional suitable arroyo toad habitat and populations; (4) conduct research to determine the population dynamics and ecology of the species to guide management efforts and determine the best methods for reducing threats; and (5) develop and implement an outreach program.

A number of integrated natural resource management plans (INRMPs) on military lands, developed as part of compliance under the Sikes Act Improvement Act of 1977, have provided additional arroyo toad conservation

and protection measures, including the 2007 INRMP for Fort Hunter Liggett Military Reservation, which includes conservation measures for arroyo toad such as reducing bullfrog populations and identifying and reducing areas of noxious weeds (USFWS 2009).

The U.S. Forest Service has developed land management plans that provide additional guidance and protection for arroyo toad (USFWS 2009). Specific guidelines from the land management plans include the following: (1) standards and guidelines with measures to protect arroyo toad habitat that are incorporated into projects for managing vegetation, soil, water, and riparian areas; (2) identification of the arroyo toad as a Management Indicator Species to be used to track the health of aquatic habitat; (3) specific requirements for monitoring and monitoring activities that may affect arroyo toad habitat; (4) a five-step project screening process to minimize impacts to riparian arroyo toad habitat; and (5) guidelines for use of retardant and foams in aquatic environments to minimize the impacts of these chemicals to the arroyo toad and its habitat during fire suppression activities (USFWS 2009).

Multiple Habitat Conservation Plans (HCPs) provide additional protection for arroyo toad and suitable habitat on private lands. The Western Riverside Multiple Habitat Conservation Plan (MSHCP) identified a large Conservation Area where lands will be conserved. It also requires that areas outside of the Conservation Area will be surveyed for arroyo toad prior to development. The MSHCP also recognizes the importance of habitat connectivity and provides measures to ensure habitat conserved for arroyo toad will be connected to other areas of suitable habitat. The MSHCP also provides for the management and monitoring of populations of arroyo toad (USFWS 2009).

Additionally, a study by Miller et al (2012) indicates that periodic disturbance to water flows within stream segments are beneficial to arroyo toads and detrimental to non-native predators. Arroyo toads are able to persist in the adjacent upland areas while drought occurs, and are able to quickly reoccupy water once they return. Their non-native predators are unable to do so; therefore, recolonization of these resources takes longer for them.

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California Red-Legged Frog (*Rana draytonii*)

State: California Department of Fish and Game Species of Special Concern
Federal: Threatened

Status and Taxonomy

California red-legged frog was originally described in 1852 as two distinct species *R. aurora* (northern red-legged frog) and *R. draytonii* (California red-legged frog), but was later reclassified as a single, polytypic species with two geographically contiguous subspecies, *R. a. aurora* and *R. a. draytoni*, whose ranges overlap over a broad zone spanning several hundred kilometers from Marin to Humboldt Counties (Schaffer et al. 2004). The results of genetic studies by Conlon et al. (2006) concluded that the two subspecies are actually separate species. The classification of the California red-legged frog as a distinct species has now been accepted by the scientific community (Crother 2008). The final critical habitat designation for California red-legged frog published in 2010 recognizes the California red-legged frog as a distinct species (75 FR 12816–12959).

The California red-legged frog was federally listed as threatened in 1996 (61 FR 25813–25833). On April 13, 2006, final critical habitat was designated for the California red-legged frog (71 FR 19244–19346). As a result of concern about scientific integrity and litigation (Center for Biological Diversity v. Kempthorne et al.) regarding the 2006 designation of critical habitat, the U.S. Fish and Wildlife Service (USFWS) published final revised critical habitat for the California red-legged frog on March 17, 2010 (75 FR 12816–12959). Although California red-legged frog is not state-listed as threatened or endangered, it is a California Department of Fish and Game Species of Special Concern.

The California red-legged frog is the largest native frog in the western United States (116 to 138 millimeters (4.6 to 5.4 inches)). The posterior abdomen and hind legs of adults are often red or salmon pink; the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish-brown background color. A full description of the physical characteristics of the California red-legged frog can be found in the *Recovery Plan for the California Red-legged Frog (*Rana aurora draytonii*)* (USFWS 2002).

Habitat Description

California red-legged frogs use a variety of different habitats including riparian, aquatic, and upland habitats during their life cycle. The species may complete its cycle in one particular habitat or it may utilize a number of habitat types depending on climatic conditions or distance between, and the availability of, wetland and other moist environments (75 FR 12816–12959). Although the California red-legged frog can utilize multiple habitat types, breeding must occur in aquatic habitats including streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds, dune ponds, lagoons, and stock ponds. Red-legged frogs can occur in ephemeral ponds or permanent streams and ponds, but populations probably cannot persist in ephemeral streams (Jennings and Hayes 1985). Red-legged frogs generally avoid large river channels with widely fluctuating flows because such habitat does not permit successful reproductive activity (Hayes and Jennings 1988). Breeding adults often use deep, still, or slow-moving water and dense, shrubby riparian or emergent vegetation (Hayes and Jennings 1988), but frogs have been observed in shallow sections of streams and ponds that are devoid of vegetative cover. Habitats with the highest densities of frogs are deep water ponds with dense stands of overhanging willows (*Salix* sp.) and

a fringe of cattails (*Typha latifolia*) between the willow roots and overhanging willow limbs (Jennings 1988; Rathbun et al. 1993). The California red-legged frog uses riparian and upland habitats for shelter, foraging, cover, and non-dispersal movement (75 FR 12816–12959).

Life History

California red-legged frogs breed during the winter and early spring from as early as late November through April and May. Larvae remain in breeding ponds until metamorphosis in the summer months (Storer 1925; Wright and Wright 1949; 75 FR 12816–12959). There is no evidence to suggest that they lay more than one clutch per year like some eastern ranids (Emlen 1977). Males appear at breeding sites approximately 2 to 4 weeks before females. Males call in groups of two to seven individuals with females attracted to the calling males (Jennings and Hayes 1994; USFWS 2002). Egg masses containing approximately 2,000 to 6,000 dark reddish eggs are attached to emergent vegetation such as bulrushes (*Scirpus* spp.) and cattails. Eggs require 20 to 22 days to develop into tadpoles, and tadpoles require 4 to 5 months to attain metamorphosis, which usually occurs between July and September. However, not all tadpoles develop into frogs the first year since overwintering tadpoles have been observed by a number of studies (USFWS 2002). Sexual maturity can be attained at 2 years of age by males and 3 years of age by females (USFWS 2002).

Red-legged frogs also use non-aquatic terrestrial habitats for refuge and dispersal. They rest and feed in riparian vegetation, and the moisture and cover of the riparian zone may facilitate dispersal. During periods when water is absent, red-legged frogs may take refuge in moist areas within riparian habitats and small mammal burrows in surrounding upland areas. California red-legged frogs may aestivate in small mammal burrows and moist leaf litter up to 98 feet from water in adjacent dense riparian vegetation for up to 77 days (Rathbun et al. 1993).

California red-legged frog dispersal patterns appear to depend on habitat availability and environmental conditions (75 FR 12816–12959). In non-aquatic habitats, dispersal may be limited, although California red-legged frogs have been documented to disperse over 2 miles under certain conditions (Bugler et al. 2003). Fellers and Kleeman (2007) found that the average dispersal distance of California red-legged frogs in their survey was 492 feet away from breeding habitat, and they concluded that although most frogs move from their breeding habitat, most only disperse as far as the nearest non-breeding habitat.

Hayes and Tennant (1985) found that most frequent prey groups for adult red-legged frogs were carabid and tenebrionid beetles, water striders (Gerridae), lycosid spiders, and larval neuropterans. Tadpoles probably feed on algae (Jennings et al. 1992). Small vertebrates such as Northern Pacific treefrog (*Pseudacris regilla*) and California mouse (*Peromyscus californicus*) comprised more than 50% of the prey mass taken by larger frogs and were the largest prey items in the Hayes and Tennant (1985) study.

Range and Distribution

The California red-legged frog formerly occurred from Shasta County, California, to Baja California, Mexico, west of the mountains, in habitats ranging in elevation from sea level to approximately 1,500 meters (4,921feet). The current geographic range extends from southern Mendocino County south to Baja California (Shaffer et al. 2004). It is now known from isolated localities in the Sierra Nevada Mountains, northern Coast, and northern Transverse Ranges while it is believed to be extirpated from the southern Transverse and Peninsular Ranges (USFWS 2002).

There is one historic (pre-1990) occurrence record of California red-legged frog within the Plan Area at Grant's Lake, west of Bitterwater Valley Road. There are six recent occurrence records for the species within the Plan Area. These include three records from a small drainage and ponds located between 2 and 4 miles east of the intersection of Highway 41 and Antelope Grade, east of Cholame Valley. One record is from the Cuyama River, downstream from Miranda Canyon to an unnamed road crossing, and one record from 1 mile south of Ortega Spring, in the Temblor Ranges (CDFG 2012) (Figure A-3).

Population Status and Trends

According to the USFWS (61 FR 25813–25833), the species has been extirpated from 70% of its former range and is now found primarily in wetlands and streams in coastal drainages of central California from Marin County to Ventura County. Historically, the species was known from 46 counties, but it has been extirpated from 24 of these (USFWS 2002). It has nearly been extirpated from California's inland regions, including the foothills of the Sierra Nevada and coastal areas south of Ventura County (Jennings and Hayes 1994). In 2002, the USFWS listed the species as common in the San Francisco Bay area and along the central coast (USFWS 2002). Within the Plan Area, California red-legged frogs were once widespread in the inner Coast Ranges between the Salinas River system and the San Joaquin Valley but have been extirpated from more than 90% of historic localities.

Threats

Habitat loss and degradation have been primary factors in the decline of the California red-legged frog. Other factors contributing to declining red-legged frog populations, directly related to urban development, include the introduction and spread of exotic predators (e.g., bullfrog (*Lithobates catesbeianus*), African clawed-frog (*Xenopus laevis*), green sunfish (*Lepomis cyanellus*), and crayfish) and increases in mesopredators (e.g., raccoons (*Procyon lotor*), skunks (*Mephitis mephitis*), and opossums (*Didelphis marsupialis*)) (Jennings 1988; Jennings and Hayes 1985; Moyle et al. 1986; Hayes and Jennings 1986). Additionally, water pollution, in the form of fertilizers, biocides, chlorine, and other pollutants, adversely affect amphibian development, survival, and habitat. Further, exotic plant species (e.g., tamarisk, giant reed (*Arundo donax*), iceplant (Hottentot fig) (*Carpobrotus edulis*), and pampas grass (*Cortaderia selloana*)) may also degrade red-legged frog habitat by contributing to altered hydrology, eliminating breeding pools, and restricting access to and quality of upland habitat. Other factors that may adversely affect the species include livestock grazing and recreational activities in riparian areas, and human-related increases in fire frequency (Jennings 1988).

In 2010, the USFWS designated critical habitat for the California red-legged frog, including one critical habitat area (SLO-1) that overlaps with the northeast corner of the Plan Area. This area of critical habitat includes locations in the Cholame Creek drainage and portions of the following watersheds: the southern portion of Blue Point, the western portion of Jack Canyon, and the eastern portion of Palo Prieto Canyon. The USFWS (75 FR 12816–12959) lists the following threats within this area of critical habitat: highway construction, overgrazing, and water diversions and recommends that the following issues across all suitable habitat for California red-legged frog may require special management considerations: disease; impacts from recreational activities, water diversions, mining, and flood-control maintenance activities; dredging; sedimentation; water chemistry; sedimentation; water chemistry or temperature alterations; pesticide application; overgrazing; competition and predation by non-native animal species; and habitat removal and alteration by urbanization, timber activities, and nonnative plant introduction.

Conservation and Management

The *Recovery Plan for the Red-legged Frog (*Rana aurora draytonii*)* was published by the USFWS on May 28, 2002 (USFWS 2002). The Plan Area overlaps with the Diablo Range and Salinas Valley Recovery Unit and the Northern Transverse Ranges and Tehachapi Mountains Recovery Unit. The recovery strategy for the California red-legged frog consists of four parts: (1) protect existing populations by reducing threats, (2) restore and create habitat that will be protected and managed in perpetuity, (3) survey and monitor populations and conduct research on the biology of and threats to the subspecies, and (4) reestablish populations of the subspecies within its historical range.

Jennings and Hayes (1994) recommend that riparian habitats need greater protection, especially areas of dense vegetation associated with deep water habitats. They also recommend that water quality standards and water flow regimes need to be maintained.

The 2010 final revised critical habitat rule designates 1,636,609 acres of critical habitat in 48 critical habitat units within 27 California counties (75 FR 12816–12959). The USFWS states that the proposed fourfold expansion of critical habitat over the 2006 designation better reflects areas that contain the primary constituent elements of red-legged frog habitat, including aquatic habitat for breeding activities; aquatic habitat for non-breeding activities; and upland habitat for shelter, foraging, predator avoidance, and dispersal (75 FR 12816–12959). In addition, 34 core areas that were described in the *Recovery Plan for the Red-legged Frog (*Rana aurora draytonii*)* (USFWS 2002) were used to focus on critical habitat areas, and areas within the 2006 designation were expanded to include habitat that is adjacent to areas with documented occurrences of red-legged frogs.

The California red-legged frog is covered under 22 habitat conservation plans (USFWS 2012).

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APPENDIX C

Non-Protocol Fish Survey Memorandum

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38 NORTH MARENGO AVENUE
PASADENA, CALIFORNIA 91101
T 626.204.9800 F 626.204.9834

MEMORANDUM

To:	Elisa Ventura
From:	Michael Cady
Subject:	Arroyo Seco Canyon – Focused Fish Survey
Date:	December 15, 2019
Attachment(s):	A) Project and Survey Area Location; B) Southern Steelhead/Rainbow Trout and Arroyo Chub Species Accounts

Dudek conducted a focused fish survey for the City of Pasadena (City) Pasadena Water and Power (PWP) in support of Arroyo Seco Canyon Project Areas 2 and 3 (proposed Project or Project). The focus of the survey were southern steelhead/rainbow trout *Oncorhynchus mykiss*) and arroyo chub (*Gila orcuttii*). The Project is located in the in the northwest corner of the City of Pasadena in Los Angeles County, California, as shown in Attachment A, Project and Survey Area Location. For the proposed Project's Environmental Impact Report analysis, the proposed Project consists of two primary action areas: a diversion dam and intake replacement in Area 2, and the spreading basin expansion in Area 3. An additional area (Area 1; Arroyo Seco Headworks) was previously allowed under an Initial Study/Mitigated Negative Declaration for the project. This area was included in the focused fish survey in support of the permits needed for impacts to jurisdictional waters for the project that will be for all three areas. These areas are connected by the Gabrielino Trail/Access Road, which serves as a recreational trail and the access road for City of Pasadena and U.S. Forest Service vehicles heading into and out of the Angeles National Forest.

Species accounts for southern steelhead/rainbow trout and arroyo chub are included in Attachment B, Southern Steelhead/Rainbow Trout and Arroyo Chub Species Accounts.

Methods

Desktop Analysis

Prior to conducting the field investigation, a literature review was conducted to evaluate the environmental setting of the Project site and identify potential special-status biological resources that may be found on the site. The following reports that encompass the Project site were reviewed:

- Biological Technical Report, Arroyo Seco Canyon Project, dated September 2014 (BonTerra Psomas 2014a)

The following online databases and reports were reviewed:

- California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB) (CDFW 2019)
- U.S. Fish and Wildlife Service's (USFWS) Critical Habitat and Species Occurrence Data (USFWS 2019)

- National Oceanic and Atmospheric Administration's (NOAA). Southern California Steelhead Recovery Plan (NOAA 2012)
- Inland Fishes of California (Moyle 2002)
- The Status and Distribution of the Freshwater Fishes of Southern California (Swift et al. 1993)
- Fish Species of Special Concern Of California (Moyle et al. 2015)

The CNDDB was queried based on the U.S. Geological Survey 7.5-minute quadrangle on which the Project site is located (*Pasadena, California*) and the eight surrounding quadrangles (*Sunland*, *Condor Peak*, *Chilao Flat*, *Burbank*, *Mount Wilson*, *Hollywood*, Los *Angeles*, and *El Monte*). The USFWS occurrence data and critical habitat databases were queried using geographic information system (GIS) software based on a 5-mile buffer around the Project site.

Field Survey

The focused survey area was within the Arroyo Seco from where the waters go sub-grade to the west of Area 3 and upstream to the Brown Mountain Dam; approximately 4.5 river miles, as shown in Attachment A. The purpose of the survey was to look for individuals of the two species and identify potential habitat. The survey was conducted on May 3, 2019 by Dudek Senior Biologist Michael Cady, as shown in Table 1, Survey Conditions. The focused survey passes were conducted by walking along and within the stream. Any pools, if present, where southern steelhead/rainbow trout could be present would be examined from a distance using binoculars before being approached.

Table 1
Survey Conditions

Date	Hours	Personnel	Conditions
10/14/2019	0900-1500	Michael Cady	61°F–73°F, 0% cc, 1–2 mph

Notes: cc = cloud cover; mph = miles per hour.

Results

No fish were observed during the survey. No suitable habitat, characterized by slow-moving water, mud or sand substrate, and depths greater than 40 centimeters (Moyle et al. 2015), for arroyo chub was observed in the survey area. No large, deep pools were observed that are preferred by the species during the summer and early fall (NOAA 2012), prior to the onset of the wet season.

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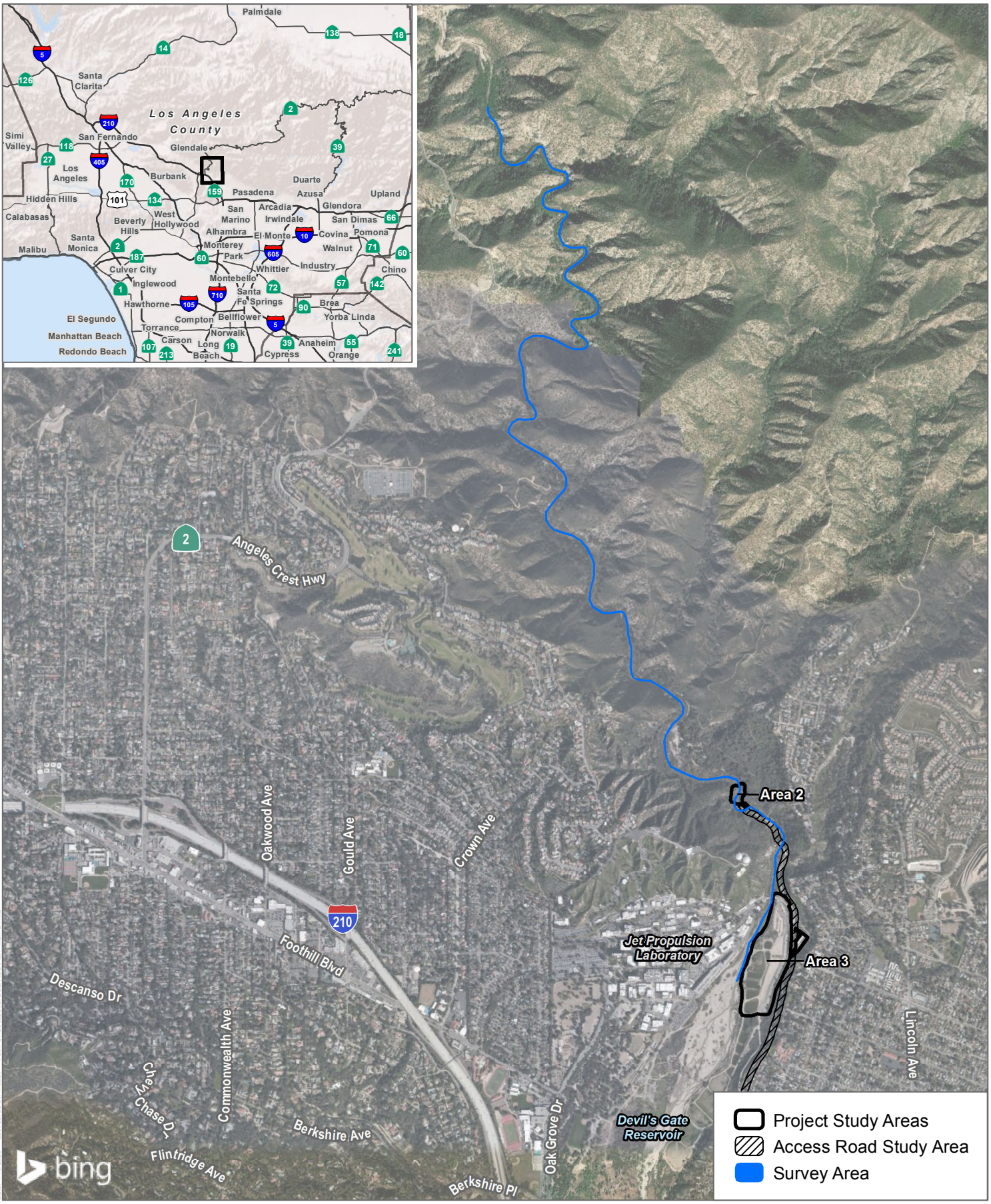
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Attachment A

Project and Survey Area Location

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SOURCE: Bing 2019, Open Street Map 2019

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Project and Survey Area Location

Arroyo Seco Canyon – Focused Fish Survey

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Attachment B

Southern Steelhead/Rainbow Trout and Arroyo Chub Species Accounts

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Southern Steelhead (*Oncorhynchus mykiss*)

State: None
Federal: Endangered

Life History

The southern steelhead (*Oncorhynchus mykiss*) and the rainbow trout are the same species, but the steelhead is anadromous (migrating from salt to freshwater) and the rainbow trout is confined to freshwater habitats. It is common to find populations exhibiting both life history strategies within the same river system, and individuals that exhibit one life history strategy can produce offspring that exhibit the other strategy (62 FR 43937–43954). Southern steelhead are lightly to heavily spotted with small black spots on a lighter background; the dorsal, caudal, and adipose fins have these spots as well. Juvenile and larger freshwater resident trout have a red to pink stripe down the mid-sides, hence the name 'rainbow" for the freshwater populations. Anadromous fish are larger, lack the pink stripe of the rainbow trout, and exhibit an overall silvery appearance with a "steely" blue-grey color dorsally. The inside of the mouth is entirely white in contrast to the other Pacific salmonid species, and they have a stronger tail stock and smaller anal fin than the other native Pacific salmon. The adipose fin separates them from all other native freshwater fish in anadromous streams in coastal southern California (Moyle 2002).

The range of the southern steelhead is from the Santa Maria River along the San Luis Obispo–Santa Barbara County line in the north to the Tijuana River just north of the United States–Mexico border in the south. The southern steelhead's historic range within many of these coastal streams was limited by natural barriers, above which no known southern California populations of native rainbow trout or steelhead previously existed. Definitive records of southern steelhead are not available for many of the small coastal streams within the Southern California Evolutionarily Significant Unit (ESU); however, it is believed that most of the streams were inhabited by southern steelhead. The distribution of southern steelhead within the ocean is not well known, but some evidence indicates that they stay relatively close to the coast and even near the mouths of their natal streams, in contrast to other Pacific salmonid species that range widely in the ocean (NMFS 2007).

Since the late 1990s southern steelhead have been recorded in the following watersheds:

- Santa Barbara County – the Santa Maria River, Santa Ynez River, Gaviota Creek, Arroyo Honda, Mission Creek, and Carpinteria Creek;
- Ventura County – the Ventura River and Santa Clara River;
- Los Angeles County – Malibu Creek and Topanga Creek;
- Orange County – San Juan Creek; and
- San Diego County – San Mateo Creek.

Migration and life history patterns of southern steelhead depend on rainfall and streamflow. In the highly variable conditions of the watersheds along the south central California coast, populations may commonly decline to extremely low numbers in some years. In most southern California streams sandbars at the mouth of the estuaries during periods of low river flow may block migration from the ocean. Adult steelhead congregate in the Pacific Ocean

off the mouth of the River and migrate upstream after the sandbar is breached from seasonal tidal influences and/or when triggered by rising streamflows from storm events (Moyle 2002; Shapovalov and Taft 1954).

In some river systems such as the Santa Clara River, steelhead appear to use winter freshets (a rise or overflowing of a stream resulting from heavy rain or snow melt) as a means to move from the sea to the upper areas of the watershed. These winter freshets may provide enough surface flow to break through the sandbar that builds up at the River–estuary interface during the low flow summer months.

Downstream migration of juveniles usually occurs between March and June (Shapovalov and Taft 1954). In southern California, steelhead typically migrates to the ocean as one- or two-year olds (Moore 1980). Outmigrating steelhead in the Santa Clara River, for example, have been observed from January through early June, but the majority of steelhead smolt emigrate during the period from March through early May, and the timing of migration is strongly dependent on streamflows (ENTRIX 2000).

Steelhead in the ocean feed on a variety of pelagic organisms, primarily anchovies and crustaceans. In streams, they overwhelmingly feed on aquatic insects in both the benthos and stream drift. They also consume available non-insects, including amphipods, isopods, oligochaete worms, and terrestrial insects that fall into streams. Larger steelhead in freshwater streams also take fish, such as sculpin, tidewater gobies, and small minnows and suckers. Larger juveniles in lagoons may feed on mysid shrimp, amphipods, and isopods, as well as a smaller variety of insects available in lagoons (Moyle 2002).

In streams, steelhead use habitat consisting of relatively cool, well-oxygenated water with adequate depth and cover. Temperature tolerances and preferences of steelhead vary among life stages. Eggs mortality may occur at water temperatures in excess of 55° F (13.3° C) (McEwan and Jackson 1996). At water temperatures greater than 70° F (21.1° C), steelhead appear to have difficulty obtaining sufficient oxygen from the water (McEwan and Jackson 1996). However, Carpanzano (1996) found trout living in Sespe Creek with a water temperature of 82.4° F (28° C). Cover provided by gravel, cobble, boulder, undercut banks, large and small woody debris, and overhanging vegetation is important for survival.

Steelhead require relatively clean unconsolidated gravel and cobble for spawning. Females excavate oval nests and lay their eggs while one or more attending males fertilize the eggs as they fall among the gravel. Unlike other Pacific salmonid species, steelhead can survive spawning and return to reproduce multiple times. Eggs hatch within three to four weeks, but the alevins (yolk-sac fry) cannot swim because they still have a large yolk attached. The alevins remain in the gravel for two additional weeks and then emerge when their yolk is used up. At this point, the alevins become free swimming juveniles. The juveniles spend one to two years in freshwater, reaching five to 10 inches in length before attempting to migrate to the ocean (Moyle 2002). Fish that descend to larger river habitats or coastal lagoons often attain larger sizes than stream-reared fish. It has been shown in the Santa Cruz, for example, that larger fish survive much better in the ocean than smaller fish. After their first year of life, steelhead may undergo physiological and morphological changes to smolts enabling them to survive in a marine environment. These smolts then migrate to the ocean, typically from March to May (Moyle 2002). Steelhead spend two to three years in the ocean and can grow to approximately 35 inches in length and weigh up to 22 pounds, although most are smaller (Moyle 2002). Studies of central California steelhead indicate that most individuals return to their natal stream, but some individuals do stray to other streams. This aspect of southern California populations is little studied and is an area of active current research.

Regulatory History

The southern steelhead was federally-listed as endangered in 1997 in the Southern California ESU that extends from the Santa Maria River in the north southward to Malibu Creek without critical habitat (62 FR 43937–43954). In 2002 the range of the Southern California ESU was extended south to the United States–Mexico Border (67 FR 21586–21598). On January 5, 2006, the federal endangered status of the southern steelhead was re-affirmed for 10 Distinct Population Segments (DPS) of West Coast Steelhead (71 FR 834).

Critical Habitat

The NMFS designated final critical habitat for five steelhead ESUs on September 2, 2005, (70 FR 52488–52586). The NMFS identified the following primary constituent elements (PCEs) in designating steelhead critical habitat (70 FR 52521):

1. Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
3. Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
4. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
5. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
6. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Recovery Plan

Presently, a Recovery Plan required by the federal ESA has not been published. However, a Southern California ESU recovery team has been formed and is currently working on a draft Recovery Plan for southern steelhead within the Santa Clara River and the Southern California ESU. In September 2007, a Federal Recovery Outline for the DPS of southern steelhead was released (NMFS 2007).

Threats

The primary threats to southern steelhead include loss of important portions of habitat range and deterioration of habitats due to artificial barriers that limit upstream migration, diversion of water from natural channels, and introduction of non-native species. The following provides a brief summary of the threats to southern steelhead based on the five listing factors that are used to assess species for listing as threatened or endangered under the federal ESA: (1) alteration of flow regimes from construction of dams and diversions; (2) decreased water quality (particularly higher water temperatures); (3) recreational fishing; (4) predation from birds and other fishes; and (5) competition and introduction of disease from trout and exotic species such as channel catfish, black bullhead, green sunfish, and largemouth bass.

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ARROYO CHUB

State: California Department of Fish and Wildlife Species of Special Concern
Federal: None

Life History

The arroyo chub (Gila orcutti) is native to the Los Angeles, San Gabriel, San Luis Rey, Santa Ana, and Santa Margarita rivers and San Juan and Malibu creeks (CDFG 1995B). Arroyo chub are now rare within their native range and are only common in the upper Santa Margarita River and its tributary De Luz Creek in northern San Diego County; Trabuco Creek below O'Neill Regional Park and San Juan Creek (San Juan Creek drainage) in southern Orange County; and Malibu Creek (Swift et al. 1993) and West Fork San Gabriel River below Cogswell Reservoir in Los Angeles County (CDFG 1995). The arroyo chub's range was artificially expanded as bait with trout or mosquitofish in the 1930s and 1940s (Swift et al. 1993). The arroyo chub was successfully introduced into the Santa Ynez, Santa Maria, Cuyama, and Mojave rivers, and is considered to be introduced within the Santa Clara River watershed (Swift et al. 1993; CDFG 1995). If not for the introduced populations, the arroyo chub would likely be considered a threatened or endangered species (NatureServe 2007).

The arroyo chub is a small fish, typically about 70 to 100 millimeters in size. It occurs in slow-moving or backwater sections of warm to cool (10ºC to 24ºC) streams with mud or sand substrates; it thrives in low-gradient systems (Swift et al. 1993). This species may tolerate high temperatures and hypoxic conditions that occur in slow-flowing or stagnant streams and backwater pools in dry summers. The arroyo chub feeds primarily on algae but also feeds on insects and small crustaceans.

The arroyo chub can successfully reproduce after one year (CDFG 1995). Arroyo chubs are fractional spawners that will breed from May to August, with the majority of breeding events taking place in June and July (CDFG 1995), although others report spawning in March to April or May (NatureServe 2007). The arroyo chub breeding habitat requires slow-moving areas of water or pools. After hatching, the young spend the next three to four months in areas of quiet water, usually among vegetation or areas with cover (CDFG 1995).

Threats

The arroyo chub is subject to various threats, including urbanization and associated habitat fragmentation, degradation, and reduction of suitable habitat for necessary for survival and breeding (CDFG 1995). The red shiner (*Cyprinella lutrensis*), an introduced minnow, can competitively exclude the arroyo chub from many areas it would be expected to occur. The arroyo chub can also be the victim of predation by various species, including green sunfish (*Lepomis cyanellus*) and salmonids. Other threats include lowering of the water level by dewatering, diversions, and water quality effects of waste and storm waters. The genetic integrity of introduced arroyo chub populations is at risk because as the species may hybridize in areas where other species of the *Cyprinidae* family occur (NatureServe 2007).

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APPENDIX D

Representative Site Photographs

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APPENDIX D
Representative Site Photographs



Photo 1. Area 2, existing diversion dam.



Photo 2. Area 2, existing diversion dam.

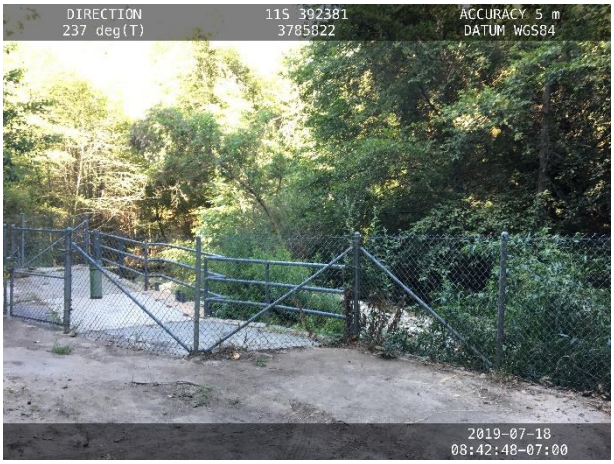


Photo 3. Area 2, existing diversion dam from Gabrielino Trail/Access Road.



Photo 4. Staging area south of Area 2 and adjacent to the Gabrielino Trail/Access Road.



Photo 5. Area 3, existing basin.



Photo 6. Area 3, graded area is where proposed basins will be constructed.



Photo 7. Area 3, existing basin.



Photo 8. The Arroyo Seco wash adjacent to Area 3 with JPL in the background.



Photo 9. Gabrielino Trail/Access Road south of Area 2.



Photo 10. North Arroyo Boulevard.



Photo 11. California sagebrush-California buckwheat-laurel sumac scrub in Area 3.



Photo 12. Coast live oak woodland on the right and white alder-California sycamore woodland bordering Gabrielino Trail/Access Road.



Photo 13. Arroyo willow-mulefat scrub in the Arroyo Seco to the west of Area 3.



Photo 14. Disturbed habitat in Area 3.



Photo 15. Urban/developed lands in Area 3.



Photo 16. Urban/developed lands adjacent to California sagebrush-California buckwheat-laurel sumac scrub in Area 3.

APPENDIX E

Plant Compendium

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APPENDIX E
Plant Compendium

* Denotes non-native species.

EUDICOTS

VASCULAR SPECIES

ADOXACEAE—MUSKROOT FAMILY

Sambucus nigra—blue elderberry

AMARANTHACEAE—AMARANTH FAMILY

* *Amaranthus albus*—prostrate pigweed

ANACARDIACEAE—SUMAC OR CASHEW FAMILY

Malosma laurina—laurel sumac
Rhus integrifolia—lemonade berry
Rhus ovata—sugarbush
* *Schinus molle*—Peruvian peppertree
Toxicodendron diversilobum—poison oak

APIACEAE—CARROT FAMILY

* *Anthriscus caucalis*—bur chervil
* *Conium maculatum*—poison hemlock

APOCYNACEAE—DOGBANE FAMILY

* *Nerium oleander*—oleander
* *Vinca major*—bigleaf periwinkle

ARALIACEAE—GINSENG FAMILY

* *Hedera helix*—English ivy

ASTERACEAE—SUNFLOWER FAMILY

Achillea millefolium—common yarrow
Ambrosia acanthicarpa—flatspine bur ragweed
Ambrosia psilostachya—western ragweed
* *Anthemis cotula*—stinking chamomile
Artemisia californica—California sagebrush
Artemisia douglasiana—Douglas' sagewort
Artemisia dracunculus—wild tarragon
Baccharis pilularis—coyote brush
Baccharis salicifolia—mulefat
Bidens frondosa—devil's beggartick

* *Bidens pilosa*—hairy beggarticks
* *Carduus pycnocephalus*—Italian plumeless thistle
* *Centaurea melitensis*—Maltese star-thistle
Chaenactis glabriuscula—yellow pincushion
* *Delairea odorata*—Cape-ivy
Encelia californica—California brittle bush
Erigeron canadensis—Canadian horseweed
Erigeron foliosus—leafy fleabane
Eriophyllum confertiflorum—golden-yarrow
Helianthus annuus—common sunflower
* *Helminthotheca echioides*—bristly oxtongue
Heterotheca grandiflora—telegraphweed
* *Lactuca serriola*—prickly lettuce
Lepidospartum squamatum—scale broom
* *Logfia gallica*—narrowleaf cottonrose
Malacothrix saxatilis—cliff desertdandelion
* *Pseudognaphalium luteoalbum*—Jersey cudweed
Rafinesquia californica—California plumeseed
* *Sonchus asper*—spiny sowthistle
* *Sonchus oleraceus*—common sowthistle
Stephanomeria exigua—small wirelettuce
Stephanomeria virgata—rod wirelettuce

BETULACEAE—BIRCH FAMILY
Alnus rhombifolia—white alder

BORAGINACEAE—BORAGE FAMILY
Cryptantha intermedia—Clearwater cryptantha
Cryptantha micromeres—pygmyflower cryptantha
Eriodictyon crassifolium—thick leaf yerba santa
Eucrypta chrysanthemifolia—spotted hideseed
Pectocarya penicillata—sleeping combseed
Phacelia cicutaria—caterpillar phacelia
Phacelia tanacetifolia—lacy phacelia

BRASSICACEAE—MUSTARD FAMILY
* *Brassica nigra*—black mustard
* *Brassica rapa*—field mustard
* *Capsella bursa-pastoris*—shepherd's purse
Cardamine oligosperma—little western bittercress
Descurainia pinnata—western tansymustard

* *Hirschfeldia incana*—shortpod mustard
Lepidium virginicum—Virginia pepperweed
Nasturtium officinale—watercress
* *Raphanus sativus*—cultivated radish
* *Sisymbrium irio*—London rocket
* *Sisymbrium officinale*—hedgemustard
* *Sisymbrium orientale*—Indian hedgemustard

CACTACEAE—CACTUS FAMILY
* *Opuntia ficus-indica*—Barbary fig
Opuntia oricola—chaparral pricklypear

CARYOPHYLLACEAE—PINK FAMILY
Silene laciniata—cardinal catchfly

CHENOPODIACEAE—GOOSEFOOT FAMILY
* *Chenopodium album*—lambsquarters
* *Salsola tragus*—prickly Russian thistle

CONVOLVULACEAE—MORNING-GLORY FAMILY
Calystegia macrostegia—island false bindweed
Cuscuta californica—chaparral dodder

CRASSULACEAE—STONECROP FAMILY
Dudleya cymosa—canyon liveforever

CUCURBITACEAE—GOURD FAMILY
Marah fabacea—California man-root
Marah macrocarpa—Cucamonga manroot

EUPHORBIACEAE—SPURGE FAMILY
Euphorbia albomarginata—whitemargin sandmat
* *Ricinus communis*—castorbean

FABACEAE—LEGUME FAMILY
Acmispon americanus—Spanish clover
Acmispon glaber—deer weed
Acmispon maritimus—coastal bird's-foot trefoil
* *Colutea arborescens*—bladder senna
Lathyrus vestitus—Pacific pea
Lupinus bicolor—miniature lupine
Lupinus hirsutissimus—stinging annual lupine

* *Medicago polymorpha*—burclover
* *Melilotus indicus*—annual yellow sweetclover
Pickeringia montana—chaparral pea
* *Spartium junceum*—Spanish broom

FAGACEAE—OAK FAMILY
Quercus agrifolia—coast live oak
Quercus berberidifolia—scrub oak
Quercus chrysolepis—canyon live oak

GERANIACEAE—GERANIUM FAMILY
* *Erodium botrys*—longbeak stork's bill
* *Erodium cicutarium*—redstem stork's bill
* *Geranium molle*—dovefoot geranium

GROSSULARIACEAE—GOOSEBERRY FAMILY
Ribes amarum—bitter gooseberry
Ribes aureum—golden currant
Ribes malvaceum—chaparral currant

JUGLANDACEAE—WALNUT FAMILY
Juglans californica—Southern California black walnut

LAMIACEAE—MINT FAMILY
* *Marrubium vulgare*—horehound
Salvia apiana—white sage
Salvia mellifera—black sage

LAURACEAE—LAUREL FAMILY
Umbellularia californica—California bay

MALVACEAE—MALLOW FAMILY
* *Malva parviflora*—cheeseweed mallow

MONTIACEAE—MONTIA FAMILY
Claytonia perfoliata—miner's lettuce

MORACEAE—MULBERRY FAMILY
* *Ficus carica*—edible fig

MYRTACEAE—MYRTLE FAMILY
* *Eucalyptus camaldulensis*—river redgum

OLEACEAE—OLIVE FAMILY

Fraxinus velutina—velvet ash

ONAGRACEAE—EVENING PRIMROSE FAMILY

Camissoniopsis bistorta—southern suncup
Camissoniopsis confusa—San Bernardino suncup
Camissoniopsis micrantha—miniature suncup
Clarkia purpurea—winecup clarkia
Epilobium canum—hummingbird trumpet
* *Oenothera laciniata*—cutleaf evening primrose

OROBANCHACEAE—BROOM-RAPE FAMILY

Castilleja affinis—coast Indian paintbrush

PAPAVERACEAE—POPPY FAMILY

Eschscholzia californica—California poppy

PHRYMACEAE—LOPSEED FAMILY

Diplacus aurantiacus—bush monkeyflower
Erythranthe cardinalis—scarlet monkeyflower

PLANTAGINACEAE—PLANTAIN FAMILY

Keckiella cordifolia—heartleaf keckiella
* *Plantago arenaria*—sand plantain
* *Plantago lanceolata*—narrowleaf plantain
* *Plantago major*—common plantain
* *Veronica anagallis-aquatica*—water speedwell

PLATANACEAE—PLANE TREE, SYCAMORE FAMILY

Platanus racemosa—California sycamore

POLEMONIACEAE—PHLOX FAMILY

Allophyllum glutinosum—sticky false gilyflower

POLYGONACEAE—BUCKWHEAT FAMILY

Eriogonum fasciculatum—California buckwheat
* *Rumex crispus*—curly dock

RANUNCULACEAE—BUTTERCUP FAMILY

Clematis lasiantha—pipestem clematis

RHAMNACEAE—BUCKTHORN FAMILY

Ceanothus crassifolius—hoary leaf ceanothus
Ceanothus leucodermis—chaparral whitethorn
Ceanothus oliganthus—hairy leaf ceanothus
Frangula californica—California coffee berry
Rhamnus crocea—redberry buckthorn
Rhamnus ilicifolia—hollyleaf redberry

ROSACEAE—ROSE FAMILY

Cercocarpus betuloides—birch leaf mountain mahogany
Heteromeles arbutifolia—toyon
Prunus ilicifolia—holly leaf cherry
Rosa californica—California rose
Rubus ursinus—California blackberry

RUBIACEAE—MADDER FAMILY

Galium angustifolium—narrowleaf bedstraw
Galium aparine—stickywilly

SALICACEAE—WILLOW FAMILY

Populus fremontii—Fremont cottonwood
Salix exigua—sandbar willow
Salix gooddingii—black willow
Salix laevigata—red willow
Salix lasiolepis—arroyo willow

SAPINDACEAE—SOAPBERRY FAMILY

Acer macrophyllum—bigleaf maple
* *Acer saccharinum*—silver maple

SCROPHULARIACEAE—FIGWORT FAMILY

* *Verbascum blattaria*—moth mullein
* *Verbascum virgatum*—wand mullein

SIMAROUBACEAE—QUASSIA OR SIMAROUBA FAMILY

* *Ailanthus altissima*—tree of heaven

SOLANACEAE—NIGHTSHADE FAMILY

Datura wrightii—sacred thorn-apple
* *Nicotiana glauca*—tree tobacco
Solanum americanum—American black nightshade
Solanum douglasii—greenspot nightshade

Solanum xanti—chaparral nightshade

URTICACEAE—NETTLE FAMILY

* *Urtica dioica*—stinging nettle

ZYGOPHYLLACEAE—CALTROP FAMILY

* *Tribulus terrestris*—puncturevine

FERNS AND FERN ALLIES

VASCULAR SPECIES

DRYOPTERIDACEAE—WOOD FERN FAMILY

* *Dryopteris arguta*—coastal woodfern

POLYPODIACEAE—POLYPODY FAMILY

Polypodium californicum—California polypody

PTERIDACEAE—BRAKE FAMILY

Pellaea andromedifolia—coffee cliffbrake

GYMNOSPERMS AND GNETOPHYTES

VASCULAR SPECIES

CUPRESSACEAE—CYPRESS FAMILY

Calocedrus decurrens—incense cedar

PINACEAE—PINE FAMILY

Pinus coulteri—Coulter pine

* *Pinus halepensis*—Aleppo pine

MONOCOTS

VASCULAR SPECIES

AGAVACEAE—AGAVE FAMILY

* *Agave americana*—American century plant

Hesperoyucca whipplei—chaparral yucca

ARECACEAE—PALM FAMILY

* *Washingtonia robusta*—Washington fan palm

POACEAE—GRASS FAMILY

* *Avena barbata*—slender oat
* *Avena fatua*—wild oat
* *Bromus diandrus*—ripgut brome
* *Bromus hordeaceus*—soft brome
* *Bromus madritensis* ssp. *rubens*—red brome
  Elymus condensatus—giant wild rye
* *Festuca myuros*—rat-tail fescue
* *Festuca perennis*—perennial rye grass
* *Hordeum murinum*—mouse barley
* *Lamarckia aurea*—goldentop grass
* *Pennisetum setaceum*—fountain grass
* *Phalaris minor*—littleseed canarygrass
* *Polypogon monspeliensis*—annual rabbitsfoot grass
* *Polypogon viridis*—beardless rabbitsfoot grass
* *Schismus barbatus*—common Mediterranean grass
* *Stipa miliacea*—no common name

APPENDIX F

Wildlife Compendium

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* Denotes non-native species.

AMPHIBIAN

FROGS

HYLIDAE—TREEFROGS

Pseudacris cadaverina—California treefrog
Pseudacris hypochondriaca—Baja California treefrog

TOADS

BUFONIDAE—TRUE TOADS

Anaxyrus boreas—western toad

BIRD

BLACKBIRDS, ORIOLES, AND ALLIES

ICTERIDAE—BLACKBIRDS

Icterus bullockii—Bullock's oriole
Icterus cucullatus—hooded oriole
* *Molothrus ater*—brown-headed cowbird

BUSHTITS

AEGITHALIDAE—LONG-TAILED TITS AND BUSHTITS

Psaltriparus minimus—bushtit

CARDINALS, GROSBEAKS, AND ALLIES

CARDINALIDAE—CARDINALS AND ALLIES

Pheucticus melanocephalus—black-headed grosbeak
Piranga ludoviciana—western tanager

FINCHES

FRINGILLIDAE—FRINGILLINE AND CARDUELINE FINCHES AND ALLIES

Haemorhous mexicanus—house finch
Spinus lawrencei—Lawrence's goldfinch
Spinus psaltria—lesser goldfinch
Spinus tristis—American goldfinch

FLYCATCHERS

TYRANNIDAE—TYRANT FLYCATCHERS

Contopus sordidulus—western wood-pewee
Empidonax difficilis—Pacific-slope flycatcher
Myiarchus cinerascens—ash-throated flycatcher
Sayornis nigricans—black phoebe
Tyrannus vociferans—Cassin's kingbird

HAWKS

ACCIPITRIDAE—HAWKS, KITES, EAGLES, AND ALLIES

Accipiter cooperii—Cooper's hawk
Buteo jamaicensis—red-tailed hawk
Buteo lineatus—red-shouldered hawk

HUMMINGBIRDS

TROCHILIDAE—HUMMINGBIRDS

Calypte anna—Anna's hummingbird
Selasphorus sasin—Allen's hummingbird

JAYS, MAGPIES, AND CROWS

CORVIDAE—CROWS AND JAYS

Aphelocoma californica—California scrub-jay
Corvus brachyrhynchos—American crow
Corvus corax—common raven

MOCKINGBIRDS AND THRASHERS

MIMIDAE—MOCKINGBIRDS AND THRASHERS

Mimus polyglottos—northern mockingbird
Toxostoma redivivum—California thrasher

NEW WORLD QUAIL

ODONTOPHORIDAE—NEW WORLD QUAIL

Callipepla californica—California quail

NEW WORLD VULTURES

CATHARTIDAE—NEW WORLD VULTURES

Cathartes aura—turkey vulture

OLD WORLD WARBLERS AND GNATCATCHERS

SYLVIIDAE—SYLVIID WARBLERS

Polioptila caerulea—blue-gray gnatcatcher

PIGEONS AND DOVES

COLUMBIDAE—PIGEONS AND DOVES

Patagioenas fasciata—band-tailed pigeon

Zenaida macroura—mourning dove

* *Streptopelia decaocto*—Eurasian collared-dove

SHOREBIRDS

CHARADRIIDAE—LAPWINGS AND PLOVERS

Charadrius vociferus—killdeer

SILKY FLYCATCHERS

PTILOGONATIDAE—SILKY-FLYCATCHERS

Phainopepla nitens—phainopepla

STARLINGS AND ALLIES

STURNIDAE—STARLINGS

* *Sturnus vulgaris*—European starling

SWALLOWS

HIRUNDINIDAE—SWALLOWS

Hirundo rustica—barn swallow

Petrochelidon pyrrhonota—cliff swallow

Stelgidopteryx serripennis—northern rough-winged swallow

Tachycineta thalassina—violet-green swallow

SWIFTS

APODIDAE—SWIFTS

Aeronautes saxatalis—white-throated swift

TITMICE

PARIDAE—CHICKADEES & TITMICE

Baeolophus inornatus—oak titmouse

VIREOS

VIREONIDAE—VIREOS

Vireo gilvus—warbling vireo

WATERFOWL

ANATIDAE—DUCKS, GEESE, AND SWANS

Anas platyrhynchos—mallard

WOOD WARBLERS AND ALLIES

PARULIDAE—WOOD-WARBLERS

Cardellina pusilla—Wilson's warbler
Oreothlypis celata—orange-crowned warbler
Setophaga petechia—yellow warbler

WOODPECKERS

PICIDAE—WOODPECKERS AND ALLIES

Colaptes auratus—northern flicker
Melanerpes formicivorus—acorn woodpecker
Dryobates nuttallii—Nuttall's woodpecker
Dryobates pubescens—downy woodpecker
Dryobates villosus—hairy woodpecker

WRENS

TROGLODYTIDAE—WRENS

Catherpes mexicanus—canyon wren
Thryomanes bewickii—Bewick's wren
Troglodytes aedon—house wren

WRENTITS

TIMALIIDAE—BABBLERS

Chamaea fasciata—wrentit

PARROTS

PSITTACIDAE—AFRICAN AND NEW WORLD PARROTS

* *Amazona viridigenalis*—red-crowned parrot

NEW WORLD SPARROWS

PASSERELLIDAE—NEW WORLD SPARROWS

Junco hyemalis—dark-eyed junco
Melospiza melodia—song sparrow
Melozone crissalis—California towhee
Pipilo maculatus—spotted towhee

MAMMAL

CANIDS

CANIDAE—WOLVES AND FOXES

Canis latrans—coyote

SQUIRRELS

SCIURIDAE—SQUIRRELS

Sciurus griseus—western gray squirrel
Spermophilus (Otospermophilus) beecheyi—California ground squirrel

UNGULATES

CERVIDAE—DEERS

Odocoileus hemionus—mule deer

REPTILE

LIZARDS

PHRYNOSOMATIDAE—IGUANID LIZARDS

Sceloporus occidentalis—western fence lizard
Uta stansburiana—common side-blotched lizard

ANGUIDAE—ALLIGATOR LIZARDS

Elgaria multicarinata—southern alligator lizard

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APPENDIX G

Special-Status Plant Species with Recorded Occurrences in the Project Vicinity

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APPENDIX G
Special-Status Plant Species with Recorded Occurrences in the Project Vicinity

Scientific Name	Common Name	Status[1] (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Arctostaphylos glandulosa ssp. *gabrielensis*	San Gabriel manzanita	None/None/1B.2	Chaparral (rocky)/perennial evergreen shrub/Mar/1950–4920	Not expected to occur. The Study Area is outside the range of the species.
Arenaria paludicola	marsh sandwort	FE/SE/1B.1	Marshes and swamps (freshwater or brackish); sandy, openings/perennial stoloniferous herb/May–Aug/5–560	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Astragalus brauntonii	Braunton's milk-vetch	FE/None/1B.1	Chaparral, Coastal scrub, Valley and foothill grassland; recent burns or disturbed areas, usually sandstone with carbonate layers/perennial herb/Jan–Aug/10–2100	Low potential to occur. Marginal habitat (coastal scrub) is present, but the species distribution is very limited in the San Gabriel Mountains (Monrovia Canyon). The species was not observed during the focused special-status plant species surveys in the Study Area.
Astragalus pycnostachyus var. lanosissimus	Ventura marsh milk-vetch	FE/SE/1B.1	Coastal dunes, Coastal scrub, Marshes and swamps (edges, coastal salt or brackish)/perennial herb/(June)Aug–Oct/0–115	Not expected to occur. Marginal habitat is present (coastal sage scrub), but the species typically occurs closer to the coast and is currently only known from Ventura County. Los Angeles County occurrences believed to be extirpated.
Atriplex parishii	Parish's brittlescale	None/None/1B.1	Chenopod scrub, Playas, Vernal pools; alkaline/annual herb/June–Oct/80–6235	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Atriplex serenana var. *davidsonii*	Davidson's saltscale	None/None/1B.2	Coastal bluff scrub, Coastal scrub; alkaline/annual herb/Apr–Oct/30–655	Not expected to occur. Marginal habitat (coastal scrub) is present, but Los Angeles County occurrences believed to be extirpated. Recent records (<50 years) are primarily closer to the coast or located in areas with alkaline soils.
Berberis nevinii	Nevin's barberry	FE/SE/1B.1	Chaparral, Cismontane woodland, Coastal scrub, Riparian scrub; sandy or gravelly/perennial evergreen shrub/(Feb)Mar–June/225–2705	Low potential to occur. Suitable associated habitat present and recent local records occur, but the conspicuous shrub was not observed during the focused special-status plant species survey in the Study Area.
Calochortus clavatus var. *gracilis*	slender mariposa lily	None/None/1B.2	Chaparral, Coastal scrub, Valley and foothill grassland/perennial bulbiferous herb/Mar–June(Nov)/1045–3280	Low potential to occur. Suitable associated habitat is present, but no records from within the Arroyo Seco watershed. The species was not observed during the focused special-status plant species surveys in the Study Area.

Scientific Name	Common Name	Status[1] (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Calochortus palmeri var. *palmeri*	Palmer's mariposa lily	None/None/1B.2	Chaparral, Lower montane coniferous forest, Meadows and seeps; mesic/perennial bulbiferous herb/Apr–July/2325–7840	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the elevation range of the species.
Calochortus striatus	alkali mariposa lily	None/None/1B.2	Chaparral, Chenopod scrub, Mojavean desert scrub, Meadows and seeps; alkaline, mesic/perennial bulbiferous herb/Apr–June/225–5235	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the range of the species (western Mojave Desert).
Calochortus weedii var. *intermedius*	intermediate mariposa lily	None/None/1B.2	Chaparral, Coastal scrub, Valley and foothill grassland; rocky, calcareous/perennial bulbiferous herb/May–July/340–2805	Low potential to occur. Marginal habitat (coastal scrub) is present, but the species has a single record from the San Gabriel Mountains. Records for the species are primarily associated with the Puente Hills, the Santa Ana Mountains, and the Perris Basin. The species was not observed during the focused special-status plant species surveys in the Study Area.
Calystegia felix	lucky morning-glory	None/None/1B.1	Meadows and seeps (sometimes alkaline), Riparian scrub (alluvial); historically associated with wetland and marshy places, but possibly in drier situations as well; possibly silty loam and alkaline/annual rhizomatous herb/Mar–Sep/95–705	Not expected to occur. Only one record within the last 100 years in Los Angeles County, with the remaining recent occurrences from Chino in San Bernardino County.
Castilleja gleasoni	Mt. Gleason paintbrush	None/SR/1B.2	Chaparral, Lower montane coniferous forest, Pinyon and juniper woodland; granitic/perennial herb (hemiparasitic)/May–June(Sep)/2180–7120	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the elevation range of the species.
Centromadia parryi ssp. *australis*	southern tarplant	None/None/1B.1	Marshes and swamps (margins), Valley and foothill grassland (vernally mesic), Vernal pools/annual herb/May–Nov/0–1575	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Centromadia pungens ssp. *laevis*	smooth tarplant	None/None/1B.1	Chenopod scrub, Meadows and seeps, Playas, Riparian woodland, Valley and foothill grassland; alkaline/annual herb/Apr–Sep/0–2100	Low potential to occur. Marginal habitat is present (riparian woodland), but the species has only one historic record (>100 years) within the Los Angeles River watershed. The species was not observed during the focused special-status plant species surveys in the Study Area.

Scientific Name	Common Name	Status[1] (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Chorizanthe parryi var. *fernandina*	San Fernando Valley spineflower	FC/SE/1B.1	Coastal scrub (sandy), Valley and foothill grassland/annual herb/Apr–July/490–4005	Low potential to occur. Marginal habitat is present, but the species has no local records within the last 100 years. The species was not observed during the focused special-status plant species surveys in the Study Area.
Chorizanthe parryi var. *parryi*	Parry's spineflower	None/None/1B.1	Chaparral, Cismontane woodland, Coastal scrub, Valley and foothill grassland; sandy or rocky, openings/annual herb/Apr–June/900–4005	Low potential to occur. Suitable habitat (coastal scrub) is present and the species has a historical record (1919) upstream of the Study Area; however, the species was not observed during the focused special-status plant species surveys in the Study Area.
Cladium californicum	California sawgrass	None/None/2B.2	Meadows and seeps, Marshes and swamps Alkaline or Freshwater/perennial rhizomatous herb/June–Sep/195–5250	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Cuscuta obtusiflora var. *glandulosa*	Peruvian dodder	None/None/2B.2	Marshes and swamps (freshwater)/annual vine (parasitic)/July–Oct/45–920	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Dodecahema leptoceras	slender-horned spineflower	FE/SE/1B.1	Chaparral, Cismontane woodland, Coastal scrub (alluvial fan); sandy/annual herb/Apr–June/655–2495	Low potential to occur. Suitable associated habitat (coastal scrub) is present and the species has a historical record (1920) upstream of the Study Area; however, the focused special-status plant surveys were negative for the species in the Study Area.
Dudleya multicaulis	many-stemmed dudleya	None/None/1B.2	Chaparral, Coastal scrub, Valley and foothill grassland; often clay/perennial herb/Apr–July/45–2590	Not expected to occur. Suitable associated habitat (coastal scrub) is present, but the species has no records west of the San Gabriel River in the San Gabriel Mountains.
Galium grande	San Gabriel bedstraw	None/None/1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest/perennial deciduous shrub/Jan–July/1390–4920	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Helianthus nuttallii ssp. *parishii*	Los Angeles sunflower	None/None/1A	Marshes and swamps (coastal salt and freshwater)/perennial rhizomatous herb/Aug–Oct/30–5005	Not expected to occur. Suitable associated habitat is not present and the species is presumed extinct.

Scientific Name	Common Name	Status[1] (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Horkelia cuneata var. *puberula*	mesa horkelia	None/None/1B.1	Chaparral (maritime), Cismontane woodland, Coastal scrub; sandy or gravelly/perennial herb/Feb–July(Sep)/225–2655	Low potential to occur. Suitable associated habitat (coastal scrub) is present and the species has been previously found in the Study Area area, but the record is greater than 100 years old. The species was not observed during the focused special-status plant species surveys in the Study Area.
Imperata brevifolia	California satintail	None/None/2B.1	Chaparral, Coastal scrub, Mojavean desert scrub, Meadows and seeps (often alkali), Riparian scrub; mesic/perennial rhizomatous herb/Sep–May/0–3985	Low potential to occur. Suitable associated habitat (coastal) is present, but the species has only been found within the Big Tujunga Creek portion of the Los Angeles River watershed. The species was not observed during the focused special-status plant species surveys in the Study Area.
Lasthenia glabrata ssp. *coulteri*	Coulter's goldfields	None/None/1B.1	Marshes and swamps (coastal salt), Playas, Vernal pools/annual herb/Feb–June/0–4005	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Linanthus concinnus	San Gabriel linanthus	None/None/1B.2	Chaparral, Lower montane coniferous forest, Upper montane coniferous forest; rocky, openings/annual herb/Apr–July/4985–9185	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the elevation range of the species.
Linanthus orcuttii	Orcutt's linanthus	None/None/1B.3	Chaparral, Lower montane coniferous forest, Pinyon and juniper woodland; openings/annual herb/May–June/3000–7035	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the elevation range of the species.
Lupinus peirsonii	Peirson's lupine	None/None/1B.3	Joshua tree woodland, Lower montane coniferous forest, Pinyon and juniper woodland, Upper montane coniferous forest; gravelly or rocky/perennial herb/Apr–June/3280–8200	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the elevation range of the species.
Malacothamnus davidsonii	Davidson's bush-mallow	None/None/1B.2	Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland/perennial deciduous shrub/June–Jan/605–3740	Low potential to occur. Suitable habitat is present (coastal scrub), but the conspicuous shrub was not observed during the focused special-status plant species surveys in the Study Area.
Nasturtium gambelii	Gambel's water cress	FE/ST/1B.1	Marshes and swamps (freshwater or brackish)/perennial rhizomatous herb/Apr–Oct/15–1085	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Navarretia prostrata	prostrate vernal pool navarretia	None/None/1B.1	Coastal scrub, Meadows and seeps, Valley and foothill grassland (alkaline), Vernal pools; Mesic/annual herb/Apr–July/5–3970	Not expected to occur. The species is almost exclusively associated with vernal pools in southern California, which are not found onsite.

Scientific Name	Common Name	Status[1] (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Opuntia basilaris var. *brachyclada*	short-joint beavertail	None/None/1B.2	Chaparral, Joshua tree woodland, Mojavean desert scrub, Pinyon and juniper woodland/perennial stem succulent/Apr–June(Aug)/1390–5905	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the range of the species (northern slopes of the San Gabriel and San Bernardino mountains.
Orobanche valida ssp. *valida*	Rock Creek broomrape	None/None/1B.2	Chaparral, Pinyon and juniper woodland; granitic/perennial herb (parasitic)/May–Sep/4100–6560	Not expected to occur. Suitable associated habitat is not present and the Study Area is outside the elevation range of the species.
Phacelia stellaris	Brand's star phacelia	None/None/1B.1	Coastal dunes, Coastal scrub/annual herb/Mar–June/0–1310	Not expected to occur. Suitable associated habitat (coastal scrub) is present, but the species is only known from one record in the Los Angeles River watershed (Downey) and no records less than 75 years old in Los Angeles County.
Pseudognaphalium leucocephalum	white rabbit-tobacco	None/None/2B.2	Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland; sandy, gravelly/perennial herb/(July)Aug–Nov(Dec)/0–6890	Low potential to occur. Suitable habitat (coastal scrub and riparian woodland) is present, but the species has only one record within the last 75 year within the Los Angeles River watershed (Big Tujunga Creek). The species was not observed during the focused special-status plant species surveys in the Study Area.
Quercus dumosa	Nuttall's scrub oak	None/None/1B.1	Closed-cone coniferous forest, Chaparral, Coastal scrub; sandy, clay loam/perennial evergreen shrub/Feb–Apr(May–Aug)/45–1310	Low potential to occur. Suitable habitat (coastal scrub) is present, but the conspicuous shrub was not observed during the focused special-status plant species surveys in the Study Area.
Ribes divaricatum var. *parishii*	Parish's gooseberry	None/None/1A	Riparian woodland/perennial deciduous shrub/Feb–Apr/210–985	Not expected to occur. Suitable habitat (riparian woodland) is present, but the species is presumed extinct.
Scutellaria bolanderi ssp. *austromontana*	southern mountains skullcap	None/None/1B.2	Chaparral, Cismontane woodland, Lower montane coniferous forest; mesic/perennial rhizomatous herb/June–Aug/1390–6560	Not expected to occur. Suitable associated habitat is not present in the Study Area.
Sidalcea neomexicana	salt spring checkerbloom	None/None/2B.2	Chaparral, Coastal scrub, Lower montane coniferous forest, Mojavean desert scrub, Playas; alkaline, mesic/perennial herb/Mar–June/45–5020	Not expected to occur. Suitable soil conditions are not present in the Study Area.
Spermolepis lateriflora	western bristly scaleseed	None/None/2A	Sonoran desert scrub; Rocky or sandy/annual herb/Mar–Apr/1195–2200	Not expected to occur. Suitable associated habitat is not present in the Study Area.

Scientific Name	Common Name	Status[1] (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Symphyotrichum defoliatum	San Bernardino aster	None/None/1B.2	Cismontane woodland, Coastal scrub, Lower montane coniferous forest, Meadows and seeps, Marshes and swamps, Valley and foothill grassland (vernally mesic); near ditches, streams, springs/perennial rhizomatous herb/July–Nov(Dec)/5–6695	Low potential to occur. Suitable habitat (coastal scrub and streams) is present, but the species has no records within the last 100 year within the Los Angeles River watershed. The species was not observed during the focused special-status plant species surveys in the Study Area.
Symphyotrichum greatae	Greata's aster	None/None/1B.3	Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest, Riparian woodland; mesic/perennial rhizomatous herb/June–Oct/980–6595	Low potential to occur. Suitable habitat (riparian woodland) is present in Area 2 and there a recent (1991) local records upstream of the Study Area; however, the species was not observed during the focused special-status plant species surveys in the Study Area.
Thelypteris puberula var. *sonorensis*	Sonoran maiden fern	None/None/2B.2	Meadows and seeps (seeps and streams)/perennial rhizomatous herb/Jan–Sep/160–2000	Low potential to occur. Suitable habitat is present (streams) and there is a local record from 1967; however, the species was not observed during the focused special-status plant species surveys in the Study Area.

Notes:

[1] Status abbreviations:

FE: Federally Endangered

FT: Federally Threatened

SE: State Endangered

SR: State Rare

ST: State Threatened

CRPR: California Rare Plant Rank

1A: Plants presumed extirpated in California and either rare or extinct elsewhere

1B: Plants rare, threatened, or endangered in California and elsewhere

2A: Plants presumed extirpated in California but common elsewhere

2B: Plants rare, threatened, or endangered in California but more common elsewhere

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APPENDIX H

Special-Status Wildlife Species with Recorded Occurrences in the Project Vicinity

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APPENDIX H
Special-Status Wildlife Species with Recorded Occurrences in the Project Vicinity

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Fish				
Catostomus santaanae	Santa Ana sucker	FT/None	Small, shallow, cool, clear streams less than 7 meters (23 feet) in width and a few centimeters to more than a meter (1.5 inches to more than 3 feet) in depth; substrates are generally coarse gravel, rubble, and boulder	Not expected to occur on the Study Area or upstream and downstream from the Study Area. Suitable associated habitat is present and the Santa Ana sucker was historically documented throughout the upper and lower areas of the Los Angeles River watershed including the main stem Los Angeles River near Universal City and Los Feliz Boulevard and the tributaries Big Tujunga Creek and Arroyo Seco Creek. However, the species has been extirpated throughout most of this watershed.[2] The species was not found during previous surveys conducted downstream from Devil's Gate Dam in the Arroyo Seco and Los Angeles River to the Pacific Ocean.[3]
Gila orcuttii	arroyo chub	None/SSC	Warm, fluctuating streams with slow-moving or backwater sections of warm to cool streams at depths >40 centimeters (16 inches); substrates of sand or mud	Not expected to occur on the Study Area or upstream and downstream from the Study Area. Marginal habitat is present and the species was reintroduced to the Arroyo Seco below Devil's Gate Dam on August 25, 2008[4], but this species was not observed during fish-focused surveys conducted in 2012.[3] It is believed that the heavy sediment flow produced by rains following the Station Fire in 2009, which burned most of the watershed of the Arroyo Seco in the San Gabriel Mountains, may have removed the transplanted population[5]. Focused surveys for the species were negative in 2019.

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Oncorhynchus mykiss irideus pop. 10	steelhead - southern California DPS	FE/None	Clean, clear, cool, well-oxygenated streams; needs relatively deep pools in migration and gravelly substrate to spawn	Not expected to occur on the Study Area or downstream from the Study Area. Suitable associated habitat is present and the Arroyo Seco supports rainbow trout (*O. mykiss*) within the upper portions of the watershed, but historic stocking of Arroyo Seco with hatchery-raised rainbow trout by CDFW occurred; hence, there is some debate as to whether some of the trout seen in these currently landlocked areas are descendants of anadromous native *O. mykiss*.[6]. A recent genetic study of *O. mykiss* in southern California found that most populations have substantial genetic lineage from introduced hatchery rainbow trout, representing almost complete introgression or replacement of native fish by introduced hatchery trout.[7] Among the populations in tributaries of rivers that run through the highly urbanized areas of Southern California, only three groups of populations contained significant evidence of native coastal steelhead ancestry: (1) populations from the San Gabriel River system, (2) Coldwater Canyon in the Santa Ana River, and (3) the San Luis Rey River; however, tissue sample were not collected from the Arroyo Seco, with only Santa Anita Creek (located 10 miles from the Study Area) representing the Los Angeles River watershed. The individuals from Santa Anita Creek had genetics that corresponded to rainbow trout raised at the Mount Whitney Fish Hatchery. Access to the Study Area from downstream waters is blocked by impassable barriers (e.g., Devil's Gate Dam, built in 1920) of various types along the Los Angeles River and Arroyo Seco. The species was not found during previous surveys conducted downstream from Devil's Gate Dam in the Arroyo Seco and Los Angeles River to the Pacific Ocean.[3] Focused surveys for the species were negative in 2019.

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Rhinichthys osculus ssp. 3	Santa Ana speckled dace	None/SSC	Headwaters of the Santa Ana and San Gabriel Rivers; may be extirpated from the Los Angeles River system	Not expected to occur on the Study Area or upstream and downstream from the Study Area. Suitable associated habitat is present and the species historically inhabited streams in the upland areas of the Santa Ana, San Gabriel and Los Angeles rivers systems, but have since been extirpated from many parts of their range, including the middle reaches of the Santa Ana River, Strawberry Creek (Santa Ana River), Mill Creek (Santa Ana River), and most of the Los Angeles River (except Big Tujunga Creek) and San Jacinto River basins.[8] The species was not found during previous surveys conducted downstream from Devil's Gate Dam in the Arroyo Seco and Los Angeles River to the Pacific Ocean.[3]
Amphibians				
Anaxyrus californicus	arroyo toad	FE/SSC	Semi-arid areas near washes, sandy riverbanks, riparian areas, palm oasis, Joshua tree, mixed chaparral and sagebrush; stream channels for breeding (typically third order); adjacent stream terraces and uplands for foraging and wintering	Not expected to occur on the Study Area or upstream and downstream from the Study Area. Marginal habitat is present and there is anecdotal evidence of arroyo toads along a small tributary of Arroyo Seco above Devil's Gate Reservoir in 1996 and in or near the settling ponds in the main channel above Devil's Gate Dam in 1997 and 1998[9]. The USFWS included this portion of the Arroyo Seco in the 2001 designation of critical habitat but it was not included in the 2005 revised designation of critical habitat, as there had been no sightings of the species since 1998. The population that historically occurred at this location are considered extirpated due to the loss of habitat and the introduction of predators and competitors [10]. Protocol surveys for the species conducted in 2013 for the Study Area were negative.[11] Focused surveys for the species were negative in 2019.

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Rana draytonii	California red-legged frog	FT/SSC	Lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby or emergent vegetation associated with deep, still or slow-moving water; uses adjacent uplands	Not expected to occur on the Study Area or upstream and downstream from the Study Area. Marginal habitat is present and the species was historically abundant in the Los Angeles River watershed, including Arroyo Seco, but it is considered extirpated from the system due to the loss of habitat and the introduction of predators and competitors.[12] Protocol surveys for the species conducted in 2013 for the Study Area were negative.[11] Focused surveys for the species were negative in 2019.
Rana muscosa	mountain yellow-legged frog	FE/SE, WL	Lakes, ponds, meadow streams, isolated pools, and open riverbanks; rocky canyons in narrow canyons and in chaparral	Not expected to occur on the Study Area or upstream and downstream from the Study Area. Marginal habitat is present and the species was historically known from the Arroyo Seco watershed, but those populations are considered extirpated.[13] Additionally, the Arroyo Seco watershed was not included in the San Gabriel Mountains Management Unit as described in the USFWS prepared recovery plan for the species.[14] Protocol surveys for the species conducted in 2013 for the Study Area were negative.[11]
Taricha torosa	California newt	None/SSC	Wet forests, oak forests, chaparral, and rolling grassland	Present. The species was observed during surveys for the Study Area in 2013 in the Arroyo Seco, suitable habitat is present within Area 2, and the species could be encountered on the access road to Area 2.
Reptiles				
Emys marmorata	western pond turtle	None/SSC	Slow-moving permanent or intermittent streams, ponds, small lakes, and reservoirs with emergent basking sites; adjacent uplands used for nesting and during winter	Low potential to occur on the Study Area and upstream. Not expected to occur downstream from the Study Area. There is marginal habitat present and the species was historically known from the Arroyo Seco, but the last available record of the species is from 1971 and the species may be extirpated from the watershed.[1]
Anniella stebbinsi	southern California legless lizard	None/SSC	Coastal dunes, stabilized dunes, beaches, dry washes, valley–foothill, chaparral, and scrubs; pine, oak, and riparian woodlands; associated with sparse vegetation and moist sandy or loose, loamy soils	Previously observed and assumed to be present. There are five recent (2017 and 2018) records[1] in the Study Area and adjacent areas of Hahamonga Park. Suitable habitat is present within Area 2 and Area 3, and it could be encountered on the access road to Area 2.

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Arizona elegans occidentalis	California glossy snake	None/SSC	Arid scrub, rocky washes, grasslands, chaparral. Appears to prefer microhabitats of open areas and areas with soil loose enough for easy burrowing.	Low potential to occur. Marginal associated habitat is present in Area 3, but there are few recent records of the species in Los Angeles County.[1]
Aspidoscelis tigris stejnegeri	coastal whiptail	None/SSC	Hot and dry areas with sparse foliage, including chaparral, woodland, and riparian areas.	Previously observed and assumed to be present. The species was observed during the 2013 surveys for the Study Area and suitable habitat for the species occurs throughout the Study Area and surrounding area.
Phrynosoma blainvillii	Blainville's horned lizard	None/SSC	Open areas of sandy soil in valleys, foothills, and semi-arid mountains including coastal scrub, chaparral, valley–foothill hardwood, conifer, riparian, pine–cypress, juniper, and annual grassland habitats	Low potential to occur. While suitable habitat for the species occurs in Area 3 and along the access road to Area 1 and Area 2, the high level of human activity and vehicle traffic has likely negatively affected the presence of the species in the area due to direct impacts or the introduction of non-native ants
Thamnophis hammondii	two-striped gartersnake	None/SSC	Streams, creeks, pools, streams with rocky beds, ponds, lakes, vernal pools	Previously observed and assumed to be present. The species was observed during the 2013 surveys for the Study Area and suitable habitat for the species occurs throughout the Study Area and surrounding area.
Birds				
Athene cunicularia (burrow sites & some wintering sites)	burrowing owl	BCC/SSC	Nests and forages in grassland, open scrub, and agriculture, particularly with ground squirrel burrows	Low potential to occur. There is marginal associated habitat species and there is only one wintering record for the species within Hahamonga Watershed Park[15].
Buteo swainsoni (nesting)	Swainson's hawk	BCC/ST	Nests in open woodland and savanna, riparian, and in isolated large trees; forages in nearby grasslands and agricultural areas such as wheat and alfalfa fields and pasture	Not expected to occur (nesting). Suitable associated nesting habitat for the species does not occur in the Study Area or within the immediate vicinity. Species may be transient in the Study Area vicinity during migration.
Coccyzus americanus occidentalis (nesting)	western yellow-billed cuckoo	FT, BCC/SE	Inhabits extensive deciduous riparian thickets or forests, with dense, low-level understory foliage, and abuts slow-moving watercourses, backwaters, or seeps; willow usually a dominant component of the vegetation; densely foliaged, deciduous trees and shrubs, especially willows, required for roosting/nesting sites	Not expected to occur. Suitable associated nesting habitat for the species does not occur in the Study Area or within the immediate vicinity. The species is a rare visitor to Los Angeles County

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Coturnicops noveboracensis	yellow rail	BCC/SSC	Nesting requires wet marsh/sedge meadows or coastal marshes with wet soil and shallow, standing water	Not expected to occur. Suitable associated nesting and foraging habitat for the species does not occur in the Study Area or within the immediate vicinity.
Cypseloides niger (nesting)	black swift	BCC/SSC	Nests in moist crevices, caves, and cliffs behind or adjacent to waterfalls in deep canyons; forages over a wide range of habitats	Not expected to occur. Suitable associated nesting habitat for the species does not occur in the Study Area or within the immediate vicinity.
Empidonax traillii extimus (nesting)	southwestern willow flycatcher	FE/SE	Nests in dense riparian habitats along streams, reservoirs, or wetlands; uses variety of riparian and shrubland habitats during migration	Not expected to occur. Marginal nesting habitat for the species does occur in the Study Area; however, the protocol survey for the species was negative for the Study Area.
Falco peregrinus anatum (nesting)	American peregrine falcon	FDL, BCC/FP, SDL	Nests on cliffs, buildings, and bridges; forages in wetlands, riparian, meadows, croplands, especially where waterfowl are present	Not expected to occur. Suitable associated nesting habitat for the species does not occur in the Study Area or within the immediate vicinity.
Polioptila californica californica	coastal California gnatcatcher	FT/SSC	Nests and forages in various sage scrub communities, often dominated by California sagebrush and buckwheat; generally avoids nesting in areas with a slope of greater than 40%; majority of nesting at less than 1,000 feet above mean sea level	Not expected to occur. Marginal associated habitat for the species is present in Area 3, but the species does not have any records in the Study Area or at Hahamonga Watershed Park and it has few records from the southern slopes of the San Gabriel Mountains.[1, 15] Protocol surveys for the species were conducted for the Devil's Gate Reservoir Sediment Removal Project located just to the south of the Study Area and the surveys were negative for the species.[16]
Riparia riparia (nesting)	bank swallow	None/ST	Nests in riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with sandy soils; open country and water during migration	Not expected to occur. Suitable nesting habitat for the species does not occur in the Study Area or within the immediate vicinity.
Setophaga petechia (nesting)	yellow warbler	None/SSC	Riparian plant associations in close proximity to water. Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada. Frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders.	Present. Observed during the surveys in the Study Area near Area 2.

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Vireo bellii pusillus (nesting)	least Bell's vireo	FE/SE	Nests and forages in low, dense riparian thickets along water or along dry parts of intermittent streams; forages in riparian and adjacent shrubland late in nesting season	Not expected to occur. Suitable nesting habitat for the species does occur in the Study Area; however, the focused survey for the species was negative for the Study Area.
Mammals				
Antrozous pallidus	pallid bat	None/SSC	Grasslands, shrublands, woodlands, forests; day roosts are in caves, crevices, mines, and occasionally in hollow trees and buildings; night roosts may be in more open sites, such as porches and open buildings; few hibernation and maternity sites are known, but probably uses rock crevices	Low potential to occur. Suitable associated day/night roosts and foraging habitat for the individuals of the species occurs within the Study Area, but hibernation and maternity sites are not expected to occur.
Corynorhinus townsendii	Townsend's big-eared bat	None/SSC	Mesic habitats characterized by coniferous and deciduous forests and riparian habitat, but also xeric areas; requires caves, mines, tunnels, buildings, or other human-made structures for day and night roosting; hibernation sites are cold, but not below freezing; maternity roosts are found in caves, tunnels, mines, and buildings	Low potential to occur. Suitable associated day/night roosts and foraging habitat for the individuals of the species occurs within the Study Area, but hibernation and maternity sites are not expected to occur.
Eumops perotis californicus	western mastiff bat	None/SSC	Chaparral, coastal and desert scrub, coniferous and deciduous forest and woodland; day and night roosts in crevices in rocky canyons and cliffs where the canyon or cliff is vertical or nearly vertical, trees, and tunnels; nursery roosts described as tight rock crevices	Low potential to occur. Suitable associated day/night roosts and foraging habitat for the individuals of the species occurs within the Study Area, but hibernation and maternity sites are not expected to occur.
Lasionycteris noctivagans	silver-haired bat	None/None	Primarily a coastal and montane forest dweller; hibernates in hollow trees, rock crevices, buildings, mines, caves, and under sloughing bark; forages in or near coniferous or mixed deciduous forest, stream or river drainages; females may form nursery colonies or occur as solitary individuals in dense foliage or hollow trees	Low potential to occur. Suitable associated day/night roosting, hibernation roosting, and foraging habitat for the individuals of the species occurs within the Study Area; however, there are few records of the species from southern California, with most occurring in the Sierra Nevada and Cascade ranges.[1]

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Lasiurus blossevillii	western red bat	None/SSC	Roosting habitat includes forests and woodlands from sea level up through mixed conifer forests; feeds over a wide variety of habitats including grasslands, shrublands, open woodlands and forests, and croplands; day/night/maternal roosts primarily in trees, less often in shrubs and are often in edge habitats adjacent to streams, fields, or urban areas; usually solitary, although nursery colonies occasionally are found	Low potential to occur. Suitable associated day/night roosts, maternity roosts, and foraging habitat for the individuals of the species occurs within the Study Area; however, there are few records of the species from the San Gabriel Mountains.[1]
Lasiurus cinereus	hoary bat	None/None	Forest, woodland riparian, and wetland habitats; also juniper scrub, riparian forest, and desert scrub in arid areas; generally roosts in dense foliage of medium to large trees; preferred sites are hidden from above, with few branches below, and have ground cover of low reflectivity; females and young tend to roost at higher sites in trees	Medium potential to occur. Suitable associated day/night roosting, maternity roosts, and foraging habitat for the individuals of the species occurs within the Study Area, and there are records of the species from other watersheds within the San Gabriel Mountains that have similar habitat as the Arroyo Seco.[1]
Lasiurus xanthinus	western yellow bat	None/SSC	Valley–foothill riparian, desert riparian, desert wash, and palm oasis habitats; below 2,000 feet above mean sea level; day/night roosts in riparian trees and palms; may form small maternity groups in trees and palms	Low potential to occur. Suitable associated day/night roosts, maternity roosts, and foraging habitat for the individuals of the species occurs within the Study Area; however, there are few records of the species from the San Gabriel Mountains.[1]
Lepus californicus bennettii	San Diego black-tailed jackrabbit	None/SSC	Arid habitats with open ground; grasslands, coastal scrub, agriculture, disturbed areas, and rangelands	Low potential to occur. Area 3 has suitable, open habitat for the species, but the species few records from the vicinity.[1]
Macrotus californicus	Californian leaf-nosed bat	None/SSC	Riparian woodlands, desert wash, desert scrub; day/night roosts in mines and caves, occasionally buildings and bridges; maternity colonies found in tunnels and caves	Low potential to occur. Suitable associated day/night roosts and foraging habitat for the individuals of the species occurs within the Study Area, but maternity roosts habitat is not present. Former populations have disappeared from coastal basins, from Los Angeles to San Diego.[17]
Microtus californicus stephensi	south coast marsh vole	None/SSC	Tidal marshes along the coast	Not expected to occur on the Study Area or upstream and downstream from the Study Area. Suitable associated habitat is not present in the Study Area, upstream, or downstream of the Study Area.

Scientific Name	Common Name	Status[1] (Federal/State)	Habitat[1]	Potential to Occur
Neotoma lepida intermedia	San Diego desert woodrat	None/SSC	Coastal scrub, desert scrub, chaparral, cacti, rocky areas	Low potential to occur. Marginal habitat is located within the Study Area, but the species is expected to occur in the uplands areas of the Arroyo Seco Canyon slopes within rocky areas or densely vegetated areas.
Nyctinomops macrotis	big free-tailed bat	None/SSC	Rocky areas; roosts in caves, holes in trees, buildings, and crevices on cliffs and rocky outcrops; forages over water; probably does not breed in California. In other areas, small nursery colonies are formed in rocky crevices in high cliffs.	Low potential to occur. Suitable associated day/night roosts and foraging habitat for the individuals of the species occurs within the Study Area, but maternity roosts habitat is not present.
Onychomys torridus ramona	southern grasshopper mouse	None/SSC	Common in arid desert habitats of the Mojave Desert and southern Central Valley of California. Alkali desert scrub and desert scrub habitats are preferred, with somewhat lower densities expected in other desert habitats, including succulent shrub, wash, and riparian areas. Also occurs in coastal scrub, mixed chaparral, sagebrush, low sage, and bitterbrush habitats. Uncommon in valley foothill and montane riparian, and in a variety of other habitats.	Low potential to occur. Marginal habitat is located within the Study Area within Area 3; however there are few records of this species the Los Angeles Basin.[1]

Notes:

[1] Status abbreviations:

FE: Federally Endangered
FT: Federally Threatened
FDL: Federally Delisted
BCC: U.S. Fish and Wildlife Service Bird of Conservation Concern
SSC: California Species of Special Concern
FP: California Fully Protected Species
WL: California Watch List Species
SE: State Endangered
ST: State Threatened
SDL: State Delisted

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APPENDIX I

Protected Tree Report

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PROTECTED TREE REPORT
for the
Arroyo Seco Canyon Project Areas 2 and 3
City of Pasadena, California

Prepared for:

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
City	City of Pasadena
GIS	geographic information system
ISA	International Society of Arboriculture

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1 INTRODUCTION

This protected tree report provides an inventory and evaluation of the protected trees located on the Arroyo Seco Canyon Project Areas 2 and 3 (project). The project site is located in the City of Pasadena, California (Figure 1). As such, this protected tree report covers the regulations and requirements for the protection and removal of protected trees within the jurisdiction of the City of Pasadena (City).

The City retained Dudek to conduct a tree inventory and assessment for the project site. The project site includes Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements, which are connected by the North Arroyo Boulevard (i.e. Gabrielino Trail/Access Road). A Dudek International Society of Arboriculture (ISA)-Certified Arborist performed various functions associated with surveying, inventorying, and evaluating the condition of all protected trees located within the project site to meet the requirements of the municipal code Chapter 8.52 – City Trees and Tree Protection. This protected tree report addresses protected and non-protected trees.

The purpose of this protected tree report is to present the physical characteristics and mapped locations of the site's protected trees that are to be removed or protected in place during the proposed grading and construction-related activities, which are limited to Areas 2 and 3 of the project site. No earthmoving is anticipated to occur within the Gabrielino Trail/Access Road or the staging areas.

1.1 Project Location

The project site is located in the City within the Arroyo Seco Canyon at 3420 and 3500 Arroyo Seco Road, City of Pasadena. The project site is located in within Township 1 and 2 North, Range 12 West, of the Pasadena, California 7.5-minute USGS quadrangle. As shown on Figure 1, Explorer Road provides vehicular access to the southernmost boundary of Area 3 (approximately 0.3-mile from the intersection of Windsor Avenue and Ventura Street) and continues northward along the eastern boundary of Area 3. Area 2 is located approximately 0.34-mile north of Area 3, and just south of the boundary of the Angeles National Forest. The project site lies within Los Angeles County, just east of the City of La Canada Flintridge and west of the City of Altadena.

1.2 Site Characteristics

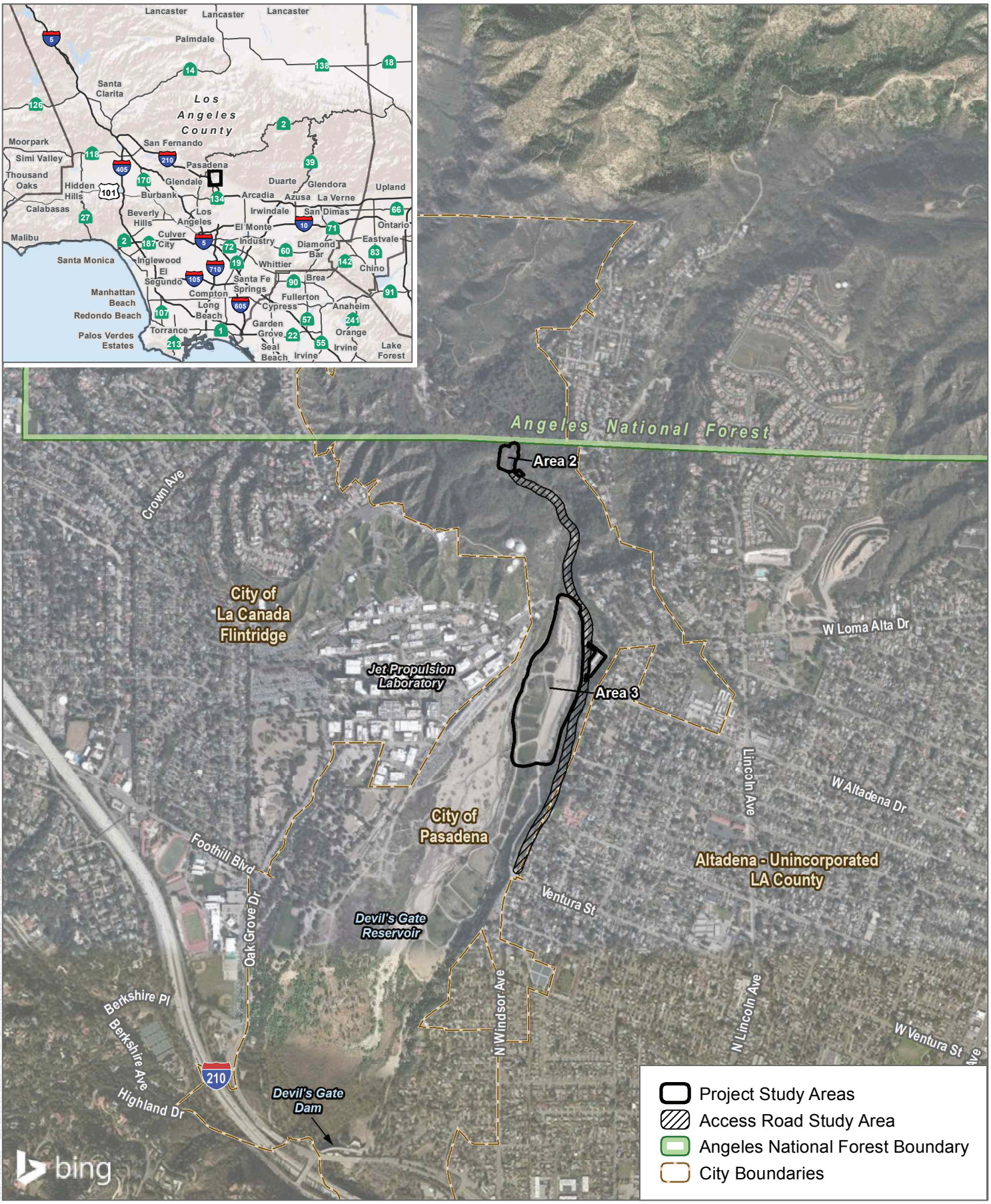
The project site has one paved access road on the south end of the property that extends into the spreading basin. The site continues further along the Gabrielino Trail on the north end of the property. The remaining land within the project site is best characterized as undeveloped native riparian land consisting of native tree species.

1.3 Project Description

The project site consists of two primary areas, as shown on Figure 1, Local Vicinity and Regional Location, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements, which are connected by the North Arroyo Boulevard (i.e., Gabrielino Trail/Access Road). The proposed project involves construction activity and facility improvements in Areas 2 and 3, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The former Travelling Screen and Chlorine Building (Screen Building) adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging only.

Improvements in Area 2 include the demolition and removal of the existing diversion weir and intake structure, and construction of a new diversion weir/intake structure that would allow for the diversion of up to 25 cubic feet per second (cfs) of flows from the Arroyo Seco for conveyance into the spreading basins in Area 3. Improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of creek flows for infiltration into the Raymond Basin.

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SOURCE: Bing 2019, Open Street Map 2019

DUDEK

0 700 1,400 Feet

FIGURE 1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3

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2 METHODS

2.1 Individual Tree Evaluation

Dudek mapped tree locations for all trees located on the project site. Tree mapping was conducted using a Trimble Pathfinder Pro XH GPS receiver with H-Star Technology. Since tree canopies can sometimes cause loss of satellite lock by blocking the line-of-sight to satellites, an electronic compass and reflectorless, electronic distance-measuring device were also used in mapping tree locations. The reflectorless, electronic distance-measuring device/compass combination operates in concert with the Pathfinder system to position offsets, and offset information is automatically attached to the GPS position data string. The electronic tree locations were then evaluated using ArcView 10.4 software to determine the position of the trees related to the project development footprint.

All inventoried and assessed protected trees were tagged with an aluminum tag bearing a unique identification number, which was placed on the trunk of each tree. These numbers correspond to the tree attribute information presented in Appendix A, Tree Information Matrix. Tree trunk diameters were measured using a diameter tape providing adjusted figures[1] for diameter measurements when wrapping the tape around an object's circumference. Diameter measurements were taken using protocol provided by the Council of Tree and Landscape Appraisers in the Guide for Plant Appraisal (ISA 2000). The trunk diameter measurement of each tree was taken at 4.5 feet above the ground along the trunk axis, with common exceptions. For example, in cases where a tree's trunk was located on a slope, the 4.5-foot distance was approximated as the average of the shortest and longest sides of the trunk (i.e., the uphill side and downhill side of a tree's trunk, respectively), and the measurement was made at this point. Tree height was visually estimated by experienced tree surveyors. Tree canopy diameters were typically estimated by "pacing-off" the measurement based on the investigator's knowledge of their stride length or by visually estimating the canopy width. The crown diameter measurements were made along an imaginary line intersecting the tree trunk that best approximated the average canopy diameter. Additionally, Dudek arborists calculated composite trunk diameters for multiple-stem trees according to ISA standards. According to these standards, the sum of all stem diameters was calculated to ascertain composite trunk diameter values for multiple-stem trees.

Pursuant to the Guide for Plant Appraisal (ISA 2000), tree health and structure were evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Each component of the tree was assessed with regard to health factors such as insect and pathogen damage, mechanical damage, presence of decay, presence of wilted or dead leaves, and wound closure. Tree health and structure were graded as good, fair, poor, and dead, with "good" representing no apparent problems, and "dead" representing a dying and/or dead tree. Good

[1] Inches divided by 3.14 (π) provide diameter measurement in inches.

condition trees exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Fair condition trees are typically those with few maladies but declining vigor. This method of tree condition rating is comprehensive and results in ratings that are useful for determining the status of trees based on common urban forestry standards.

Individual tree attribute data is presented in Appendix A, and protected tree locations are presented in Appendix B, Protected Tree Locations and Proposed Impacts Exhibit. Representative protected tree photographs are presented in Appendix C.

2.2 Tree Impact Analysis

Dudek's ISA-certified arborists determined tree impacts by conducting a spatial analysis of individual tree locations and canopy extents visible in project site aerial imagery in relation to the proposed development plan. The tree dataset, digital aerial imagery, and site development planning data were evaluated using geographic information system (GIS) software to determine where individual trees were located in relation to proposed development areas. Trees are considered impacted when anticipated disturbance to the tree is either 5 feet outside the dripline, or 15 feet from the trunks of a tree, whichever distance is greater. Trees with project-related construction activity occurring within their driplines are considered encroached upon for the purposes of this report. The impact analysis results were used to determine overall tree impacts for the project site.

2.3 Scope of Work Limitations

No root crown excavations or investigations, internal probing, or aerial canopy inspections were performed during the tree assessments. Therefore, the presence or absence of internal decay or other hidden or inaccessible inferiorities in individual trees could not be confirmed. It is recommended that any large tree proposed for preservation or relocation in an urban setting be thoroughly inspected for internal or subterranean decay by a qualified arborist before finalizing preservation or relocation plans.

3 OBSERVATIONS

3.1 Individual Trees

A total of 93 City-protected trees were inventoried within biological study areas for Areas 2 and 3. No tree in the project area meets the City definition of a "Landmark tree".

- A total of 49 protected trees were identified within Area 2.
- A total of 44 protected trees were identified within Area 3.

Appendix B presents the location of the individual trees mapped and assessed for the proposed project. Overall, the trees exhibit growth and structural conditions that are typical of their location in a native riparian watershed setting prone to drought and wildfires. The trees include various trunk and branch maladies and health and structural conditions. As presented in Appendix A, 34% of the individually mapped trees (32 trees) exhibit good health; 64% (59 trees) are in fair health; 2% (2 trees) are in poor health. Structurally, 5% (5 trees) of the individually mapped trees are considered to exhibit good structure, 88% (82 trees) exhibit fair structure, 7% (6 trees) poor structure. The trees in good condition exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Trees in fair condition are typical, with few maladies but declining vigor. Trees in poor condition exhibit declining vigor, unhealthy foliage, poor branch structure, and excessive lean. No pests or pathogens were observed on site.

Trees within biological study areas for Areas 2 and 3 vary in size and stature according to species and available growing space. The site's trees are composed of single- and multi-stemmed trees, with single-stemmed trunk diameters that range from 1 to 70 inches, and multi-stemmed trunk diameters that range from 9 to 135 inches. Tree heights vary from 12 to 60 feet. Tree canopy extents range from 9 feet to approximately 50 feet.

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4 REGULATORY DEFINITIONS AND REQUIREMENTS

A tree inventory and assessment of the project site was performed pursuant to City municipal code Chapter 8.52 – City Trees and Tree Protection. The following is an outline of the key aspects of the ordinance.

4.1 Definitions

Municipal Code Chapter 8.52.020 – City Trees and Tree Protection

For this project, trees subject to City permit requirements include those defined by municipal code Chapter 8.52.020, as follows:

- "Public tree" means a tree located in a place or area under ownership or control of the city including but without limitation streets, parkways, open space, parkland and including city owned property under the operational control of another entity by virtue of a lease, license, operating or other agreement.

- "Protected tree" means a native, specimen, landmark, landmark-eligible, mature (except for the trees in RS or RM-12 zones), or public tree.

For the purposes of this report, all trees are located in a City owned property, and therefor meet the definition of a “Public tree”, which are considered a “Protected tree” by the City Municipal Code. Determining tree impacts, trees that have protected zones that have been encroached upon would also be considered impacted. The tree protection zone is considered the area within the dripline of a tree and extending from there to a point at least five feet outside the dripline, or 15 feet from the trunks of a tree, whichever distance is greater.

4.2 Regulations

City of Pasadena – City Trees and Tree Protection

The City’s, City Trees and Tree Protection municipal code was in part established to:

- Preserve and grow Pasadena's canopy cover by protecting landmark, native and specimen trees on specified areas of private property and expanding the protection of street trees and trees on public property.
- Safeguard the City's urban forest by providing for the regulation of the protection, planting, maintenance and removal of trees in the city.
- Protect the visual and aesthetic character of the city.

- Improve and enhance property values by conserving and adding to the distinctive and unique aesthetic character of the many areas of Pasadena.
- Improve the quality of life for residents, visitors and wildlife.
- Create favorable conditions for the protection of designated landmark, native and specimen trees, for the benefit of current and future residents of Pasadena.
- Maintain and enhance the general health, safety and welfare of the city and its residents by assisting in counteracting air pollution and in minimizing soil erosion and other related environmental damage.
- Protect and maintain healthy trees in the land use planning processes as set forth herein.
- Establish procedures and practices for fulfilling the purposes of this city tree and tree protection ordinance.

Under the City municipal code, "No permits will be issued to any person or entity for pruning or removal of public trees, and all pruning and removal of public trees shall be undertaken by employees or contractors of the city pursuant to Section 8.52.080."

5 IMPACTS

Tree impacts were determined using GIS software and spatial locations of trees relative to the project's impact areas (development footprint). Impacts were further determined based on Dudek's experience with native and non-native trees and their typical reactions to root disturbances from construction activities, such as soil compaction, excavation, and grading. The impact analysis results presented herein were used for developing appropriate mitigation measures for the proposed project.

For the purposes of this report, direct impacts to trees can be classified as a removal or encroachment. Trees are identified for removal when they are located within the permanent impact boundary, as shown in Appendix B, which presents the location of the individual trees mapped and assessed for the proposed project. Trees are identified as encroachment if the tree canopy is within 5' of the permanent impact boundary, or if the tree trunk is within 15' of the permanent impact boundary. Direct impacts to encroachment trees include root damage, soil excavation and compaction, grade changes, loss of canopy, and trunk wounds, among others.

In general, there is a great deal of variation in tolerance to construction impacts among tree species, ages, and conditions. It is important to know how a certain tree, based on its species, age, and condition, would respond to different types of disturbance. The trees on the project site are of varying ages and conditions. Mature specimens are typically more sensitive to root disturbance and grade changes. In general, healthy trees will respond better to changes in their growing environment. Trees of poor health or stressed conditions may not be vigorous enough to cope with direct or indirect impacts from construction activities.

Impact totals presented are based on conceptual disturbance limits and development plans as of the date of this report. As such, the actual number of trees subject to direct impacts may change as the detailed site planning process proceeds. Actual tree impact numbers may be lower than anticipated and as presented in this report once detailed plans are developed. Measures to reduce impacts are encouraged and would be implemented in the field during grading operations. Following completion of construction-related disturbances, actual protected tree impact totals would be updated and provided, along with revised mitigation totals.

5.1 Direct Tree Impacts

For the purposes of this protected tree report, direct impacts are those associated with tree removal or earth-moving encroachment activities within the tree-protected zone (canopy dripline plus 5 feet or 15 feet from trunk, whichever is greater). Tree removal is expected to be required when the trunk is located inside the permanent impact boundary. Encroachment is expected when soil and roots are disturbed within the tree protected zone. Table 1 summarizes the number of trees by species that are expected to be directly impacted by construction.

Direct tree impacts would result in the removal of 19 protected trees in total, of which all are located in Area 2. A total of 15 protected trees are expected to be encroached upon (11 trees in Area 2 and 4 trees in Area 3). No trees are anticipated to be removed in Area 3. The locations of impacted trees are presented by impact type on the map in Appendix B. Measures to minimize the extent of impacts to encroached trees are provided in Chapter 6, Tree Protection Measures.

Table 1
Summary of Direct Tree Impacts in Area 2

Species		Protected Trees	
Scientific Name	*Common Name*	*Removal*	*Encroachment*
Alnus rhombifolia	white alder	15	5
Platanus racemosa	Ca. sycamore	0	2
Populus trichocarpa	black cottonwood	0	1
Quercus agrifolia	coast live oak	3	2
Quercus chrysolepis	canyon live oak	0	1
Salix nigra	black willow	1	0
	Total	**19**	**11**

Table 2
Summary of Direct Tree Impacts in Area 3

Species		Protected Trees	
Scientific Name	*Common Name*	*Removal*	*Encroachment*
Platanus racemosa	Ca. sycamore	0	1
Quercus agrifolia	coast live oak	0	3
	Total	**0**	**4**

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6 TREE PROTECTION MEASURES

A total of 15 protected trees located on the project site are anticipated to be encroached upon and have direct impacts from construction-related activities. As such, tree protection is required for those trees that would have encroachment, in accordance with section 8.52 of the Pasadena Municipal Code, Tree Protection Ordinance. Construction related activities should be monitored by a qualified certified arborist to ensure tree protection measures are followed, and assess tree impacts.

Other trees on the project site are located within the temporary construction zone (see Appendix B), and indirect impacts to trees may result from changes to the site that may cause tree decline, even when the tree is not directly injured. Indirect impacts include potential damage due to temporary staging of equipment. Any additional City-protected tree that is within the Project's study area and is not identified as a removal or encroachment should follow the tree protection standards of the City's Tree Protection Ordinance.

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7 CONCLUSION

The project site contains 93 protected trees, of which 49 are in Area 2, and 44 in Area 3. A total of 19 protected trees will be removed due to project implementation, all of which are located within Area 2. According to the City Tree Protection Ordinance, replacement totals for removed trees are determined by the "tree replacement matrix", which means the table of requirements for replanting replacement trees on private property when removing protected trees. As the City's Tree Protection Ordinance does not dictate a replacement ratio for removed 'public trees', the tree replacement requirement and the approved tree replacement ratio is at the discretion of the City and subject to a final tree impact analysis. As such, the final tree numbers associated with tree replacement may vary from that presented in this tree inventory and assessment.

15 trees will have encroachment (11 in Area 2, and 4 in Area 3). All protected trees not removed should be subject to the tree protection standards of the City's Tree Protection Ordinance. Construction related activities around the 15 encroachment trees should be monitored by a qualified certified arborist to ensure tree protection measures are followed, and to assess tree impacts.

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8 ARBORIST'S DISCLOSURE STATEMENT

This oak tree report provides conclusions and recommendations based only on a visual examination of the trees and surrounding site by an ISA-certified arborist and reasonable reliance on the completeness and accuracy of the information provided to the arborist. The examination did not include subterranean or internal examination of the trees.

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees; recommend measures to enhance the beauty and health of trees; and attempt to reduce the risk of living near them. Although trees provide many benefits to those who live near them, they also include inherent risks from breakage or failure that can be minimized but not eliminated.

Arborists cannot detect every condition that could possibly lead to the failure of a tree. Trees are living organisms subject to attack by disease, insects, fungi, weather, and other forces of nature, and conditions that lead to failure are often hidden within trees and belowground. There are some inherent risks with trees that cannot be predicted with any degree of certainty, even by a skilled and experienced arborist. Arborists cannot predict acts of nature, including, without limitation, storms of sufficient strength, which can cause an apparently healthy tree to fail. Additionally, arborists cannot guarantee that a tree will be healthy or safe under all circumstances or for any specific period of time. A tree's condition could change over a short or long period of time due to climatic, cultural, and/or environmental conditions. Further, there is no guaranty or certainty that recommendations or efforts to correct unsafe conditions will prevent future breakage or failure of a tree.

To live or work near trees is to accept some degree of risk. Neither the author of this oak tree report nor Dudek assume any responsibility for or will be liable for any claims, losses, or damages for damage to any tree, death or injury to any person, or any loss of or damage to any personal or real property.

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9 REFERENCES CITED

ISA (International Society of Arboriculture). 2000. *Guide for Plant Appraisal*. 9th edition. Council of Tree and Landscape Appraisers.

Matheny, N., and J.R. Clark. 1998. *Trees and Development: A Technical Guide to Preservation of Trees During Land Development*. International Society of Arboriculture. June 1, 1998.

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APPENDIX A

Tree Information Matrix

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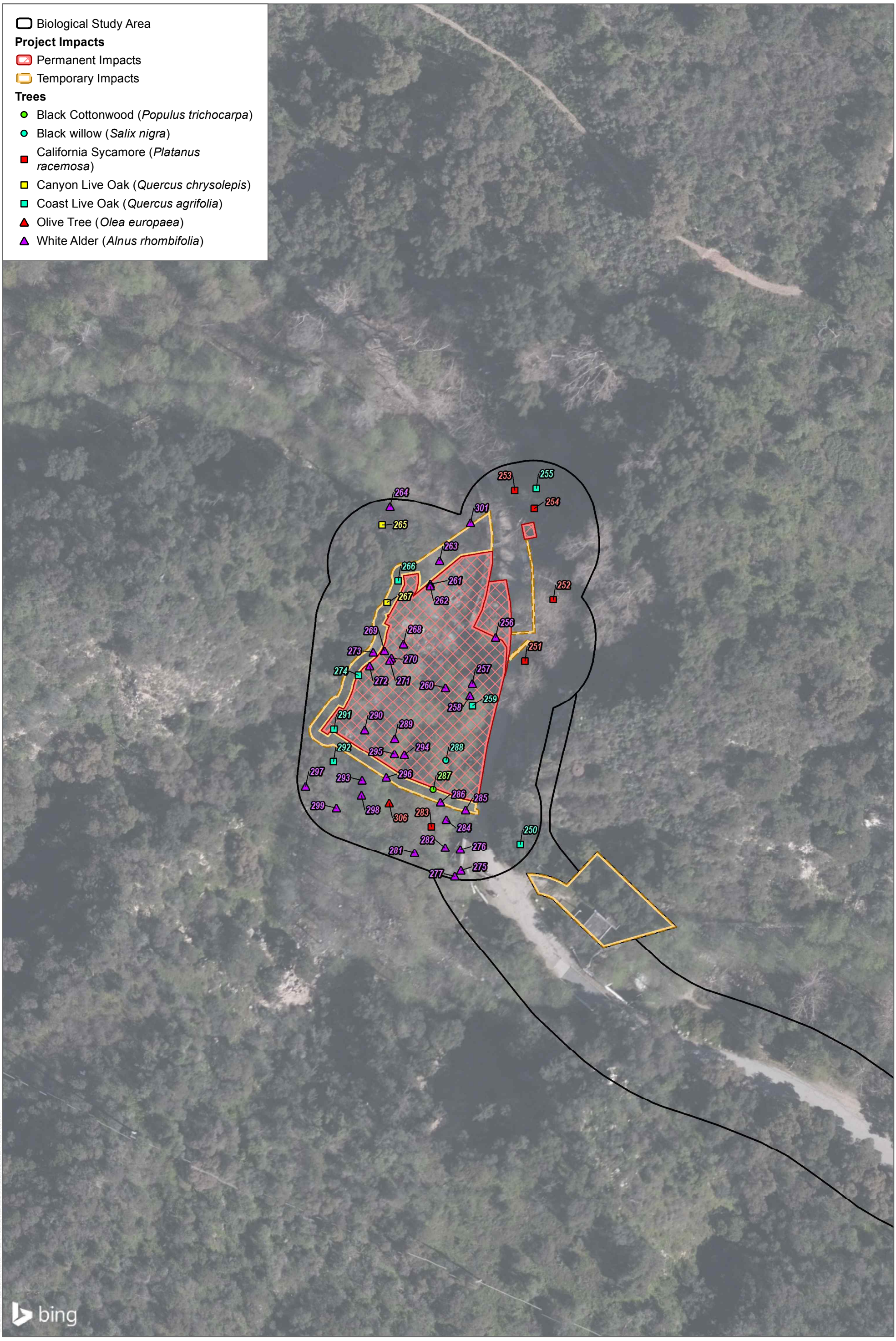
Arroyo Seco Canyon Project - Appendix A - Tree Information Matrix																	
Tree No.	Botanical Name	Common Name	Area	Tree Impacts	DBH (inches)	Number of Stems	Individual Stems						Height (ft.)	Crown Spread(ft.)	Health	Structure	Notes
							1	2	3	4	5	6					
250	*Quercus agrifolia*	coast ilve oak	Area 2	No Impact	38	1	38	0	0	0	0	0	45	35	good	Fair	
251	*Platanus racemosa*	California sycamore	Area 2	Encroachment	32	1	32	0	0	0	0	0	55	40	Fair	Fair	
252	*Platanus racemosa*	California sycamore	Area 2	No Impact	70	1	70	0	0	0	0	0	70	55	Fair	poor	poor access - estimated diameter
253	*Platanus racemosa*	California sycamore	Area 2	No Impact	20	1	20	0	0	0	0	0	45	35	Fair	Fair	
254	*Platanus racemosa*	California sycamore	Area 2	Encroachment	31	1	31	0	0	0	0	0	55	40	Fair	Fair	
255	*Quercus agrifolia*	coast ilve oak	Area 2	No Impact	8	1	8	0	0	0	0	0	27	15	Fair	Fair	
256	*Alnus rhombifolia*	white alder	Area 2	Removal	16	4	4	4	4	4	0	0	30	15	good	Fair	
257	*Alnus rhombifolia*	white alder	Area 2	Removal	17	1	17	0	0	0	0	0	50	17	Fair	Fair	old tag 25
258	*Alnus rhombifolia*	white alder	Area 2	Removal	19	1	19	0	0	0	0	0	50	25	Fair	Fair	old tag 24
259	*Quercus agrifolia*	coast ilve oak	Area 2	Removal	15	1	15	0	0	0	0	0	45	18	good	Fair	
260	*Alnus rhombifolia*	white alder	Area 2	Removal	17	3	6	7	4	0	0	0	33	15	Fair	Fair	
261	*Alnus rhombifolia*	white alder	Area 2	Removal	22	2	10	12	0	0	0	0	55	18	good	Fair	
262	*Alnus rhombifolia*	white alder	Area 2	Removal	18	1	18	0	0	0	0	0	55	20	good	Fair	
263	*Alnus rhombifolia*	white alder	Area 2	Encroachment	21	4	7	4	7	3	0	0	45	25	Fair	Fair	
264	*Alnus rhombifolia*	white alder	Area 2	No Impact	8	1	8	0	0	0	0	0	45	18	good	Fair	
265	*Quercus chrysolepis*	Canyon live oak	Area 2	No Impact	23	1	23	0	0	0	0	0	55	30	good	Fair	old tag 36
266	*Quercus agrifolia*	coast ilve oak	Area 2	Encroachment	51	5	12	16	13	6	4	0	45	50	Fair	poor	poor field access - manually placed GPS point, estimated DBH
267	*Quercus chrysolepis*	Canyon live oak	Area 2	Encroachment	17	1	17	0	0	0	0	0	45	35	Fair	Fair	No access, locked gate, did not tag, manually placed GPS point, estimated DBH
268	*Alnus rhombifolia*	white alder	Area 2	Removal	29	2	15	14	0	0	0	0	45	30	Fair	Fair	
269	*Alnus rhombifolia*	white alder	Area 2	Removal	13	1	13	0	0	0	0	0	55	15	Fair	Fair	old tag 34
270	*Alnus rhombifolia*	white alder	Area 2	Removal	18	1	18	0	0	0	0	0	55	16	Fair	Fair	old tag 33
271	*Alnus rhombifolia*	white alder	Area 2	Removal	15	1	15	0	0	0	0	0	50	18	Fair	Fair	old tag 32
272	*Alnus rhombifolia*	white alder	Area 2	Removal	13	1	13	0	0	0	0	0	50	20	Fair	Fair	
273	*Alnus rhombifolia*	white alder	Area 2	Encroachment	11	1	11	0	0	0	0	0	60	15	Fair	Fair	
274	*Quercus agrifolia*	coast ilve oak	Area 2	Removal	25	1	25	0	0	0	0	0	55	30	Fair	Fair	poor access - manually placed GPS point, estimated DBH, did not tag
275	*Alnus rhombifolia*	white alder	Area 2	No Impact	15	1	15	0	0	0	0	0	55	18	Fair	Fair	
276	*Alnus rhombifolia*	white alder	Area 2	No Impact	16	1	16	0	0	0	0	0	45	15	poor	Fair	
277	*Alnus rhombifolia*	white alder	Area 2	No Impact	44	4	8	9	12	15	0	0	45	20	Fair	Fair	
281	*Alnus rhombifolia*	white alder	Area 2	No Impact	29	2	14	15	0	0	0	0	60	40	Fair	Fair	
282	*Alnus rhombifolia*	white alder	Area 2	No Impact	15	1	15	0	0	0	0	0	65	20	Fair	Fair	
283	*Platanus racemosa*	California sycamore	Area 2	No Impact	23	2	12	11	0	0	0	0	65	22	good	Fair	
284	*Alnus rhombifolia*	white alder	Area 2	No Impact	13	1	13	0	0	0	0	0	65	25	Fair	Fair	
285	*Alnus rhombifolia*	white alder	Area 2	Encroachment	13	1	13	0	0	0	0	0	60	18	Fair	Fair	
286	*Alnus rhombifolia*	white alder	Area 2	Encroachment	18	3	7	8	3	0	0	0	55	20	Fair	Fair	
287	*Populus trichocarpa*	black cottonwood	Area 2	Encroachment	10	1	10	0	0	0	0	0	65	18	good	Fair	
288	*Salix nigra*	black willow	Area 2	Removal	22	4	6	6	6	4	0	0	45	20	Fair	Fair	
289	*Alnus rhombifolia*	white alder	Area 2	Removal	10	2	5	5	0	0	0	0	40	14	Fair	Fair	
290	*Alnus rhombifolia*	white alder	Area 2	Removal	24	4	6	6	6	6	0	0	45	20	Fair	Fair	
291	*Quercus agrifolia*	coast ilve oak	Area 2	Removal	38	2	18	20	0	0	0	0	55	40	Fair	Fair	poor access - manually placed GPS point, estimated DBH, did not tag
292	*Quercus agrifolia*	coast ilve oak	Area 2	Encroachment	27	2	27	0	0	0	0	0	55	40	Fair	Fair	poor access - manually placed GPS point, estimated DBH, did not tag
293	*Alnus rhombifolia*	white alder	Area 2	No Impact	14	1	14	0	0	0	0	0	45	15	Fair	Fair	
294	*Alnus rhombifolia*	white alder	Area 2	Removal	9	2	5	4	0	0	0	0	50	20	Fair	Fair	
295	*Alnus rhombifolia*	white alder	Area 2	Removal	9	2	6	3	0	0	0	0	55	15	Fair	Fair	
296	*Alnus rhombifolia*	white alder	Area 2	Encroachment	9	1	9	0	0	0	0	0	55	15	Fair	Fair	
297	*Alnus rhombifolia*	white alder	Area 2	No Impact	8	1	8	0	0	0	0	0	45	15	Fair	Fair	
298	*Alnus rhombifolia*	white alder	Area 2	No Impact	10	1	10	0	0	0	0	0	45	15	Fair	Fair	
299	*Alnus rhombifolia*	white alder	Area 2	No Impact	10	1	10	0	0	0	0	0	55	15	Fair	Fair	
301	*Alnus rhombifolia*	white alder	Area 2	No Impact	16	4	4	5	4	3	0	0	45	15	Fair	Fair	No access, private tree in a backyard, manually placed GPS point, estimated DBH, did not tag
306	*Olea europaea*	olive tree	Area 2	No Impact	1	1	0	0	0	1	0	0	45	30	Good	Fair	No access, private tree in a backyard, manually placed GPS point, estimated DBH, did not tag
58	*Juglans californica*	uthern California black walr	Area 3	No Impact	80	4	15	18	12	35	0	0	40	0	good	poor	
59	*Sambucus canadensis*	American elderberry	Area 3	No Impact	35	2	20	15	0	0	0	0	30	20	good	Fair	
62	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	24	2	7	17	0	0	0	0	40	30	good	Fair	
63	*Fraxinus uhdei*	evergreen ash	Area 3	No Impact	24	3	16	5	3	0	0	0	45	30	good	Fair	
64	*Eucalyptus leucoxylon*	white ironbark	Area 3	No Impact	19	1	19	0	0	0	0	0	50	18	Fair	poor	
65	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	18	1	18	0	0	0	0	0	35	30	good	Fair	
67	*Sambucus canadensis*	American elderberry	Area 3	No Impact	41	4	22	5	7	7	0	0	45	35	Fair	Fair	
68	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	16	1	16	0	0	0	0	0	30	20	good	Fair	
70	*Sambucus canadensis*	American elderberry	Area 3	No Impact	44	3	12	17	15	0	0	0	30	30	Fair	Fair	

71	*Acer negundo*	box elder	Area 3	No Impact	33	3	10	12	11	0	0	0	40	30	Fair	Fair	dormant, confirm species when it leafs out
72	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	27	4	8	5	6	8	0	0	30	20	Fair	Fair	
73	*Acacia baileyana*	bailey acacia	Area 3	No Impact	56	5	12	22	17	5	0	0	35	30	poor	poor	
76	*Eucalyptus cladocalyx*	sugar gum	Area 3	No Impact	41	1	41	0	0	0	0	0	55	45	Fair	Fair	
77	*Quercus agrifolia*	coast ilve oak	Area 3	Encroachment	75	2	38	37	0	0	0	0	45	40	good	Fair	
78	*Platanus racemosa*	California sycamore	Area 3	No Impact	26	1	26	0	0	0	0	0	45	35	Fair	Fair	
79	*Platanus racemosa*	California sycamore	Area 3	No Impact	34	3	21	7	6	0	0	0	50	40	Fair	Fair	
80	*Platanus racemosa*	California sycamore	Area 3	No Impact	45	3	21	14	10	0	0	0	40	40	Fair	Fair	
81	*Quercus agrifolia*	coast ilve oak	Area 3	Encroachment	103	8	17	19	17	19	14	17	30	35	good	poor	DBH 4in, 6in
82	*Platanus racemosa*	California sycamore	Area 3	No Impact	14	1	14	0	0	0	0	0	45	27	good	Fair	
83	*Platanus racemosa*	California sycamore	Area 3	No Impact	20	1	20	0	0	0	0	0	40	30	good	Fair	
84	*Platanus racemosa*	California sycamore	Area 3	No Impact	24	1	24	0	0	0	0	0	50	35	Fair	good	
85	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	8	1	8	0	0	0	0	0	20	12	good	Fair	
86	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	135	6	20	24	21	20	24	26	45	45	good	Fair	<Null>
87	*Platanus racemosa*	California sycamore	Area 3	No Impact	49	3	20	17	12	0	0	0	50	40	Fair	Fair	Potential ISHB
88	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	4	1	4	0	0	0	0	0	17	10	good	Fair	
89	*Platanus racemosa*	California sycamore	Area 3	Encroachment	23	1	23	0	0	0	0	0	55	30	good	Fair	
90	*Salix nigra*	black willow	Area 3	No Impact	7	1	7	0	0	0	0	0	40	13	Fair	Fair	
91	*Salix nigra*	black willow	Area 3	No Impact	5	1	5	0	0	0	0	0	30	10	Fair	Fair	
92	*Salix nigra*	black willow	Area 3	No Impact	6	1	6	0	0	0	0	0	35	12	Fair	Fair	
93	*Populus trichocarpa*	black cottonwood	Area 3	No Impact	8	1	8	0	0	0	0	0	45	18	good	Fair	poor access - manually placed GPS point, estimated DBH, did not tag
94	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	9	2	4	5	0	0	0	0	25	12	Fair	Fair	
95	*Quercus agrifolia*	coast ilve oak	Area 3	Encroachment	31	4	12	5	5	9	0	0	30	30	Fair	Fair	
96	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	27	2	13	14	0	0	0	0	30	30	good	Fair	
97	*Populus trichocarpa*	black cottonwood	Area 3	No Impact	8	1	8	0	0	0	0	0	45	18	good	Fair	poor access - manually placed GPS point, estimated DBH, did not tag
98	*Salix nigra*	black willow	Area 3	No Impact	9	1	9	0	0	0	0	0	45	18	Fair	Fair	
99	*Alnus rhombifolia*	white alder	Area 3	No Impact	10	1	10	0	0	0	0	0	50	18	good	good	
100	*Salix nigra*	black willow	Area 3	No Impact	6	1	6	0	0	0	0	0	35	15	Fair	fair	
101	*Alnus rhombifolia*	white alder	Area 3	No Impact	34	11	8	6	7	7	3	3	50	25	good	Fair	DBH 3in,3in,3in,3in,3in
102	*Alnus rhombifolia*	white alder	Area 3	No Impact	6	1	6	0	0	0	0	0	45	15	good	good	
103	*Alnus rhombifolia*	white alder	Area 3	No Impact	4	1	4	0	0	0	0	0	45	12	good	good	<Null>
105	*Corymbia maculata*	spotted gum	Area 3	No Impact	35	4	9	7	11	8	0	0	60	30	Fair	Fair	
107	*Quercus agrifolia*	coast ilve oak	Area 3	No Impact	5	1	5	0	0	0	0	0	12	9	Fair	Fair	
113	*Platanus racemosa*	California sycamore	Area 3	No Impact	35	2	21	14	0	0	0	0	60	35	good	Fair	
114	*Platanus racemosa*	California sycamore	Area 3	No Impact	12	1	12	0	0	0	0	0	30	20	Fair	good	

APPENDIX B

Protected Tree Location and Proposed Impacts Exhibit

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SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

DUDEK

0 35 70 Feet

FIGURE 11 - SHEET 1

Impacts to Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

Biological Study Area

Project Impacts

Permanent Impacts

Temporary Impacts

Trees

- American Elderberry (*Sambucus canadensis*)
- Bailey Acacia (*Acacia baileyana*)
- Black Cottonwood (*Populus trichocarpa*)
- Black willow (*Salix nigra*)
- Box Elder (*Acer negundo*)
- California Sycamore (*Platanus racemosa*)
- Coast Live Oak (*Quercus agrifolia*)
- Evergreen Ash (*Fraxinus uhdei*)
- Southern California Black Walnut (*Juglans californica*)
- Spotted Gum (*Corymbia maculata*)
- Sugar Gum (*Eucalyptus cladocalyx*)
- White Alder (*Alnus rhombifolia*)
- White Ironbark (*Eucalyptus leucoxylon*)



SOURCE: Bing 2019, Open Street Map 2019, Psomas (2014c)

DUDEK 0 75 150 Feet

FIGURE 11 - SHEET 2

Impacts to Protected Trees

Arroyo Seco Canyon Project Areas 2 and 3

APPENDIX C

Representative Protected Tree Photographs

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Arroyo Seco Canyon Project – Protected Tree Report
Site Photograph Log



Photo #1. Representative view of California sycamore trees facing southwest.



Photo #2. Representative view of alder trees facing southwest.

Photographs were taken on April 2, 2020

Arroyo Seco Canyon Project – Protected Tree Report
Site Photograph Log



Photo #3. Representative view of Area 3 facing south.



Photo #4. Representative view of Area 3 facing west.

Photographs were taken on April 2, 2020

APPENDIX J

Arroyo Seco Canyon Diversions
Biological Impacts Memorandum

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MEMORANDUM

November 8, 2018

To:
Elisa Ventura, PE, Principal Engineer
Pasadena Water and Power

From:
Marc T. Blain
Senior Project Manager

Subject: Arroyo Seco Canyon Diversions Biological Impacts Memorandum

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The purpose of this Memorandum is to describe methods and results of an analysis of the potential impacts on biological resources in the Upper Arroyo Seco, including the Devil's Gate Reservoir (Reservoir) area that may result from proposed water diversions associated with the implementation of the Pasadena Water and Power (PWP) proposed Arroyo Seco Canyon Project (ASCP). The ASCP would repair, replace and/or rehabilitate the diversion and intake structures in the Arroyo Seco in order to maximize the capture of PWP's surface water rights. The improvements, including a new sedimentation basin in the vicinity of the spreading basins, would facilitate management of sediment for diversion and spreading operations that were in the past managed with a headworks structure and settling basins further upstream. The ASCP also includes the expansion of PWP's spreading basins. The facilities and improvements that would be constructed as part of the ASCP would be located at three areas along the Arroyo Seco: Area 1 – Arroyo Seco Headworks; Area 2 – Arroyo Seco Intake; and Area 3 – Former PL Jet Propulsion Laboratory (JPL) East Parking Lot/Spreading Basins.

This Memorandum includes: (1) a summary of ASCP activities in the upper Arroyo Seco; (2) a description of current biological conditions in the study area; (3) background information on the biology and ecology of the dominant vegetation in the study area; (4) a summary of the findings of the recent Hydraulic, Sediment Transport, and Groundwater Analysis of the study area prepared by Psomas and included as Appendix A; (5) a summary of the methods and results of an ecological modeling study prepared by Southern California Coastal Water Research Project and included as Appendix B; (6) an analysis of the potential effect Project diversions may have on downstream vegetation communities and habitat; and (7) potential mitigation options with associated cost estimates to reduce diversion impacts.

PROJECT DESCRIPTION

PWP currently operates several structures in the upper Arroyo Seco Canyon that capture and convey water to a series of groundwater recharge (spreading) basins that are located along the eastern boundary of Devil's Gate Reservoir. The City of Pasadena (City) owns the right to divert up to 25 cubic feet per second (cfs) of surface water into their spreading basins, but heavy rain events in 2010 and 2011 washed down excessive amounts of sediment from the watershed that was destabilized due to the 2009 Station Fire. These debris flows damaged the diversion structure and prevented the City from diverting their allowed surface water rights into their spreading basins.

As a result, PWP proposes to repair and replace damaged facilities in the upper Arroyo Seco Canyon as a part of the ASCP. The improvements will allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this historically important local water resource. Specifically, modifications to the facilities in Area 2 will allow for increased diversion by capturing stream flows during storm events that in the past have been bypassed.

The proposed new diversion structure would capture all flows during small storm events and dry weather flows in the Arroyo Seco and would also capture up to PWP's surface water rights during large storm events. During larger storms when the water is too turbid (i.e. flows generally above 100 cfs), the stream with its associated sediment load would bypass the diversion structure and continue downstream to Devil's Gate Reservoir. Operations during high flows would be facilitated by the adjustable height weir or crest gate. At low flows, the gate would start in the 'up' position and as flows increase, the gate would be lowered to maintain a constant water surface level in the diversion pool (a pool created behind weir to allow for elevation appropriate to flow into diversion intake). When the gate is fully lowered, flows would entirely bypass the diversion structure and carry sediment downstream unabated.

PROJECT LOCATION

The survey area for this Memorandum includes a portion of the upper Arroyo Seco from Devil's Gate Dam extending upstream to the existing diversion weir and intake structure (to be replaced as part of the ASCP). The survey area is located in the City of Pasadena, in Hahamongna Watershed Park, south and east of the JPL (see Exhibit 1, Study Area).

EXISTING CONDITIONS

Climate and Hydrology

The Arroyo Seco upstream of the diversion weir is a perennial stream that contains surface water flow throughout the year. Currently, the City captures most dry season (approximately May through October) surface flows in the intake structure and transports this water to spreading basins that are located along the eastern boundary of Devil's Gate Reservoir. Wooden boards are placed in the diversion weir to direct flowing water into the intake structure. A small amount of water (e.g. less than 0.1 cfs) passes around the wooden boards and some limited pooling is often visible in the stream extending approximately 350 linear feet downstream of the diversion weir where a wooden A-frame bridge crosses over the stream. The stream gradient is generally flat immediately upstream of the bridge. There is a concrete footing for the bridge in the stream and downstream of that footing, there is an immediate four-foot drop in elevation of the stream bottom. This footing impedes the flow of water during the dry season, so that any surface flows do not generally extend past the bridge during the dry season.

The survey area is in a region that is subject to a Mediterranean climate, characterized by warm, dry summers and mild winters with intermittent rain that falls from November through April, usually peaking from December through March. Therefore, the region is subject to long periods without precipitation followed by wet winter months. In addition to significant variability in rainfall within any given year, rainfall amounts vary significantly from year to year. As shown in Table 1, total annual rainfall in recent years has ranged from as little as 6.24 inches in the 2006-2007 water year to 56.47 inches in the 2004-2005 water year.

The extreme range in rainfall totals results in wide variations in the amount of surface flows in the Arroyo Seco. For example, the monthly rainfall for Pasadena in January 2005 was 15.89 inches, which resulted in a mean stream flow in the Arroyo Seco of 268 cfs (Psomas 2018). That January 2005 data in the context of the mean monthly stream flow for Arroyo Seco in January (19.6 cfs), February (31.6 cfs), and March (25.8 cfs) is illustrative of the wide range of stream flows in the wet season months. Notably, the mean stream flow in the peak of the dry season (July through October) averaged less than 2.0 cfs.

TABLE 1
RAINFALL SUMMARY IN INCHES FOR PASADENA 1999-2018

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual Total
1999-2000	0.00	0.43	0.35	1.08	9.70	3.42	2.71	0.17	0.00	0.00	0.04	0.38	18.28
2000-2001	1.29	0.00	0.00	5.06	8.43	1.31	2.13	0.00	0.00	0.08	0.00	0.00	18.30
2001-2002	0.06	2.60	1.26	1.88	0.41	0.43	0.15	0.25	0.12	0.00	0.03	0.63	7.82
2002-2003	0.00	2.50	2.92	0.00	7.04	4.03	1.26	1.04	0.53	0.04	0.00	0.00	19.36
2003-2004	0.60	1.14	2.15	0.26	8.21	1.27	0.52	0.00	0.01	0.00	0.00	0.00	14.16
2004-2005	8.77	1.60	9.54	15.89	15.62	3.21	1.43	0.04	0.00	0.00	0.02	0.35	56.47
2005-2006	0.77	0.17	0.75	3.67	4.01	2.22	4.45	0.98	0.04	0.00	0.01	0.00	17.07
2006-2007	0.03	0.10	0.74	0.55	2.40	0.12	0.59	0.05	0.00	0.05	0.03	1.58	6.24
2007-2008	0.57	0.82	3.03	13.79	1.66	0.11	0.03	0.73	0.00	0.00	0.00	0.03	20.77
2008-2009	0.07	3.55	3.77	0.82	6.91	0.73	0.09	0.00	0.15	0.00	0.00	0.00	16.09
2009-2010	1.32	0.00	5.50	8.19	6.40	1.24	2.42	0.04	0.00	0.00	0.00	0.00	25.11
2010-2011	1.85	0.86	15.10	0.99	4.35	4.49	0.00	0.53	0.18	0.00	0.01	0.00	28.36
2011-2012	1.68	2.55	1.17	1.27	0.74	2.64	3.14	0.18	0.00	0.01	0.02	0.00	13.40
2012-2013	0.47	1.11	3.38	1.86	0.71	1.36	0.00	0.08	0.01	0.00	0.00	0.03	9.01
2013-2014	0.17	1.08	0.94	0.01	3.65	1.75	0.39	0.00	0.01	0.00	0.03	0.54	8.57
2014-2015	0.00	0.10	7.66	1.51	1.53	1.67	0.03	1.19	0.06	0.64	0.00	1.90	16.29
2015-2016	1.03	0.19	1.09	3.35	1.66	3.65	0.61	0.61	0.01	0.00	0.00	0.01	12.21
2016-2017	0.36	1.22	4.38	9.24	4.63	0.23	0.05	1.01	0.00	0.00	0.05	0.08	21.25
2017-2018	0.03	0.04	0.00	2.84	0.25	4.24	0.01	0.50	0.00	0.00	0.00	0.00	7.91
Average	**1.00**	**1.06**	**3.35**	**3.80**	**4.65**	**2.01**	**1.05**	**0.39**	**0.06**	**0.04**	**0.01**	**0.29**	**17.72**

Source: WRCC 2018. Rainfall totals provided in inches

During the wet periods or during episodic storms, surface water will flow from the upper Arroyo Seco into Devil's Gate Reservoir. Ongoing surface flows from the Arroyo Seco will result in standing water in the Reservoir. A review of historic aerial photos from Google Earth shows at least some surface water in the lower portion of the Reservoir in May 2003, January 2005, November 2005, March 2006, October 2007, January 2008, November 2009, and March 2011. Surface water is not observed in aerial photos subsequent to 2011, which corresponds to the severe drought conditions experienced in California from 2011 through 2016.

As the Arroyo Seco flows in a southerly direction past the existing diversion weir and past the JPL bridge, the channel morphology changes from a narrow canyon to a wide alluvial plain. During high flow periods, surface flows can reach the Devil's Gate Reservoir area, but at other times, water quickly infiltrates into the sandy sediment at the uppermost portion of the Reservoir. Therefore, a lack of observed surface water doesn't necessarily correlate to insufficient moisture within the substrate for the riparian vegetation in the Reservoir.

Existing Vegetation

The dominant vegetation community in the survey area is Black Willow Series, in which Goodding's black willow (*Salix gooddingii*) is the dominant species (Chambers Group 2010). Other native species associated with this vegetation community in the survey area include mule fat (*Baccharis salicifolia*), Fremont cottonwood (*Populus fremontii*), black cottonwood (*Populus trichocarpa*), and red willow (*Salix laevigata*). Non-native species such as gum trees (*Eucalyptus* sp.) and tree tobacco (*Nicotiana glauca*) were also observed. This vegetation type occurs throughout the lower portion of Devil's Gate Reservoir, correlated with the wettest conditions observed in the aerial photo analysis described above.

In somewhat drier areas in the upper Reservoir, a patchy distribution of mule fat scrub occurs intermixed with areas of unvegetated wash (Chambers 2010). These patches consist of dense stands of mule fat with occasional willow trees. Other species observed in these patches are various herbaceous non-native species such as Italian thistle (*Carduus pycnocephalus*), poison hemlock (*Conium maculatum*), and short-pod mustard (*Hirschfeldia incana*).

Further upstream, at the transition area from the narrow Arroyo Seco Creek to the wide alluvial system of Devil's Gate Reservoir (near the JPL bridge), the habitat consists of California sycamore woodland (BonTerra Psomas 2017). This vegetation community consists of California sycamore (*Platanus racemosa*) with occasional white alder (*Alnus rhombifolia*) and mule fat.

Continuing upstream, the vegetation is generally dominated by coast live oak (*Quercus agrifolia*) with patches of mule fat and occasional California sycamores. Immediately downstream of the diversion weir, vegetation is dominated by a mix of California sycamores and white alders with occasional Goodding's black willows and arroyo willows (*Salix lasiolepis*) (BonTerra Psomas 2014). Understory vegetation downstream of the diversion weir consists of riparian species such as tall umbrella sedge (*Cyperus eragrostis*), crofton weed (*Ageratina adenophora*), and water cress (*Nasturtium officinale*). As stream conditions become drier downstream of the existing diversion weir, understory vegetation is dominated by upland species such as smilo grass (*Stipa miliacea*) and poison oak (*Toxicodendron diversilobum*).

In general, the spatial distribution of vegetation in the study area is correlated to the hydrology of the area. Modest dry season surface flows occur immediately downstream of the diversion weir, which encourages establishment of facultative wetland species such as California sycamore and white alder (Lichvar and Kartesz 2009). As less water is available further downstream in the dry season, the vegetation is dominated by upland-riparian transitional species, such as mule fat and coast live oak. The greatest density and extent of facultative wetland species such as Goodding's black willow occurs in the downstream portion of Devil's Gate Reservoir, where Devil's Gate Dam blocks surface and subsurface flows, resulting in more available water to vegetation behind the Dam. No obligate wetland vegetation species (species that require wetlands) were described in the Chambers (2010) report, which is consistent with the highly variable surface flows that occur in the study area.

SPECIES BACKGROUND INFORMATION

Plant Species

Vegetation in the study area generally varies from facultative wetland plant species that can occur in perennially wet to intermittently wet areas, to drier species that are adapted to intermittent or ephemerally flowing water and/or to upland conditions. This section summarizes the general characteristics of the dominant facultative wetland species in the study area, as these are assumed to be the most sensitive to changes in the hydrological regime.

Goodding's Black Willow

Goodding's black willow is a phreatophyte, in other words, a deep-rooted species that is adapted to absorbing available groundwater for survival (Bush et al 1992). It is a deciduous tree species that is common to riparian areas throughout the southwestern United States (Hatch 2007). Goodding's black willow is a fast-growing species with a life span of approximately 50 years (Karrenberg et al 2002). They produce small wind-dispersed seeds that are short-lived (Stella et al 2006) and germinate within hours of landing (Karrenberg et al 2002). Peak seed production for this species occurs from April to July (Boland 2014). Seed germination requires moist sand that has some sun exposure, though long-term inundation of an area will greatly reduce seed germination (Tallent-Halsell and Walker 2002). Goodding's black willow is a potentially deep-rooted species with a maximum rooting depth of approximately seven feet (Stromberg 2013).

Fremont Cottonwood

Fremont cottonwood is a deep-rooted phreatophyte tree that is one of the most common trees in riparian areas of central and southern California (Hatch 2007). It is a fast-growing, deciduous tree that can grow up to 60 feet in height and has a life span of up to 130 years. Reproduction is similar to willows in that Fremont cottonwoods produce large amounts of small wind-dispersed seeds that are short-lived and typically germinate within 24 to 48 hours of landing on suitable sites (Fenner et al 1984). Seeds are covered with tiny hairs that aid in wind dispersal and allow them to float on water. Peak seed production for this species occurs in the later winter and early spring from February to April (Fenner et al 1984). Fremont cottonwood root depth is similar to Goodding's black willow potentially reaching seven feet below grade (Stromberg 2013).

Wildlife Species

Riparian habitats in southern California provide essential refuge, food, and water for a wide variety of wildlife. Certain species, such as the song sparrow (*Melospiza melodia*), are obligate riparian species and require riparian zones for their life cycle. Riparian zones are characterized by a unique set of physical ecological factors in comparison to the surrounding regional landscape (Gregory et al. 1991). Ecological factors inherent to riparian zones include flooding, rich soils, a water table within reach of plant roots (discussed further in the Impact of Diversions on Vegetation/Habitat section below); and fluvial events such as sediment transport, scouring, and channel movement (Griggs 2009). Species that require riparian zones for any portion of their life cycle are adapted to the associated fluvial events. The dynamic nature of riparian zones due to fluvial events disrupts habitat structure; therefore, various structural forms such as forest, woodland, shrubland, meadow and grassland, evolve over time. The heterogeneity of riparian zones creates many habitat features, and in turn, they support a greater diversity of wildlife than any other habitat type (Smith 1980). Riparian zones also function as important migration routes for many species.

Special status bird species that may potentially breed in riparian habitats in the Project's zone of influence include the State and federally-listed Endangered southwestern willow flycatcher (*Empidonax traillii extimus*) and least Bell's vireo (*Vireo bellii pusillus*); the yellow-breasted chat (*Icteria virens*), a California Species of Special Concern; and the yellow warbler (*Setophaga petechia*) a California Species of Special Concern. Non-special status bird species that may occur for breeding in the riparian habitats include the red-shouldered hawk (*Buteo lineatus*), red-tailed hawk (*Buteo jamaicensis*), cooper's hawk (*Accipiter cooperii*), warbling vireo (*Vireo gilvus*), common yellowthroat (*Geothlypis trichas*), and song sparrow among others. Preserving habitat for Endangered species has an indirect effect of preserving habitat for a host of other species that utilize the same habitat. In the study area, the least Bell's vireo, a State and federally-listed Endangered species, has been documented. Due to its regulatory status and its use as the key species for the ecological modeling (discussed in the Ecological Modeling Study section below), a detailed description of the vireo's life history, habitat requirements, and the study area's potential for supporting the vireo are discussed below.

Least Bell's Vireo

Bell's vireo is a Neotropical migrant that breeds in central and southwestern North America from northern Mexico to Southern California, Nevada, and Utah; east to Louisiana; and north to North Dakota, Wisconsin, and Indiana in the central United States (AOU 1998). There are four recognized subspecies of Bell's vireo (*Vireo bellii*) including *V. b. belli*; V. *b. medius*; *V. b. arizonae*; and *V. b. pusillus*, the least Bell's vireo (AOU 1998). Of the four Bell's vireo subspecies, only two breed in California: the least Bell's vireo and the Arizona Bell's vireo which breeds in the Colorado River Valley (Garrett and Dunn 1981; Rosenberg et al. 1991). The least Bell's vireo breeds in cismontane southern California and on the western edge of the deserts (Garrett and Dunn 1981). This subspecies winters in southern Baja California, and on the Pacific slope of mainland Mexico from Sonora south through northern Nicaragua (Brown 1993), and on the Atlantic slope from Veracruz Mexico south to Honduras (AOU 1998). The least Bell's vireo is a federally and State-listed Endangered Species. On February 2, 1994, the USFWS issued their final determination of critical habitat for the least Bell's vireo (USFWS 1994), identifying approximately 37,560 acres as critical habitat in Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside, and San Diego counties. These areas account for nearly 49 percent of the least Bell's vireo population in the United States (USFWS 1994). The Project area is not located in the designated critical habitat area for this species.

The least Bell's vireo population has increased tenfold from 291 territories in the early 1980s to an estimated 2,968 territories 35 years later (USFWS 2006). After a decade or more of absence in Los Angeles County, the least Bell's vireo returned by the mid-1980s with a pair reported from Whittier Narrows in 1985 and 1986 (Long 1993). Numbers of least Bell's vireo have continued to increase since that time, and it is now known to occur at several other locations in Los Angeles County such as the San Fernando (Van Norman) Dam; the San Gabriel River at Fish Canyon and Van Tassel Canyon; the Sepulveda Basin Wildlife Area; and the Castaic Lagoon Recreation Area (CDFW 2018). The two largest populations in the county are at Hansen Dam in the northeastern corner of the San Fernando Valley where 44 least Bell's vireo territories were present in 2009 (Griffith Wildlife Biology 2009) and on the Santa Clara River from I-5 downstream to the Las Brisas Bridge where 56 least Bell's vireo territories were present in 2007 (Bloom Biological, Inc. 2007).

This small olive-gray passerine occurs in riparian habitats. Breeding habitat consists of willow riparian woodland dominated by willows (*Salix* spp.), with western sycamore (*Platanus racemosa*), and cottonwoods (*Populus* spp.), with dense understory vegetation. Understory shrubs such as mule fat (*Baccharis salisifolia*) and California rose (*Rosa californica*) are often a component of the understory (Goldwasser 1981). The least Bell's vireo generally nests in early successional stages of riparian habitats, with nest sites predominantly located in willows, and more specifically willows that are between four and ten feet high (Franzreb 1989). The most critical factor in breeding habitat structure is the presence of a dense understory shrub layer from approximately two to ten feet above ground (Goldwasser 1981; Salata 1983; Franzreb 1989). The least Bell's vireo arrives on its breeding grounds mid-March with males arriving slightly before females (Barlow 1962; Brown 1993; Nolan 1960). Most individuals depart breeding grounds by September (Brown 1993). The vireo shows a high degree of site fidelity[1] (Greaves 1987). This species has two broods per season and its territory size is approximately 0.5-4.2 acres (Franzreb 1989). Nests are constructed from grass, plant fibers, leaves, paper, and strips of park fashioned with spider silk and lined with fine grass, down, and hair and are shaped like an open bag or basket (Barlow 1962; Nolan 1960). Nests are suspended from a fork in a low branch of a tree or shrub (Barlow 1962; Nolan 1960). Insects and spiders comprise 99 percent of the Bell's vireo diet, but some fruit may be taken after July (Barlow 1962; Brown 1993; Nolan 1960).

Conditions suitable for this species are present in riparian vegetation in the study area within the Devil's Gate Reservoir. Least Bell's vireo has been detected in the Reservoir during 2013 focused surveys for the Devil's Gate Sediment Removal Project, and by civilian birders in 2017 and 2018 (Chambers Group 2013; eBird 2018). During the 2013 focused surveys, one un-pared male was detected singing frequently, apparently defending a territory, on April 29, May 23, June 5, and 17. In 2017, one observation was reported to eBird on April 1 (no details given in the observation). Two least Bell's vireo, thought to be the same bird, were reported from the Reservoir in 2018 by the same individual (eBird 2018). On July 1, 2018 a singing male was recorded and uploaded to eBird; and on August 12, 2018 recordings of a singing male and multiple photographs showing the vireo clearly were uploaded (eBird 2018). No nesting in the Arroyo Seco has been documented to date.

The least Bell's vireo observations that include location data (2013 and August 2018 observations) place them in the black willow woodland within the Devil's Gate Reservoir within 0.5 miles of the Devil's Gate Dam, south of the Project area (see Exhibit 2, Modeled Change in Maximum Inundation Due to Proposed Project). The description of the black willow woodland from 2013 describes this area as containing large and small patches of black willow dominant habitat with mule fat, Fremont cottonwood (*Populus fremontii*), black cottonwood (*Populus trichocarpa*), white alder (*Alnus rhombifolia*), red alder (*Alnus rubra*), red willow (*Salix laevigata*) gum (*Eucalyptus* sp.), and tree tobacco (*Nicotiana glouca*) (Chambers Group 2013). It is also noted that portions of this community are lacking secondary structure (dense understory) due to unstable sediment accumulation and subsequent scouring from storm events (Chambers Group 2013). The July 2018 observer noted that the vireo was observed in a fairly open willow forest containing cottonwoods and eucalyptus, with a thick weedy understory about 3-6 feet high. This description is consistent with the breeding habitat requirements for the vireo as described above.

Upstream of the diversion point, potentially suitable habitat for the southwestern willow flycatcher and least Bell's vireo occurs in the arroyo willow thickets, arroyo willow thickets/mule fat thickets, and mule fat thickets habitat types. Focused surveys for the flycatcher and vireo have been negative to date in this area (BonTerra Consulting 2013, BonTerra Psomas 2016).

[1] Site fidelity refers to the tendency to return each season to the same nest site or breeding colony.

A drastic change in the Arroyo Seco habitat occurred as storms washed down large volumes of sediment from the canyon after the 2009 Station Fire, as is evidenced from historical aerial imagery. Sediment was deposited in the stream and washed down and settled in the Reservoir just above the Dam (refer to the 2014 Biological Technical Report for the Arroyo Seco Canyon Project for Area locations). Riparian habitat in these areas was knocked down or covered by sediment effectively removing the habitat over large areas. Habitat is slowly recovering, although, in the Reservoir large patches of low stature vegetation, free of mature willows are still visible.

The least Bell's vireo observations in the Reservoir occurred after this sediment inundation and associated habitat degradation. Although no pairing of vireo has been detected, it is not conclusive that breeding has not occurred. The least Bell's vireo is notoriously cryptic when breeding, and a female may have gone undetected. Additionally, multiple vireo were detected recently (2017 and 2018) in nearby Eaton Canyon approximately 4.75 miles south east of the study area, indicating that there is regional potential for a female to pair with a male defending a territory in the Reservoir (eBird 2018).

The vireo will nest in in the openings in between thickets, within thickets, and within closed canopied woodlands (Greaves 1989), and because of this, the dynamic nature of the habitat in the Reservoir remains potentially suitable for this species so long as a portion of the habitat remains unaffected long enough to generate a thick understory. A thick, tangled understory of mule fat, California rose, or other shrub species could potentially provide suitable habitat within 2-3 years if conditions were appropriate for growth.

HYDRAULIC, SEDIMENT TRANSPORT, AND GROUNDWATER STUDIES

A Hydraulics, Sediment Transport, and Groundwater Analysis was prepared for the study area and is included in Attachment A to this Memorandum (Psomas 2018). The purpose of the Analysis was to evaluate the relative impact of the City's proposed management of diversions from the Arroyo Seco on riparian resources located downstream of the diversion structure. Hydraulic modeling assumed 100 percent efficiency in diversions in order to reflect the maximum reduced flow and thereby the maximum potential downstream habitat impacts. A summary of the results of the Analysis is presented below.

The ***maximum depth*** of the Reservoir pool "with-diversion" is reduced by approximately 1.3 feet in a dry year in comparison to the "without-diversion" scenario (Exhibit 7, Attachment A). A review of Exhibit 5 of Attachment A indicates that the cause of the decrease in maximum depth is likely due to the fact that the total runoff for the representative dry year without-diversions is approximately 2,480 acre-feet (af), while the hydrograph with diversions for the representative dry year is approximately 550 af. Therefore, the difference in runoff volume accounts for the difference in maximum depths shown in Exhibit 7, Attachment A. It is important to note that the area of inundation is approximately the same between the two scenarios owing largely to the shape of the Reservoir upstream of the Dam.

The ***maximum Reservoir pool water surface elevation*** for the representative average year without-diversion and representative average year with-diversions are approximately equal, with the WSE (water surface elevation) = 1,035 feet (Exhibit 9, Attachment A). In these scenarios, the factor that controls the depth and WSE is the operation of Devil's Gate Dam. Despite the same maximum depths, the with-diversion scenario has greater inundation durations at the Reservoir fringes because the depth reaches the operational curve elevation more slowly than does the without-diversion scenario.

Like the representative average year scenarios, the representative wet year maximum depth is the same in the with- and the without-diversion scenarios because the Dam operational curve is controlling the maximum depth in the Reservoir, approximately WSE=1,035 feet (Exhibit 11, Attachment A). Like the average year scenarios, the with-diversion scenario has greater inundation durations at the Reservoir fringes because the with-diversion scenario Reservoir depth reaches the operational curve elevation more slowly than does the without-diversion scenario.

A review of regional groundwater data indicates that the distance to groundwater within the Reservoir area is substantially greater than the depth of the tree root zones and consequently would not be expected to have an effect on rootzones of the riparian habitat within the Reservoir. Studies associated with the Devil's Gate Sediment Removal Project support the reported groundwater elevation with measured average depth to ground water of over 100 feet and depth to a subsection of a perched aquifer greater than 20 feet (LACDPW 2018).

Within the upstream section of the study area, between the diversion point and the JPL Bridge, the model showed little or no measurable change in hydraulic conditions (such as depth, velocity, inundation area, and shear) with project diversions. However, factors influencing the hydraulics are markedly different in this high gradient mountainous section versus the low gradient downstream areas. The stream is much narrower and does not expand with increasing flows due to the constrictions of the hardened canyon walls and granite boulders in the mountainous section. Increasing volume of water from storms have a greater effect on flow velocity as water exits the mountains and less of an effect on increasing area of pooling or the duration of pooling. This is consistent with the model findings showing little change with project diversions in the upstream segment.

The upstream area also behaves differently during ***low flows***. Thethe hydraulic model assumptions limit the lowest modeled flow to 1 cfs; therefore. Therefore, flows below 1 cfs are not included in the modeling analysis but are considered here. During times of low flow, the role of groundwater is substantially different between the low gradient downstream area and the high gradient upstream area. Within the upstream section of the Arroyo Seco, subsurface water (i.e. groundwater) is very shallow and often just below the creekbed surface, even in areas that appear dry on the surface. Due to the steep gradient, this groundwater moves downstream through the substrate as a subsurface flow beneath the stream bed. Furthermore, this section of the Arroyo Seco is considered a "gaining" stream indicating that surface flows increase moving downstream due to upwelling of subsurface flows. Upwelling occurs when subsurface flows move around less permeable sections of substrate and reach the surface to become surface pools or flows for segments of the stream and may penetrate more permeable substrate further downstream and return to subsurface flow or continue downstream as surface flow for long distances. Evidence of the intermingling of surface and subsurface flowing can often be seen from just below the diversion point downstream to the A-frame bridge where subsurface upwelling occurs at low points in the stream.

As mentioned previously, groundwater within the low gradient portion of the study area, downstream of the JPL Bridge, is very deep. The extensive alluvial deposits allow water to readily migrate through and downward until reaching the water table approximately 100 feet below the surface. Low flows that make it downstream and past the JPL bridge are only visible on the surface for short distances before penetrating the sediment to become subsurface flow and quickly dropping vertically. Consequently, low flow in the lower study area is not expected to be influenced by groundwater to any measurable degree due to the distance between surface flows and the groundwater table.

ECOLOGICAL MODELING STUDY

An Ecological Modeling Study was prepared for the study area and is included as Attachment B. The ecological effects of flow diversions were assessed based on modeled relationships between hydraulic changes described in the Hydraulics, Sediment Transport, and Groundwater Analysis and the probability that the resultant physical conditions can support southern willow riparian habitat conditions conducive to occupancy by least Bell's vireo.

For this Study, the statistical approach, rather than a mechanistic approach, was used to estimate the probability of occurrence of vireo under physical conditions associated with flow diversion scenarios. This statistical approach was used because: (1) it is a more efficient approach for evaluating ecological effects in a relatively small area over relatively short periods of time; (2) it can be more directly related to available species observation data; (3) it produces a probability estimate that provides flexibility in setting management thresholds (i.e. managers can select a probability of effect that triggers a management decision); and (4) the hydraulic modeling does not provide a long-enough time series of output (due to the computational complexity of the model) to support a mechanistic approach.

All hydraulic variables tested showed significant statistical differences (p value <0.001) in willow occurrence between predicted future conditions and historic flow characteristics. However, given the small sample size of vegetation polygons, inherent to the relatively small size of the Project (see Exhibit 2, Excavation Limits of the LACDPW Devil's Gate Sediment Removal Project), and the high number of hydraulic observations (over 18,000), it is believed the significance estimates may be overestimated. The significant overlap in distributions of occurrence and the large AIC[2] value substantiate this suspicion.

As depicted in Figure 4 of the Ecological Modeling Study (Attachment B), the model predicts a negative correlation between increasing velocity and willow habitat presence. Expected changes in velocity are illustrated in Exhibits 3a-3f, Modeled Change in Maximum Velocity Due to Proposed Project, of this Memorandum. This is because willow habitat favors areas where water infiltrates the soil; higher velocities mean lower infiltration, and thus do not favor willow presence. A similar result is predicted for shear stress, so that as shear stress increases, the model predicts a decreased probability in willow occurrence. Depth shows an increase in willow probability as water depth increases. Due to implementation of the ASCP, willows may increase in the channel (narrow linear flow upstream of the Reservoir pool) and decrease in the Reservoir pool as water recedes and depth decreases.

Upstream areas showed little to no change consistent with the hydraulic model which forms its basis.

IMPACT OF DIVERSIONS ON VEGETATION/HABITAT

Changes in the hydrological regime of stream systems have been shown to result in changes in vegetation structure and composition (Stromberg et al 1996). Though much of the research on this topic has occurred in the desert southwest (Stromberg 2013; Tallent-Halsell and Walker 2002) and the Sierra Nevada (Smith et al 1991), these studies have generally documented the responses of species that occur in the study area for this Memorandum, namely Goodding's black willow and Fremont cottonwood. The shifts in vegetation related to changes in hydrology is based upon: (1) the degree of fluctuations in groundwater levels; (2) the depth of root systems of existing vegetation; and (3) the resulting potential of invasive

[2] The Akaike Information Criterion [AIC] is an estimator of the relative quality of statistical models and provides a measure of the relative information not well represented by the model. It represents the balance between goodness of fit and model complexity.

species establishment to displace native vegetation (Leenhouts et al 2006; Horton and Clark 2001). The concept behind this relationship is that minor fluctuations in groundwater levels will not affect the presence of phreatophytic vegetation if the root systems of those plants are deep enough to access water in the phreatic zone (zone of saturation) or the capillary fringe (zone above the saturation area where water fills soil pore spaces through capillary motion and is available for plant uptake). However, if groundwater levels drop below the maximum depth of the root zone for a sufficient amount of time, then those plants are susceptible to be displaced by other species. Factors that affect the depth of roots include the genetic ability of each plant to produce deep roots, the soil type and the depth to which gas exchange is possible, and available water and nutrients (Foxx et al 1982). Additionally, root depth has been shown to be affected by fluctuations in the water table as significant fluctuations encourage species to elongate deep roots to access waters (Horton and Clark 2001).

Therefore, the principal question is whether the proposed ASCP diversions would cause an increase in the depth to groundwater that is available for willows and cottonwoods. As shown in Exhibit 4, Baseline Hydrology Example, changes to groundwater levels should not extend beyond the maximum depths to groundwater within the root zone of phreatophytic species to maintain their presence.

Leenhouts et al (2006) studied Goodding's black willow-Fremont cottonwood woodlands and their relation to groundwater depth. They categorized the riparian corridor in three classes: (1) intermittent-dry flow regimes with average groundwater depth in excess of 3.5 meters; (2) intermittent-wet flow regimes with average groundwater depth between 2.5 and 3.5 meters; and (3) perennially flowing areas with average groundwater depth of less than 2.5 meters. Willow-cottonwood forests were dense and multi-aged in Class 3 areas; drought-tolerant species such as salt cedar (*Tamarix ramosissima*) were subdominant and a dense and diverse herbaceous layer was present. Willows and cottonwoods were still dominant at Class 2 sites, but salt cedar presence increased, the herbaceous layer was diminished, and the productivity of willows and cottonwoods was decreased. Class 1 sites became dominated by salt cedar as native species were presumably unable to access sufficient groundwater for survival.

Willow habitat in Devil's Gate Reservoir is characterized by persistent coverage of mature willow trees, though aerial photo analysis indicates that the extent of willow coverage varies over time, likely in response to annual variability in precipitation and inflows from the upper Arroyo Seco. Little change is observed in the lowest portions of the Reservoir (downstream end) while coverage appears to vary slightly at the upper portions of the Reservoir. Because the accumulated sediment in Devil's Gate Reservoir is mainly comprised of sandy material, the willow tree rhizosphere likely reaches the maximum root depth of approximately seven feet below grade. The lack of a persistent herbaceous understory suggests that the depth to groundwater for much of the year is at least two feet, since herbaceous species roots generally extend less than two feet below grade. Therefore, the depth to groundwater likely fluctuates in the range of two to seven feet in the lower end of the Reservoir. It should be noted that the groundwater at these elevations does not represent the upper limit of the groundwater aquifer (the MHSA), which occurs approximately 300 feet below the surface in the Reservoir riparian areas as described previously. Based on topography, the shallower groundwater is expected to result from subsurface flows from the from San Gabriel Mountains, which flow south off the mountains and on to the Montrose/La Canada valley floor then to the east flowing downhill, towards the Arroyo Seco, until eventually reaching the deposited sediments within the Reservoir.

The current operation of the diversion weir and intake structure allows surface water during large storm events to flow downstream unimpeded as the intake structure is closed during peak flows (greater than approximately 100 cfs) to prevent damage to the pipe that delivers water to the spreading basins. Therefore, no changes to the hydrology will occur during times when the highest surface flows are

present. When moderate flows are present in the stream during the wet season, some water is diverted and a portion of the stream water bypasses the intake and continues downstream. During dry summer months, surface flows in the upper Arroyo Seco are sufficiently low to allow PWP to divert virtually all surface flows in the stream.

The impact of the ASCP is assessed based on changes to the current operation of the intake structure. The ASCP will continue to allow peak flows during the wet season to bypass the intake structure and will continue to capture most or all dry season flows. Therefore, the ASCP's potential to affect downstream vegetation communities is assessed based on the maximum allowed diversion of 25 cfs, which would presumably result in diversion of flows for a longer time due to extended periods of surface flow in the wet season, as well as diversion beyond those captured in the existing condition.

Generally, surface flows will reach the Reservoir area during and after significant rain events during the winter months. Vegetation in the Reservoir will utilize this water as it ponds and saturates the uppermost soil layers. The presence of Devil's Gate Dam is the dominant influence to the hydrology of the study area because it blocks surface and subsurface flows to downstream areas thus increasing the time that subsurface water is available to trees in the Reservoir. Additionally, the Reservoir is a collection area for subsurface water that flows from the upper Arroyo Seco area, as well as from the Montrose/La Canada slope to the west. Some of these inflows support the riparian tree species that occupy the Reservoir area.

Due to the highly variable precipitation in the region and the resulting variability in surface flows in the upper Arroyo Seco, identifying the typical flow regime is difficult. As discussed above, surface flow rates in the wet season can range from approximately 1 cfs to more than 200 cfs. The Hydraulics, Sediment Transport, and Groundwater Analysis (Attachment A) categorizes precipitation data for the study area as either wet, average, or dry years. The maximum inundation zone in the Reservoir was shown to minimally fluctuate during wet, average, or dry years (see Exhibits 5a-5c, Modeled Change in Maximum Inundation Due to Proposed Project). The maximum flood zone for the Reservoir is determined by the management of Devil's Gate Dam, as any water that would exceed the maximum surface elevation of 1,035 feet is released downstream. Areas that would not be flooded during maximum inundation levels consist of a narrow band along the margins of the inundation footprint that measures 2.1 acres. As discussed in the Hydraulic Analysis, while the footprint of the inundated area during dry years is less than average or wet years, the duration of inundation along these fringes is increased in the with-diversions scenario. Inundation duration in dry years is increased by diversions because the amount of runoff required to initiate Dam operations is increased. Overall, the hydraulics model indicates that any reduction to the inundation footprint is infrequent (occurring only during dry years) and duration period is slightly increased on the fringes. Furthermore, the model's conservative assumption of 100 percent efficiency in diversions is highly unlikely to be achieved. Diversions would therefore be less than modeled and impacts less than depicted in modeling results.

The Hydraulic Analysis also discusses the effect on water velocities. The Ecological Modeling Study indicates that increasing water velocities result in lower water infiltration into the soil, and this reduces the probability of willow establishment. However, the Hydraulic Analysis indicates that the effects of water diversion on velocity are small overall and in some cases the change in velocity from diversions is a decrease from existing conditions (see Exhibit 3a–3f, Modeled Change in Maximum Velocity Due to Proposed Project). Therefore, no changes to the extent of willow habitat is expected to occur from modelled velocity changes.

The Hydraulic Analysis also indicates that proposed stream diversions are expected to be an unimportant factor to overall sediment transport potential because the controlling elements of sediment transport are geologic factors. Large runoff events typically drive sediment movement in southern California streams; since no diversions are proposed during peak events, the ASCP is not expected to affect stream sediment yield to Devil's Gate Reservoir. In fact, the design of the proposed crest gate diversion weir is expected to enhance sediment transport because the gate will be placed in the down position during peak flow events to prevent impediments to sediment transport, which occur presently by the diversion weir.

As described above, the hydrology of the Arroyo Seco is highly variable. The ecological modelling study indicates that water depth and duration of inundation correlate most highly with changes in the extent of willow riparian habitat in the Reservoir. Because the rainfall and resulting stream flows can vary so dramatically in the Arroyo Seco and because willow riparian habitat is dependent on available water, it stands to reason that the extent of willow habitat would mirror the dynamics of the site hydrology. Therefore, changes in the willow habitat that may result from proposed diversion changes during dry year conditions would likely be temporary (due to the high growth rate of the species and the likelihood that dry year conditions would be followed by average or wet year conditions) and within the normal range of variability of the system.

To further illustrate the Reservoir vegetation's lack of dependency on dry season flows from the upper Arroyo Seco, the drought conditions that persisted earlier this decade provided an excellent test to the resiliency of the willow habitat. From April 2011 through April 2016, only eight of those months had rainfall totals in excess of two inches. Therefore, for a five-year period, surface water likely flowed past the diversion weir for only brief and infrequent periods. Though inflows to the Reservoir were exceptionally small, the depth to groundwater appeared to remain within the rhizosphere of the willow trees in the Reservoir since the extent of those trees remained largely the same. This also provides support of the concept of subsurface flow contribution coming largely from the La Canada/Montrose valley slope and into upper limits of the sediments in the Reservoir allowing willow riparian persistence.

An additional factor considered in assessing the potential impacts is the relative contribution of the Arroyo Seco from the diversion point to the total inflow to the Devil's Gate Reservoir. The watershed area of the Reservoir, above the dam, is 18,070 acres while the area of the watershed from the diversion point is 12,010 acres. The watershed and approximate flow contribution from the diversion point is 66 percent of the total watershed and approximate inflow of the Devil's Gate Reservoir. The model results reflect the change in flows from the relative contribution at the diversion point. The additional flows from other tributaries within the remaining 33 percent of the watershed contribute to the total inflow. Consequently, the actual effect of the downstream diversions is likely to be less impactful than model results would indicate.

With respect to the vegetation that is immediately downstream of the diversion weir and upstream of the JPL bridge, water regularly flows through this area in the wet season and, as described above, a small amount of water passes through the wooden boards of the diversion weir in the dry season. The upper Arroyo Seco, above the JPL bridge and within granite-based mountains, has a high water table (Attachment A) so that the riparian vegetation downstream of the diversion weir is likely supported by subsurface flows that pass under the diversion weir and often resurface at various points. Construction of the new crest gate diversion weir may be a slightly deeper than the current diversion weir, depending on the ultimate design of the structure. Minor changes in the depth of the structure are not anticipated to substantially block subsurface flows from passing through the area and continuing downstream as subsurface and resurfacing flow based on the typical depth of groundwater in the area and the steepness of the stream gradient which provides additional force or 'head.'

Further evidence of the upstream area's lack of dependency on surface flows is indicated by the maturity of the vegetation. Riparian vegetation in this area is dominated by sycamore and alder riparian trees which have persisted in the area even when surface flows are minimal. The maturity of this habitat suggests a stable amount of water in the root zone of these trees even in the dry season. As such, impacts to riparian or other vegetation communities in the upper study area are unlikely to result from the increased proposed water diversions.

Project studies examining existing conditions within the study area and potential changes in hydraulics, sediment transport, and ground water coupled with ecological modeling and habitat requirements indicate that downstream reduced flows associated with ASCP diversions are not expected to result in any measurable effects on downstream riparian vegetation/habitat.

CHANGING EXISTING CONDITIONS

Existing conditions within the study area are expected to change significantly within the near future. Beginning in fall of 2018, a large portion of riparian vegetation within the Devil's Gate Reservoir section of the study area, as shown in Exhibit 2, Excavation Limits of the LACDPW Devil's Gate Sediment Removal Project, will be removed as part of Los Angeles County Department of Public Work's sediment removal project (LACDPW 2018). Consequently, a large portion of the riparian vegetation within areas potentially affected by the ASCP is not expected to exist when hydraulic changes resulting from Project diversions would occur. Additionally, the surface elevation of a large portion of the Reservoir area will be lowered as the County's sediment removal project excavates accumulated sediments over the course of the coming years. As a result, a much greater volume of water will be contained within a deeper pool in a smaller area of the Reservoir. It is expected that pool margins will recess accordingly towards the center of the pool and away from riparian habitat occurring at and beyond current maximum pool margins. Therefore, small changes in hydraulics at the margins of the pooled areas of the Reservoir resulting from ASCP diversions are not likely to occur within or adjacent to existing riparian woodland habitat at pool margins. In summary, the minimal potential effects on riparian habitat resulting from future ASCP diversions, as described in previous sections above, are further reduced due to changing existing conditions.

CONCLUSIONS

Downstream reduced flows associated with ASCP diversions are not expected to result in any measurable effects on downstream riparian habitat. Project studies examining existing conditions within the study area and potential changes in hydraulics, sediment transport, and ground water coupled with ecological modeling and habitat requirements all provide support of this conclusion. Additionally, changing future conditions further reduce potential ASCP effects. Mitigation would therefore not be required because there would be no significant impacts to hydrology or biological resources in the context of the California Environmental Quality Act (CEQA). Also, to ensure the diversions are implemented as proposed and modeled in the aforementioned studies, a series of design features and monitoring measures are recommended. Recommendations include:

1. All flows exceeding approximately 100 cfs will be allowed to pass through the weir structure without diversions. A monitoring protocol shall be developed to accurately measure the stream flows at the point of diversion in a timely manner during and immediately following significant rain fall events (1 or more inches within a 24-hour period). Monitoring data shall be logged on an annual basis. If modeling data determines that flows exceeding 100 cfs are being partially diverted, immediate evaluation of operational and/or structural changes shall be conducted and implemented.

2. Accurate records of weir operations shall be kept and made available upon request to regulatory agencies. Records shall include diversion methods implemented and diversion quantities over a given period of time.
3. If the proposed weir structure design exceeds the subsurface depth of the existing weir structure, the City shall evaluate the design to confirm that no measurable interference of subsurface groundwater flows would result when compared to the existing conditions.

Enclosures: Exhibit 1 – Study Area
Exhibit 2 – Excavation Limits of the LACDPW Devil's Gate Sediment Removal Project
Exhibit 3a–3f – Modeled Change in Maximum Velocity Due to Proposed Project
Exhibit 4 – Baseline Hydrology Example
Exhibit 5a–5c – Modeled Change in Maximum Inundation Due to Proposed Project

Attachments: A – Hydraulics, Sediment Transport, and Groundwater Analysis Report
B – Analysis of Potential Ecological Effects of Flow Diversions on Willow Habitat

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Study Area

Exhibit 1

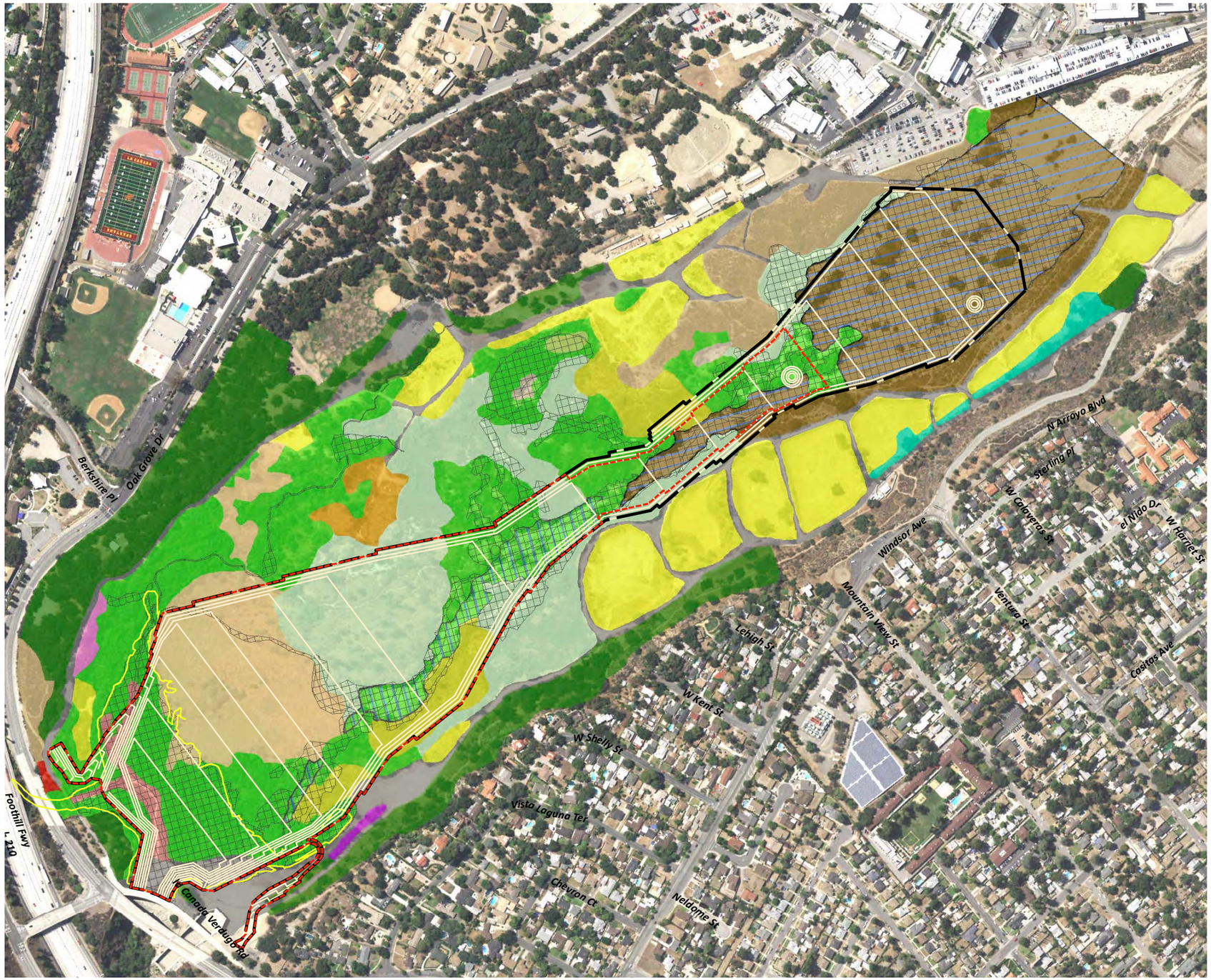
Arroyo Seco Diversions Biological Impacts Memo

N W E S

1,000 500 0 1,000 Feet

PSOMAS

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Map Features

- Initial Sediment Removal Footprint [1]
- Permanent Maintenance Footprint [1]
- Sediment Removal Excavation Contours [1]
- 1020' Elevation Contour [1]
- Corps Jurisdictional Area

Vegetation Name

- Artemisia californica - Eriogonum fasciculatum Shrubland Alliance
- Baccharis salicifolia Shrubland Alliance
- Brassica nigra and other mustards Herbaceous Semi-Natural Alliance
- Conium maculatum Herbaceous Semi-Natural Alliance 30% Lepidium latifolium
- Depression/Bare ground
- Disturbed
- Eucalyptus (globulus, camaldulensis) Woodland Semi-Natural Alliance
- Fraxinus velutina Forest Alliance
- Landscaped
- Lepidium latifolium Herbaceous Semi-Natural Alliance
- Lepidium latifolium-Conium maculatum Herbaceous Semi-Natural Alliance
- Lepidospartum squamatum Shrubland Alliance
- Lepidospartum squamatum Shrubland Alliance - Sparse
- Platanus racemosa Woodland Alliance Disturbed
- Quercus agrifolia Woodland Alliance
- Rumex crispus Herbaceous Semi-Natural Alliance
- Salix gooddingii Woodland Alliance
- Salix gooddingii Woodland Alliance - Sparse
- Xanthium strumarium Herbaceous Alliance

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community



Source: USACE 2018, ECORP Consulting Inc. 2018

Excavation Limits of the LACDPW Devil's Gate Sediment Removal Project

Exhibit 2

Arroyo Seco Diversions Biological Impacts Memo

Scale in Feet
0 600

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Study Area

Change in Max Velocity from Existing Conditions to Project Conditions

- 4 - Increase Velocity by 4 ft/sec
- 3
- 2
- 1
- 0 - No Significant Change
- 1
- 2
- 3
- 4 - Decrease Velocity by 4 ft/sec



Oak Grove Dr

Jet Propulsion Laboratory

W Altadena Dr

Odyssey Charter

The Sycamores

Ventura St

Aerial Source: LAR-IAC 2014

Modeled Change in Maximum Velocity Due to Proposed Project — Average Year

Exhibit 3a

Arroyo Seco Diversions Biological Impacts Memo

N W E S

450 225 0 450 Feet

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Study Area

Change in Max Velocity from Existing Conditions to Project Conditions

- 4 - Increase Velocity by 4 ft/sec
- 3
- 2
- 1
- 0 - No Significant Change
- 1
- 2
- 3
- 4 - Decrease Velocity by 4 ft/sec



Jet Propulsion Laboratory

The Sycamores

La Canada High School

Devil's Gate Basin

N Windsor Ave

Ventura St

Five Acres

Berkshire Pl

Figueroa Dr

Oak Grove Dr

210

Highland Dr

Woodbury Rd

Linda Vista Ave

Aerial Source: LAR-IAC 2014

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Modeled Change in Maximum Velocity Due to Proposed Project — Average Year

Exhibit 3b

Arroyo Seco Diversions Biological Impacts Memo

N W E S

450 225 0 450 Feet

PSOMAS

(Rev: 09/17/2018 CJS) R:\Projects\PAS_Pasaden\3PAS010700\Graphics\Bio_Impacts_Memo\

Study Area

Change in Max Velocity from Existing Conditions to Project Conditions

- 4 - Increase Velocity by 4 ft/sec
- 3
- 2
- 1
- 0 - No Significant Change
- 1
- 2
- 3
- 4 - Decrease Velocity by 4 ft/sec



Oak Grove Dr

Jet Propulsion Laboratory

W Altadena Dr

Odyssey Charter

The Sycamores

Ventura St

Aerial Source: LAR-IAC 2014

Modeled Change in Maximum Velocity Due to Proposed Project — Dry Year

Exhibit 3c

Arroyo Seco Diversions Biological Impacts Memo

N W E S

450 225 0 450 Feet

PSOMAS

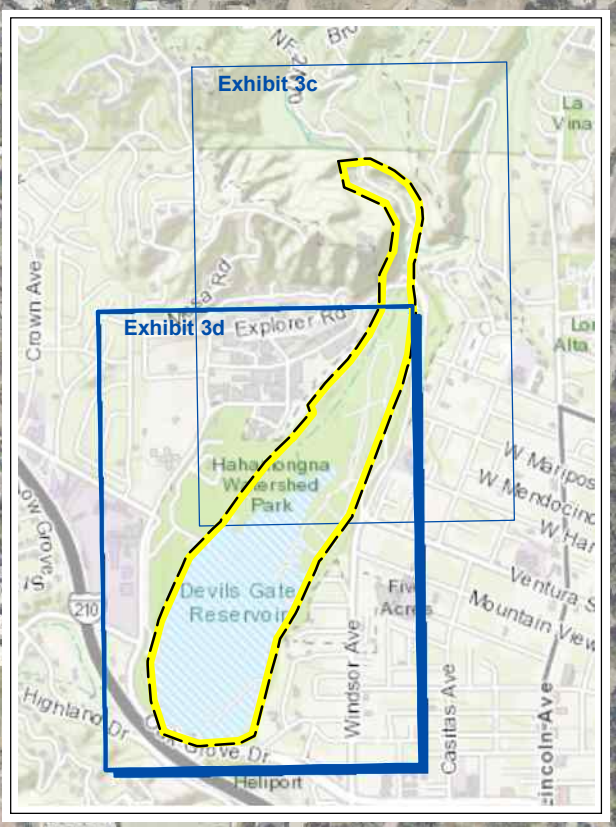
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Study Area

Change in Max Velocity from Existing Conditions to Project Conditions

- 4 - Increase Velocity by 4 ft/sec
- 3
- 2
- 1
- 0 - No Significant Change
- 1
- 2
- 3
- 4 - Decrease Velocity by 4 ft/sec



Jet Propulsion Laboratory

The Sycamores

N Windsor Ave

Ventura St

La Canada High School

Devil's Gate Basin

Five Acres

Berkshire Pl

Oak Grove Dr

210

Highland Dr

Woodbury Rd

Linda Vista Ave

Figueroa Dr

Aerial Source: LAR-IAC 2014

Modeled Change in Maximum Velocity Due to Proposed Project — Dry Year

Exhibit 3d

Arroyo Seco Diversions Biological Impacts Memo

N W E S

450 225 0 450 Feet

PSOMAS

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Study Area

Change in Max Velocity from Existing Conditions to Project Conditions

- 4 - Increase Velocity by 4 ft/sec
- 3
- 2
- 1
- 0 - No Significant Change
- 1
- 2
- 3
- 4 - Decrease Velocity by 4 ft/sec



Aerial Source: LAR-IAC 2014

Modeled Change in Maximum Velocity Due to Proposed Project — Wet Year

Exhibit 3e

Arroyo Seco Diversions Biological Impacts Memo

N W E S

450 225 0 450 Feet

PSOMAS

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Study Area

Change in Max Velocity from Existing Conditions to Project Conditions

- 4 - Increase Velocity by 4 ft/sec
- 3
- 2
- 1
- 0 - No Significant Change
- 1
- 2
- 3
- 4 - Decrease Velocity by 4 ft/sec



Jet Propulsion Laboratory

The Sycamores

N Windsor Ave

Ventura St

Five Acres

La Canada High School

Devil's Gate Basin

Berkshire Pl

Oak Grove Dr

210

Highland Dr

Woodbury Rd

Linda Vista Ave

Figueroa Dr

Aerial Source: LAR-IAC 2014

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Modeled Change in Maximum Velocity Due to Proposed Project — Wet Year

Exhibit 3f

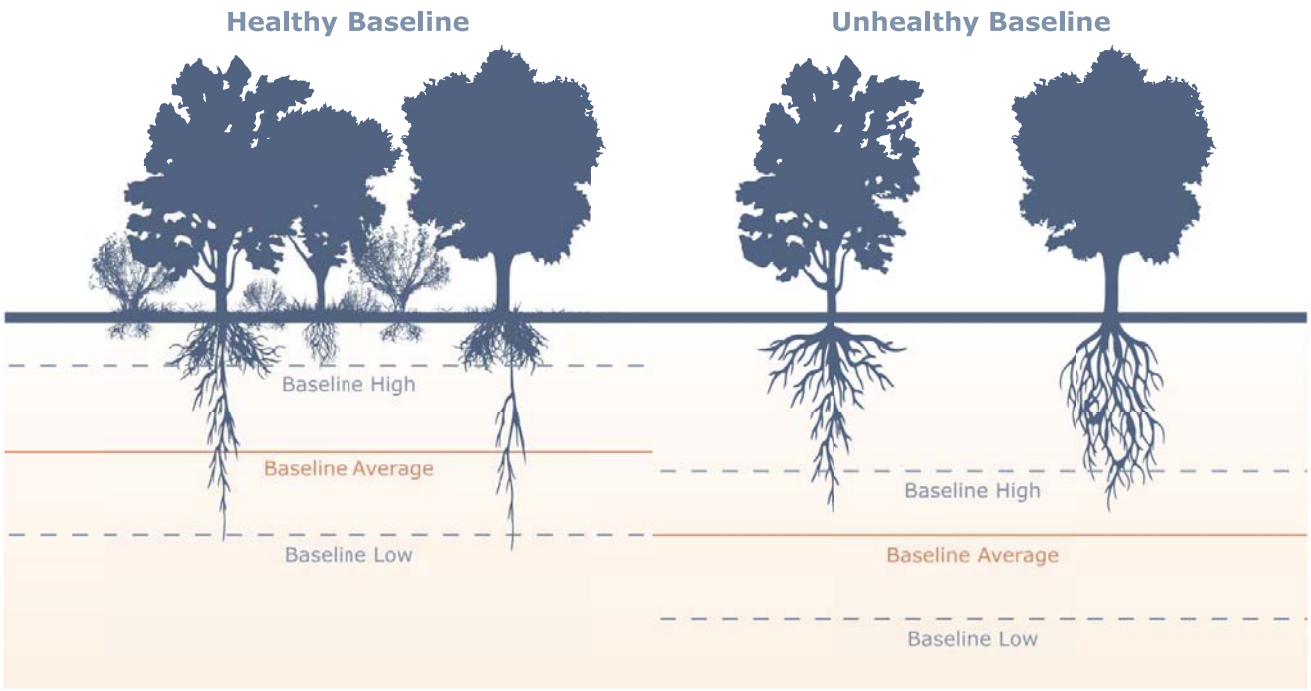
Arroyo Seco Diversions Biological Impacts Memo

N W E S

450 225 0 450 Feet

PSOMAS

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Source: Rohde et al, 2018

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Baseline Hydrology Example

Exhibit 4

Arroyo Seco Diversions Biological Impacts Memo

PSOMAS

(9/13/2018 CJS) R:\Projects\PAS_Pasaden\3PAS010700\Graphics\Bio_Impacts_Memo\

Study Area

Willow Occurrence 2014

Average Year Inundation Change from Existing Conditions to Project Conditions

No Change in Inundation Area

Jet Propulsion Laboratory

Oak Grove Dr

Foothill Blvd

The Sycamores

N Windsor Ave

Ventura St

La Canada High School

Devil's Gate Basin

Five Acres

Berkshire Pl

Figueroa Dr

Oak Grove Dr

210

Highland Dr

Linda Vista Ave

Woodbury Rd

Aerial Source: LAR-IAC 2014

Modeled Change in Maximum Inundation Due to Proposed Project — Average Year

Exhibit 5a

Arroyo Seco Diversions Biological Impacts Memo

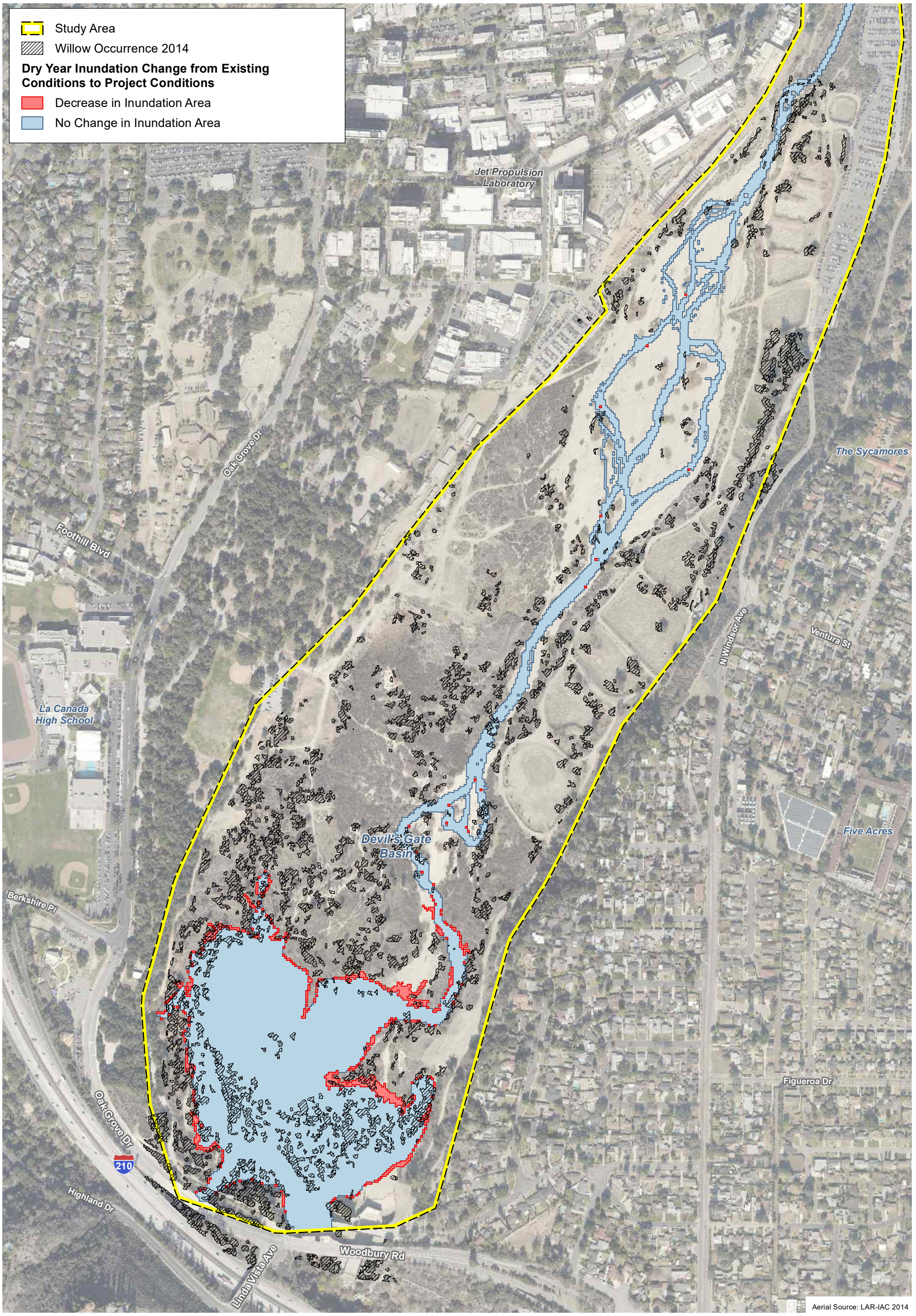
N W E S

450 225 0 450 Feet

PSOMAS

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Aerial Source: LAR-IAC 2014

Modeled Change in Maximum Inundation Due to Proposed Project — Dry Year

Exhibit 5b

Arroyo Seco Diversions Biological Impacts Memo

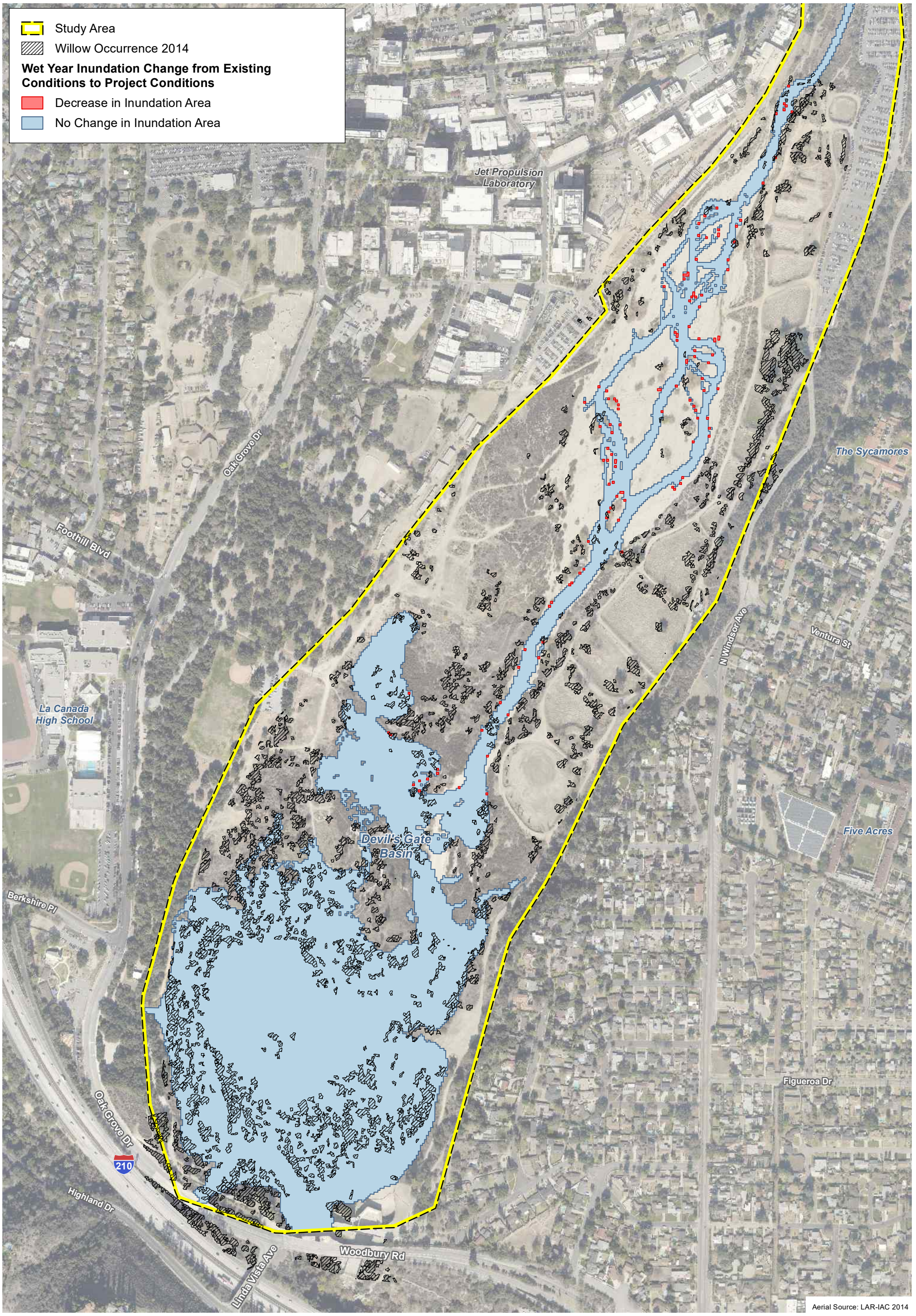
N W E S

450 225 0 450 Feet

PSOMAS

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Modeled Change in Maximum Inundation Due to Proposed Project — Wet Year

Exhibit 5c

Arroyo Seco Diversions Biological Impacts Memo

N W E S

450 225 0 450 Feet

PSOMAS

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ATTACHMENT A

HYDRAULICS, SEDIMENT TRANSPORT, AND GROUNDWATER ANALYSIS REPORT

Hydraulics, Sediment Transport, and Groundwater Analysis

Arroyo Seco Canyon Project Diversion

Prepared for

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T: (626) 351-2000

August 2018

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Attachment

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LIST OF ACRONYMS

Acronym	Acronym and Abbreviation Definition
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
HEC-RAS	Hydraulic Engineering Center River Analysis System
h	depth
Q	volumetric discharge
JPL	Jet Propulsion Laboratory
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

Pasadena Water and Power (PWP) operates a diversion structure located approximately 0.25-mile north of Millard Creek on the Arroyo Seco. PWP has surface water rights of 25 cfs and and diverts streamflows into an intake structure. Upon entering the intake, the water is piped downstream approximately 3,000 feet to the PWP's spreading basins for groundwater recharge. The diversion structure and intake structure were damaged due to the debris flows following the 2009 Station Fire. Since then, the structures have operated at a reduced capacity.

The proposed Arroyo Seco Canyon Project (ASCP) would repair, replace and/or rehabilitate the diversion and intake structures in the Arroyo Seco in order to maximize the capture of PWP's surface water rights. The improvements, including a new sedimentation basin in the vicinity of the spreading basins, would facilitate management of sediment for diversion and spreading operations that were in the past managed with a headworks structure and settling basins further upstream. The ASCP also includes the expansion of PWP's spreading basins. The facilities and improvements that would be constructed as part of the Arroyo Seco Canyon Project would be located at three areas along the Arroyo Seco: Area 1 – Arroyo Seco Headworks; Area 2 – Arroyo Seco Intake; and Area 3 – Former JPL East Parking Lot/Spreading Basins (refer to Exhibit 2). This Hydraulics, Sediment Transport, and Groundwater Analysis (Report) analyzes one component of the larger Arroyo Seco Canyon Project: water diversions from the Arroyo Seco Intake structure in Area 2 (proposed Project).

Changes to riparian habitats in the Project area can result from several potential sources, including changes in discharge patterns into the Devil's Gate Reservoir associated with water use practices (i.e. urban runoff) and diversions; infiltration of water in the existing spreading basins; alterations in sediment deposition and ponding patterns associated with the operation of Devil's Gate Dam; variation in sediment yield associated with fires in the upper watershed, such as the 2009 Station Fire; and long-term climate changes (including changes in drought cycles).

The purpose of this analysis is to evaluate the relative impact of the City's proposed management of diversions from the Arroyo Seco on riparian resources located downstream of the diversion structure. The goal of this Report is to identify the changes specifically concerning sediment transport, hydraulics, and groundwater that may affect down-stream riparian habitats. The results shall provide the baseline for further ecological modeling to assess biological impacts of the project on riparian resources.

2.0 PROJECT SETTING

2.1 PROJECT LOCATION

The Project site is located within the Arroyo Seco Watershed, which is a subwatershed of the larger Los Angeles River Watershed. The Arroyo Seco is a perennial creek, which means there is generally flowing water year-round, but the flow is below the surface (underground) in some locations. Creek flows that originate in the San Gabriel Mountains continue to flow south through the cities of Pasadena, South Pasadena and Los Angeles, before joining the Los Angeles River just east of Elysian Park and west of the Interstate (I) 5/I-110 Interchange. Within the City of Pasadena, the Arroyo Seco passes through three distinct recreational areas: (1) Upper Arroyo Seco, containing Hahamongna Watershed Park and Devil's Gate Dam; (2) Central Arroyo Seco, containing the Brookside Golf Course and Rose Bowl; and (3) Lower Arroyo Seco, containing an archery range, casting pond, and Memorial Grove. The proposed Project involves the construction of a new diversion structure in the Upper Arroyo Seco (in the City of Pasadena on land owned by the City). Exhibit 1, Regional Location and Local Vicinity, shows the location of the Arroyo Seco in the City of Pasadena, as well as the boundaries of the Project Study Area.

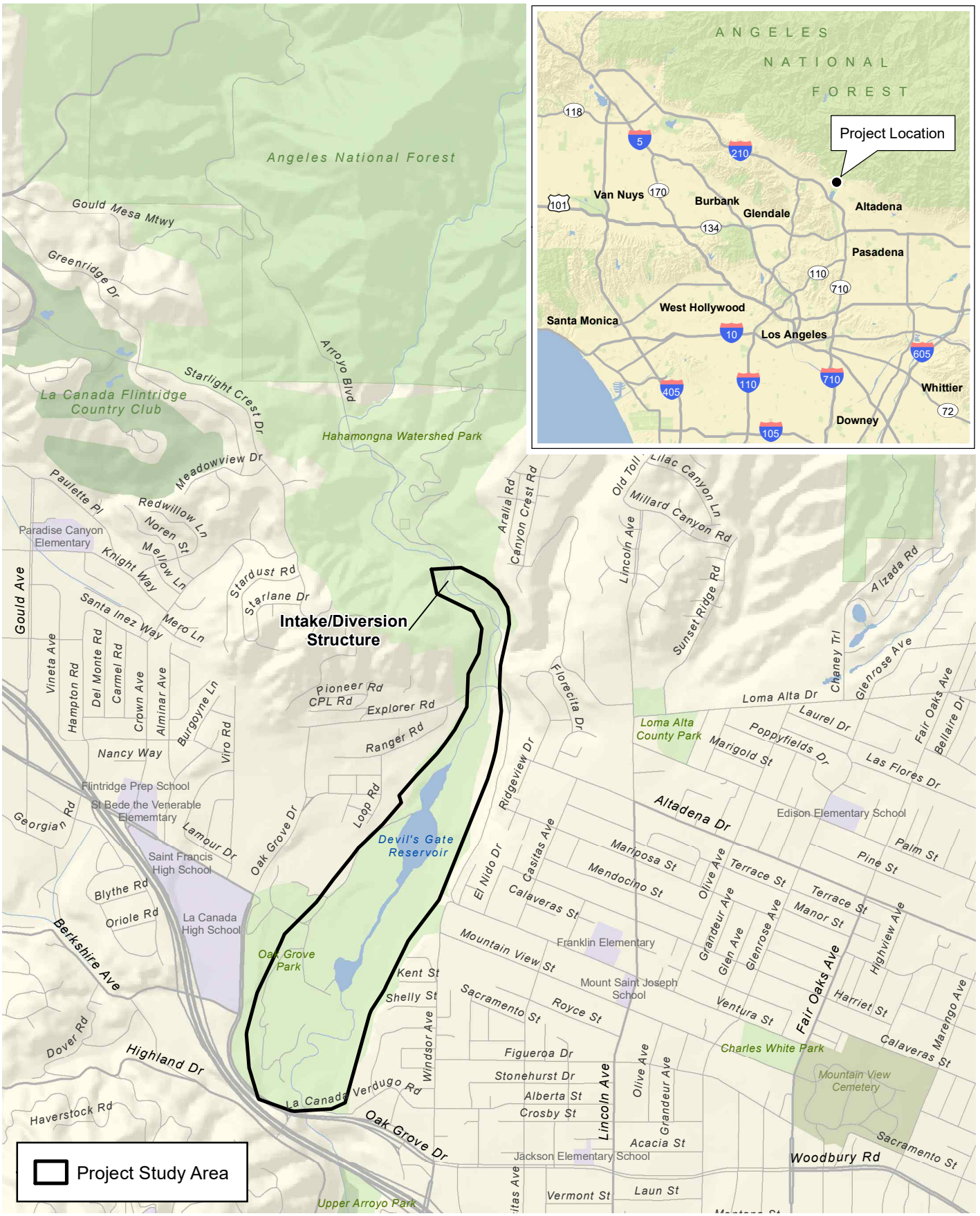
The locations of the Areas 1, 2, and 3, as identified in the larger Arroyo Seco Canyon Project, are shown in Exhibit 2, Location of Areas 1, 2, and 3. These areas are connected by the Gabrielino Trail, which serves as a recreational trail and the access road for City of Pasadena and United States Forest Service (USFS) vehicles heading into the Arroyo Seco Canyon. This Hydraulics, Sediment Transport, and Groundwater Analysis (Report) analyzes one component of the larger Arroyo Seco Canyon Project: water diversions from the Arroyo Seco Intake structure in Area 2 to the spreading grounds in Area 3.

The Project site can be accessed via I-210 by exiting Windsor Avenue and traveling northward for approximately 0.8 mile to its intersection with Ventura Street. From this intersection, the former JPL East Parking Lot is located approximately 0.27 mile north along Explorer Road, which can be accessed by walking, bicycling, driving, or by horse.

2.2 EXISTING CONDITIONS

The Arroyo Seco is an important source of water supply for the City of Pasadena. The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco into the City's spreading basins located along the east side of the Devil's Gate Reservoir, upstream of Devil's Gate Dam.. PWP uses the surface water to recharge the underlying Monk Hill Subbasin (a sub-aquifer of the Raymond Basin) for groundwater well extraction.

PWP currently operates several structures in the Arroyo Seco Canyon that capture and convey stream water to a series of groundwater recharge (spreading) basins that are located adjacent to the National Aeronautics and Space Administration's (NASA's) Jet Propulsion Laboratory (JPL) campus. These facilities include the Arroyo Seco Headworks structure and adjacent sedimentation basins, the Arroyo Seco Intake Dam, and the associated pipelines that convey water to the existing spreading basins. A large number of these facilities were entirely or severely damaged due to debris flows in 2010 and 2011, subsequent to the 2009 Station Fire.



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Regional Location and Local Vicinity

Exhibit 1

Arroyo Seco Diversion Hydraulics Analysis

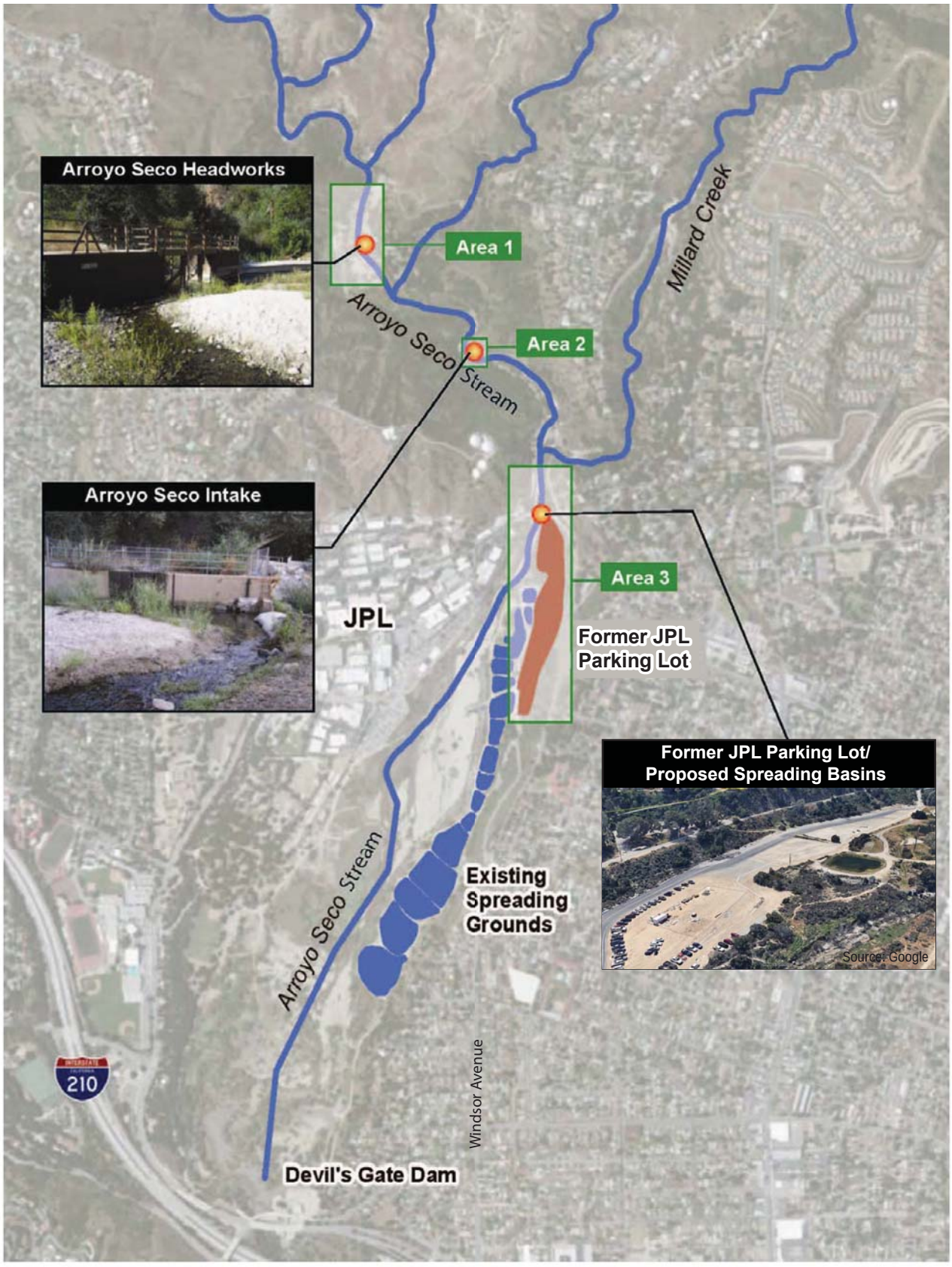
N
W E
S

2,000 1,000 0 2,000

Feet

PSOMAS

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Source: Carollo 2013, Psomas 2018

Project Location Areas 1, 2, and 3

Exhibit 2

Arroyo Seco Diversion Hydraulics Analysis

N W E S

Map not to scale

PSOMAS

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3.0 PROJECT DESCRIPTION

3.1 PROJECT PURPOSE AND NEED

PWP proposes the ASCP to repair and replace damaged facilities in Arroyo Seco Canyon. The improvements will allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this historically important local water resource. Specifically, modifications to the facilities in Area 2 will allow for increased diversion by capturing stream flows during storm events that in the past have been bypassed. PWP typically does not divert the stream water for recharge during large storm events (i.e. flows greater than approximately 100 cfs) due to the high total suspended solids (TSS) in the water. If water with high TSS levels is used for recharge, the ground surface in the spreading basins can be "blinded" or plugged by fine material, such as clays and silts, which would then reduce percolation and groundwater recharge rates. This reduced efficacy of the spreading basins is counterproductive in terms of groundwater recharge, and requires more maintenance to remove the top layer of fine materials at the spreading basins in order to recover the original recharge rates. Letting water with high TSS levels bypass without recharge is not preferred from a water supply perspective, but helps reduce maintenance issues associated with excessive cleanup of the basins. For the purposes of the present analysis, a maximum discharge in the Arroyo Seco must be defined to represent the upper limit at which water can be withdrawn. This flow rate is assumed to be 100 cfs.

3.2 PROJECT COMPONENTS

The proposed new diversion structure would capture all flows during small storm events and dry weather flows in the Arroyo Seco, and up to PWP's surface water rights during large storm events. During larger storms when the water is too turbid, the stream (with its associated sediment load) would bypass the structure and continue downstream in the creekbed. Operation during high flows would be facilitated by the adjustable height weir or crest gate. At low flows, the gate would start in the 'up' position and as flows increase, the gate would be lowered to maintain a constant water surface level in the diversion pool. When the gate is fully lowered, flows will be bypassed and carry sediment downstream.

City personnel would continue to provide maintenance of the diversion and intake structures as occurs under existing conditions.

4.0 PREVIOUS STUDIES

Two studies were reviewed to enhance the background understanding of the Project area hydraulics. A summary of each relative to the analysis in this Report is provided below.

PHILLIP WILLIAMS & ASSOCIATES (2000) – The purpose of the Phillip Williams & Associates (PWA) study was to provide supplemental analysis of hydrology and geomorphology to the development of a master plan for the Hahamongna Watershed Park. The study specifically examined hydrology, geomorphology, flood hazards, water resources history, sediment transport and maintenance, and groundwater recharge. Pertinent to the proposed Project are the hydrology, flood hazards and sediment transport analyses.

The hydrology element of the study examined precipitation gages near the Project site, including USGS stream gage #11098000. A flood frequency analysis of the gage data was conducted. Additional analysis of a Los Angeles County Department of Public Works stream gage (F277-R) was also completed. A review of the stream gage data showed that several major floods have occurred during the period of record for the stream gage and as recently as 1983. (It should be noted that the 1998 peak discharge was greater than the 1983 peak discharge, however, a vetted data set may not have been available at the time.) Interestingly, none of the major floods were preceded by a wildfire within three years. The PWA study also followed Waanan & Crippen (1977) in developing a relationship between the discharge at the gage and the discharge below the gage based on tributary area. The base relationship takes the form:

$$Q_d = Q_{gage}\left(A_d/A_{gage}\right)^n$$

where Q_d and Q_{gage} are the discharge rates at a location downstream of the gage and at the gage, respectively, A_d and A_{gage} are the watershed areas at a location downstream of the gage and at the gage, respectively, and n is an exponent based on the return frequency of the discharge being scaled. It is important to note that PWA assumed that all discharges are bulked, which appears to be reasonable for the study area and the USGS gage data.

Hydraulic numerical modeling was completed for the study using the MIKE11 model for a combination of the 2- 10- and 50-year annual return frequency events. The model was limited to the stretch of Arroyo Seco between the Jet Propulsion Laboratory (JPL) Bridge and the Devil's Gate Dam. MIKE modeling focused on flood management.

The sediment transport analysis included geomorphology and hydraulics. The geomorphic analysis noted the importance of floods, fires and debris flows within the watershed, and noted that these types of events play an important role in the frequency and magnitude of watershed and stream sediment yield in the study area. The study examines the many published rates of watershed debris yield and notes the alluvial fan-like environment of the lower portion of the study area. PWA also presents the record of sediment management within the Devil's Gate Reservoir.

Historical aerial photograph analysis was performed to determine the historical extent of the active bed and erosional patterns. The analysis found that the limits of erosion are topographically controlled and that the upper portion of the reservoir has typically been braided where the lower portion exhibits ponding.

A two-dimensional FLO-2D numerical model was run for the 2-, 10-, and 50-year hydrographs. The purpose of the model was to determine the debris flow in the reservoir. The model extents were the same as the MIKE model. Historical sectional and longitudinal analysis was also completed within the reservoir. Additional empirical analysis was completed to estimate sediment yield for discrete events. The study found what is commonly accepted as the basis for sediment

yield in southern California watersheds: yield scales with volume of precipitation. Therefore, the smallest, most frequent runoff events or the driest years will transport little or no sediment to the reservoir, while high volume, infrequent events or wet years may potentially transport relatively large volumes of sediment within the study area. The MIKE model was also updated to analyze sediment transport within the study area using sediment data collected within the reservoir. The model was calibrated against historical section data. The model results appear to over-predict bed change during the 2-year event with up to 9.5 feet of aggradation in the model bed at the most upstream cross section. The authors attribute this to the rapid expansion of channel width immediately downstream of the entrance to the reservoir.

JET PROPULSION LABORATORY (2003) – The Jet Propulsion Laboratory (JPL) study describes the development and calibration of the JPL groundwater model as part of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site. Of interest to the present work, the JPL study found no constant loss from Arroyo Seco to Raymond Basin, the underlying groundwater basin, nor any regular and consistent contribution from Raymond Basin to the Arroyo Seco. This indicates that water from the aquafer is not at a depth shallow enough to provide water to sustain vegetation.

5.0 HYDRAULIC MODEL

5.1 MODEL DESCRIPTION

Hydraulic modeling was completed using the U.S. Army Corps of Engineers' (USACE) Hydraulic Engineering Center River Analysis System (HEC-RAS). The HEC-RAS numerical model was designed to calculate water surface profiles in channels assuming a steady flow and uniform discharge based on site hydrology. The HEC-RAS model was run in two-dimensional mode. A description of the model and the model set-up follows.

5.1.1 Equations of Motion

Multi-Dimensional shallow water models can be used to resolve depth and depth-averaged velocities in the horizontal directions x and y. The shallow water equations appear in integral form as (Chaudhry 1993):

$$\frac{\partial}{\partial t}\int_{\Omega} \mathrm{U}d\Omega + \oint_{\partial\Omega} (Fdy - Gdx) = \int_{\Omega} Sd\Omega$$

The dependent variables, U, fluxes F and G, and the source terms are defined as,

$$U = \begin{pmatrix} h \\ uh \\ vh \end{pmatrix} F = \begin{pmatrix} uh \\ u^2h + \frac{gh^2}{2} \\ uvh \end{pmatrix} G = \begin{pmatrix} vh \\ uvh \\ v^2h + \frac{gh^2}{2} \end{pmatrix} S = \begin{pmatrix} 0 \\ gh(s_{ox} - s_{fx}) \\ gh(s_{oy} - s_{fy}) \end{pmatrix}$$

where u and v are the depth averaged flow velocities in the x (easterly) and y (northerly) directions, respectively. The terms in S account for the bed and friction slopes and are given as,

$$s_{ox} = -\frac{\partial z}{\partial x}\ s_{oy} = -\frac{\partial z}{\partial y}$$

and

$$s_{sf} = \frac{n^2 u\sqrt{u^2 + v^2}}{h^{3/4}}\ s_{fy} = \frac{n^2 v\sqrt{u^2 + v^2}}{h^{3/4}}$$

where z=z(x,y) is the bed elevation above an arbitrary datum. Finally, Ω represent the domain of two-dimensional control, and $\partial\Omega$ is its boundary.

5.2 TOPOGRAPHIC REPRESENTATION AND MODEL EXTENT

The HEC-RAS model domain for the study area (as identified on Exhibit 1) was developed in RAS Mapper, a subroutine of HEC-RAS, using topographic 2015 information (tested at an accuracy of 1.25' at 95% confidence level) provided by the City of Pasadena. The topographic data is found in Attachment A. A Manning's coefficient was applied to the study reach and hydrographs were developed for analysis, both described below. As shown in Exhibit 3, HEC-RAS Model Extent, the model extends from upstream of the proposed diversion point to Devil's Gate Dam to upstream of the diversion. The upstream extent was selected because it is the upstream limit of potential impacts to the stream since diversions will not impact hydraulics or hydrology upstream of this location. The downstream limit was chosen because it represents the downstream limits of impacts to the stream because of the presence of Devil's Gate Dam. Numerical hydraulic models are made up of individual computational cells (units of area analyzed) which can vary in size. This model includes approximately 22,250 computational cells with an 18-square foot cell size.

5.3 MANNING'S VALUES

HEC-RAS uses Manning's Equation to represent friction loss in the model, as described above. Manning's values were selected based on aerial (Google Earth) and site photography. The Manning's values range from 0.065 to 0.085. In the present analysis, Manning's value of 0.065 is representative of sandy bottom, wide, braided channel sections with vegetation, while a Manning's value of 0.085 is representative of relatively narrow, steep canyon sections with trees, brush and variable bed section. These values follow guidance for the selection of Manning's values as presented in Barnes (1967) and Chow (1959).

A sensitivity analysis was determined to be unnecessary. The majority of habitat of concern within the study area is generally within the reservoir and the velocities that will be experienced by this vegetation in the reservoir's pool area is at or near zero feet per second. Changing the Manning's value will not change the velocity experienced by the vegetation. Moreover, changing the velocity in the stream by modifying the Manning's values will not alter the velocities experienced by the vegetation in the reservoir. Finally, the largest discharges that occur in the study's numerical modeling are not altered by the proposed project so the roughness values that control the depth and velocities that vegetation experiences during these large events is the same in both the existing and proposed conditions. Alteration of roughness will not change the outcome during these events.

5.4 BOUNDARY CONDITIONS

The down-stream model boundary condition is set to normal depth, while the inflowing boundary condition is set to an inflowing hydrograph, described below. Model outflow is based on the operational curve of Devil's Gate Dam. Generally, there is no outflow from the model for water surface elevations below 1,025 feet. Between 1,025 feet and 1,030 feet the outflow from the Dam is 100 cfs; between 1,030 feet and 1,035 feet the outflow from the Dam is 300 cfs; above 1,035 feet the outflow is 800 cfs. The greatest observed elevation in the reservoir during the representative wet year without diversion is 1,035 feet.

5.5 HYDROLOGY

All hydraulic modeling is based on USGS daily gage data at stream gage #11098000. Daily average discharge data is utilized for the period 1989 to 2014, which is the vetted stream gage data available at the time of writing and is not strongly influenced by drought. Individual water year hydrographs representing dry, average and wet years are selected for modeling, as described below. The hydrologic record at the gage for the period is shown in Exhibit 4, USGS Stream Gage Data for the 1989/1990 to 2013/2014 Water Years.



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HEC-RAS Model Extent

Exhibit 3

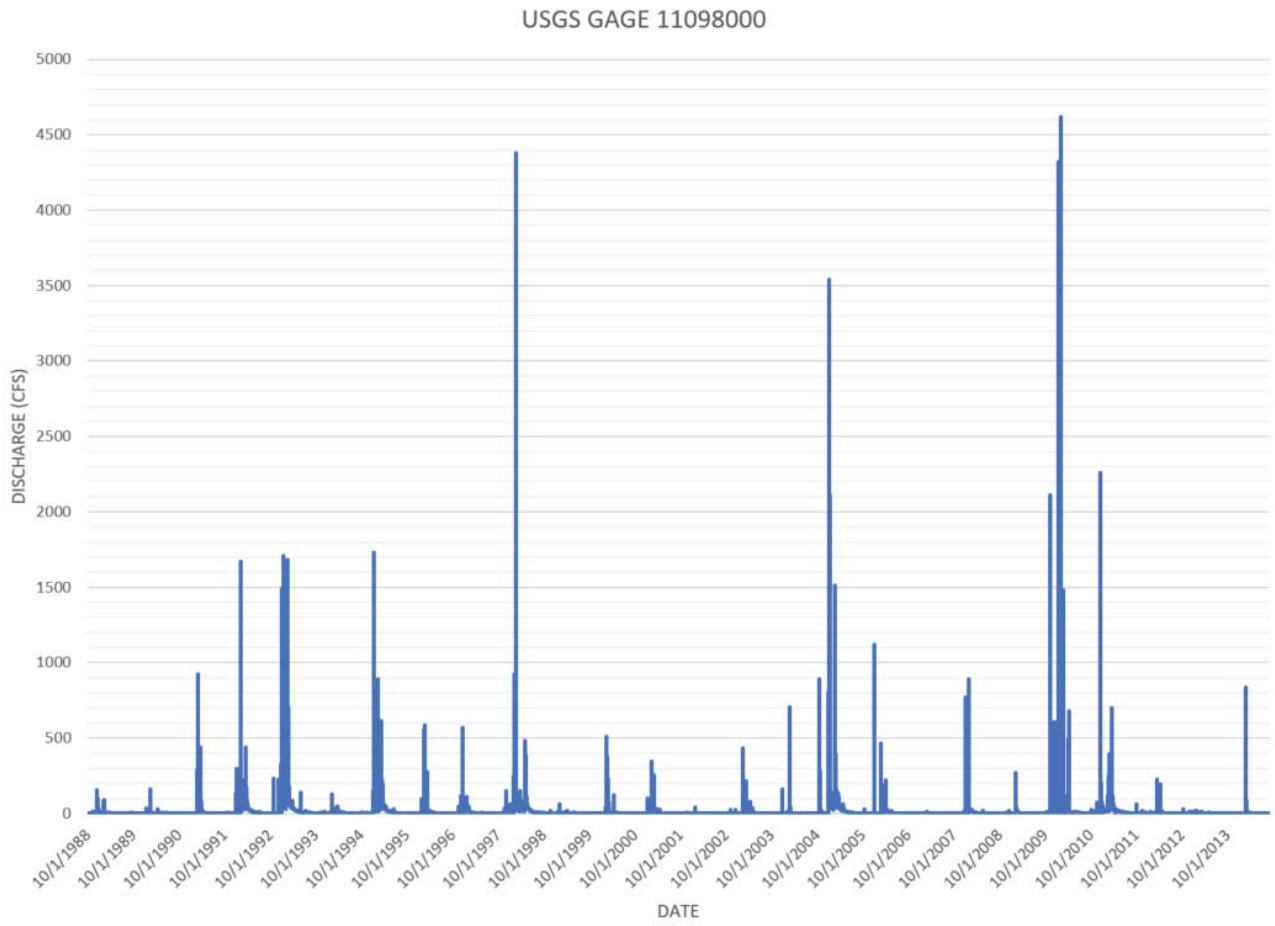
Arroyo Seco Diversion Hydraulics Analysis

N W E S

500 250 0 500 Feet

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USGS Stream Gage Data for the 1988/1989 to 2013/2014 Water Years

Exhibit 4

Arroyo Seco Diversion Hydraulics Analysis

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It is important to recognize that the area of the watershed contributing to the stream at the gage location is smaller than the area of the watershed contributing to the stream at the proposed diversion location. To account for the difference in watershed area the gage data has been scaled as a function of the watershed area to account for the difference. The scaling follows the approach of Waanan and Crippen (1977), which was also used by PWA (1990) in their flood frequency analysis of Arroyo Seco. The scaling is computed as:

$$Q_{diversion} = Q_{gage}(A_{diversion}/A_{gage})^n$$

where *Q* is the flow rate at a given location on the stream, *A* is the area of the watershed at a location corresponding to the respective flow rate, and *n* is an empirical value that is a function of the return period of the discharge being scaled. In the present study all daily discharges in the wet, average and dry hydrographs fall within the range of the 2-year peak discharge, therefore the exponent *n* is set to 0.72 after PWA (1990). The watershed areas were calculated using GIS-based tools and topography provided by the City. The watershed areas at the gage and proposed diversion are 16.0 square miles and 18.8 square miles, respectively.

To develop representations of wet, average and dry years the relative deviation percent was calculated for each year (Gao et al. 2018). The relative deviation percent was calculated by comparing the average annual runoff volume to the annual runoff volume for each year. Years where annual runoff was less than the average are considered dry, while years where the annual runoff was greater than the average are considered wet. Approximately 28% and 72% of annual runoff volumes were determined to be wet and dry, respectively. The years selected to represent wet and dry hydrographs were taken as the median wet and dry annual runoff volumes, respectively. The average runoff year was taken to be the year where annual runoff was closest to the average. The relative deviation percent data for all years is shown in Table 1.

TABLE 1
WET AND DRY ANNUAL RUNOFF VOLUME BY RELATIVE DEVIATION PERCENT AT USGS GAGE #11098000

WATER YEAR		ANNUAL RUNOFF (AF)	RELATIVE DEVIATION %	WET OR DRY?
1989	1990	752	-90.2	DRY
1990	1991	3,499	-54.6	DRY
1991	1992	13,876	80.2	WET
1992	1993	31,231	305.5	WET
1993	1994	2,307	-70.0	DRY
1994	1995	17,957	133.1	WET
1995	1996	5,040	-34.6	DRY
1996	1997	3,867	-49.8	DRY
1997	1998	20,330	164.0	WET
1998	1999	2,094	-72.8	DRY
1999	2000	2,965	-61.5	DRY
2000	2001	3,224	-58.1	DRY
2001	2002	472	-93.9	DRY
2002	2003	2,314	-70.0	DRY
2003	2004	1,290	-83.3	DRY
2004	2005	37,888	391.9	WET
2005	2006	5,239	-32.0	DRY
2006	2007	616	-92.0	DRY
2007	2008	5,754	-25.3	DRY
2008	2009	1,857	-75.9	DRY
2009	2010	9,713	26.1	WET
2010	2011	14,804	92.2	WET
2011	2012	2,759	-64.2	DRY
2012	2013	1,305	-83.1	DRY
2013	2014	1,398	-81.9	DRY
	AVERAGE=	7702		
	MEDIAN=	3224	DRY % =	0.72
			WET % =	0.28
			WET MEDIAN=	17,957
			DRY MEDIAN=	2,311

For modeling purposes, the 1994-1995 water year is used to represent a wet year's runoff volume, the 2007-2008 water year is used to represent an average year's runoff volume, and the 2002-2003 water year is used to represent a dry year's runoff volume.

To develop hydrograph input for modeling, the hydrograph data was limited to daily average discharges greater than 1 cfs. Therefore, no days without runoff are represented in the model. This approach is undertaken because discharges lower than 1 cfs will not reach the Dam owing largely to frictional attenuation within the model. Moreover, the model does not consider infiltration, and is very conservative with respect to the volume of water (more than actual) reaching the dam. It is likely that discharges less than 1 cfs not fully attenuated by friction will be infiltrated before reaching the Dam. Finally, the diversion is being modeled as capable of collecting all the water in the stream, which is unlikely since diversion structures are "leaky" by their nature and at present we cannot account for the leaky loss. Like the modeling approach to

infiltration, this approach is also very conservative with respect to the volume of water that reaches the Dam.

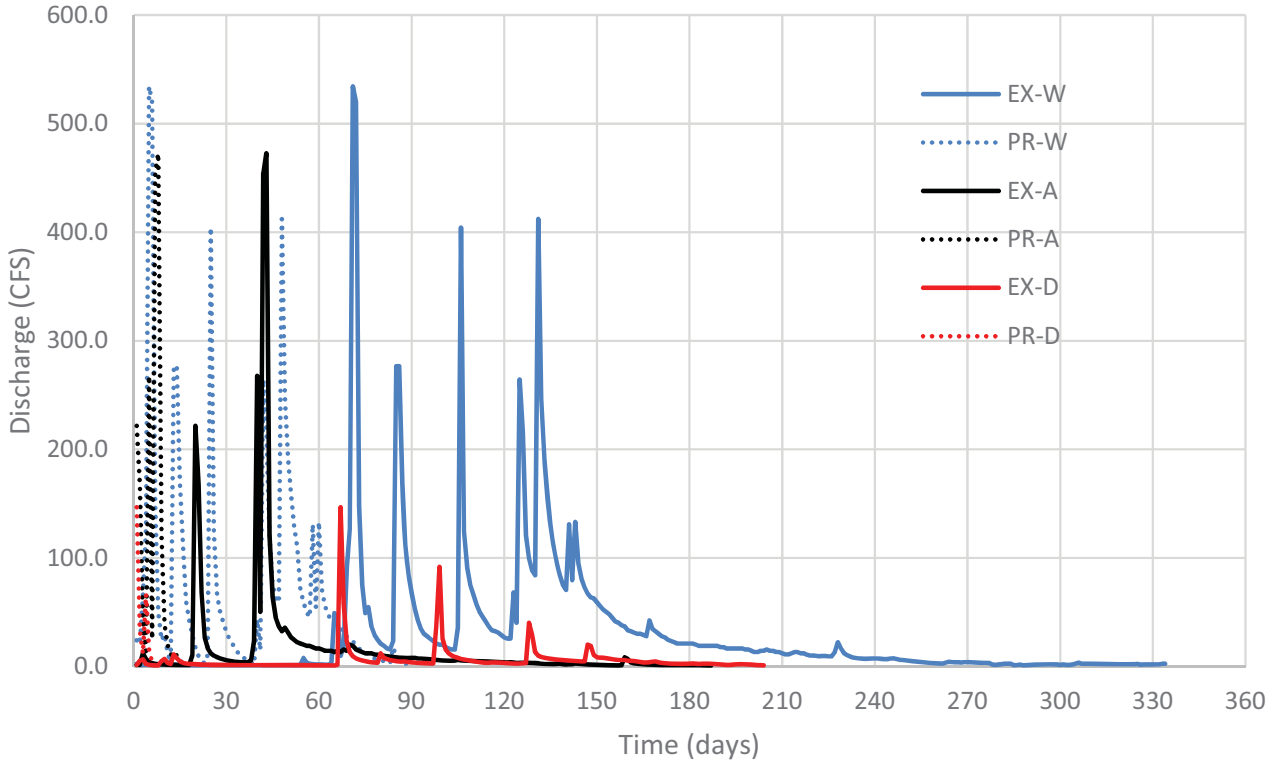
The proposed operational curve of the diversions includes three elements : 1) the diversion will remove all water from the stream up to 25 cfs; 2) diversions will cease for discharges above 100 cfs; and 3) all diverted water is assumed to infiltrate in the spreading basins regardless of the total volume of diversion. Curve elements 1 and 3 are conservative statements. Curve element 1 simplifies modeling because it doesn't consider the leaky nature of diversions, and it is conservative in approach since the constructed system will not be able to capture 100 percent of all discharges, which is typical for operations of diversion structures in natural systems, as noted above (NRC 1939). Curve element 3 is conservative because it states that all of the water to which the City has legal rights can be infiltrated, and that infiltration basins (will have sufficient capacity for all of the diverted water as designed. Factor 2 is represented in modeling since the turbidity of 100 cfs discharges typically represents the upper limit of turbidity that can be successfully managed by the proposed diversion system (City of Pasadena pers comm).

Diversions are represented in the model by subtracting 25 cfs from the daily average discharge values in the modeled hydrographs for discharge values less than 100 cfs. Durations of the discharges remain unchanged (one day), and all days with no discharge are removed from the hydrograph. The without diversion and proposed (with diversion) hydrographs for wet, average and dry years are shown in Exhibit 5, Existing and Proposed Modeling Hydrographs for the Wet, Average, and Dry Runoff Years.

Note that the "without diversion" scenario is used as the most conservative approach to reflect the maximum possible change from existing conditions. Currently there are some diversions of unspecified rates and durations, but they are well below PWP's surface water rights.

5.6 HYDRAULIC ASSUMPTIONS

Modeling used in the present study is uncalibrated hydraulically because no data exists with which to calibrate the model. That is, there does not exist any data that compares discharge to depth, velocity or other hydraulic parameters. It is assumed that the present modeling is conservative, as it doesn't consider evaporation, infiltration, evapotranspiration or other forms of loss besides friction. Attenuation in the model is only a function of friction, and both direct and anecdotal evidence exist to indicate that stream flows in the Arroyo Seco reach the Dam and reservoir.



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Existing (EX) and Proposed (PR) Modeling Hydrographs for the Wet (W), Average (A) and Dry (D) Runoff Years

Exhibit 5

Arroyo Seco Diversion Hydraulics Analysis

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6.0 HYDRAULIC MODEL OUTPUT.;

The HEC-RAS model was run for three representative water years as described above: wet, average and dry total runoff volumes. The HEC-RAS model was also run for the three representative years with proposed Project diversions, also described above. What follows is a comparison of maximum depth and maximum velocity for each representative water year for both the hydrology with and without diversions.

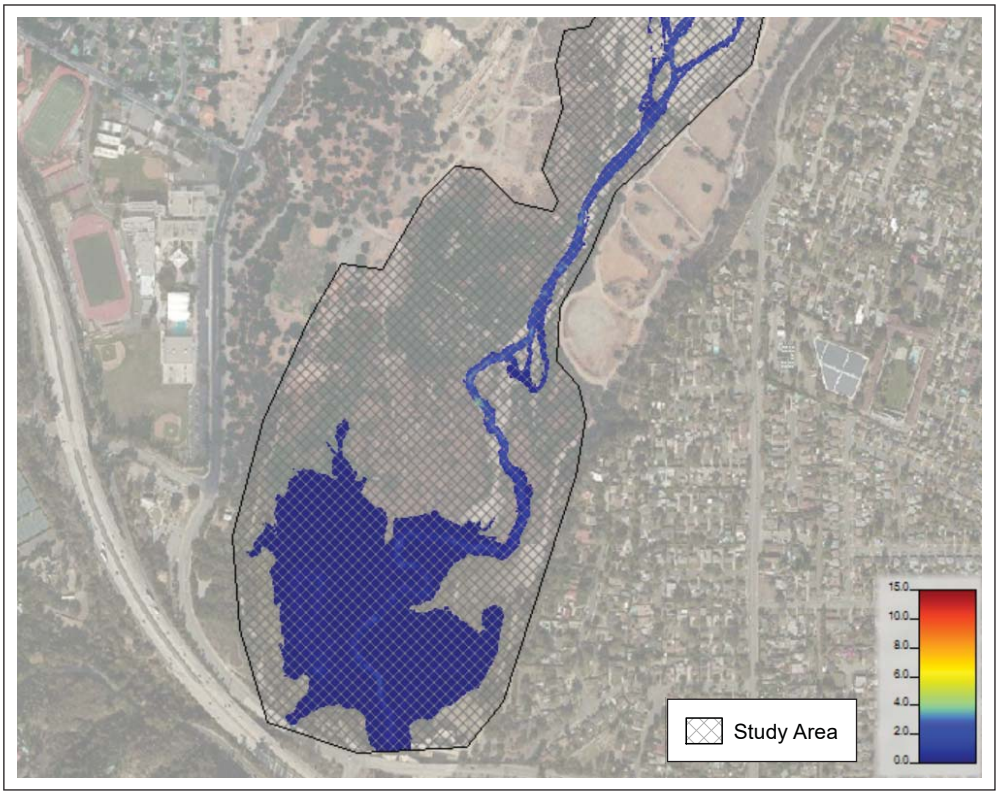
6.1 DRY YEAR VELOCITY

The representative dry year and representative dry year with diversions maximum velocity are shown in Exhibit 6, Representative Dry Year Maximum Velocity. Comparing the two graphics reveals that the maximum velocity in the with-diversion scenario is higher than in the without-diversion scenario in some locations immediately upstream of the Dam. In the primary stream channel upstream of the Dam the maximum velocity doubles from approximately 2.5 feet per second (fps) in the without-diversion condition to approximately 4.2 fps in the with-diversion scenario. In addition, there is an approximate doubling of velocity in some portions of the backwater area upstream and to the west of the Dam from approximately 0.3 fps in the without-diversion scenario to approximately 0.6 fps in the with-diversion scenario.

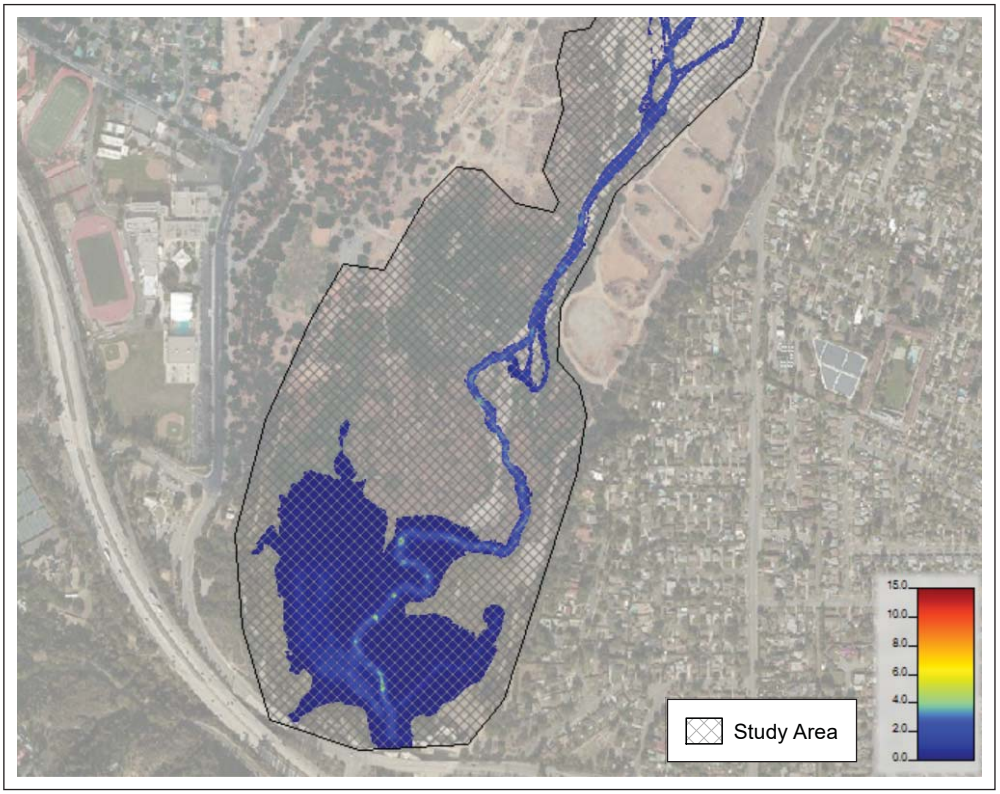
A review of Exhibit 5 indicates what the driver is for the increase in velocity. In the without-diversion scenario small discharge events (Q<25 cfs) begin to fill the reservoir prior to a significant event (Q>>25 cfs). When the smaller events pond upstream of the Dam, the larger events maximum velocity is lower because of backwatering from the Dam due to ponding. In contrast, when water has not ponded upstream of the Dam, no backwatering will occur during a more significant event and velocities will be higher in the main stream and in some of the backwatering areas. It is important to note that these higher velocities can occur in a dry, average or wet year regardless of whether diversions occur if an early runoff event in the season is relatively large and little or no backwatering has occurred prior to the runoff event. It is also important to note that the total change in velocity is relatively low and occurs well below (v=0.6 fps) or just below (v=4.0 fps) a typical velocity (i.e. 4.5 fps) for initiation of sediment transport in sandy bed, vegetated streams.

6.2 DRY YEAR DEPTH

The representative dry year without-diversions and representative dry year with-diversions maximum depth are shown in Exhibit 7, Representative Dry Year Maximum Depth. The graphics show that the maximum depth between the without-diversion and with-diversion scenarios drops by approximately 1.3 feet. A review of Exhibit 5 indicates the cause of the decrease in maximum depth. In the without-diversion conditions, the total runoff for the representative dry year is approximately 2,480 acre-feet (af), while the hydrograph with-diversions for the representative dry year is approximately 550 af. Therefore, the difference in runoff volume accounts for the difference in maximum depths shown in Exhibit 7. It is important to note that the area of inundation is approximately the same between the two scenarios owing largely to the shape of the reservoir upstream of the Dam.



Representative dry year maximum velocity without diversions.



Representative dry year maximum velocity with diversions.

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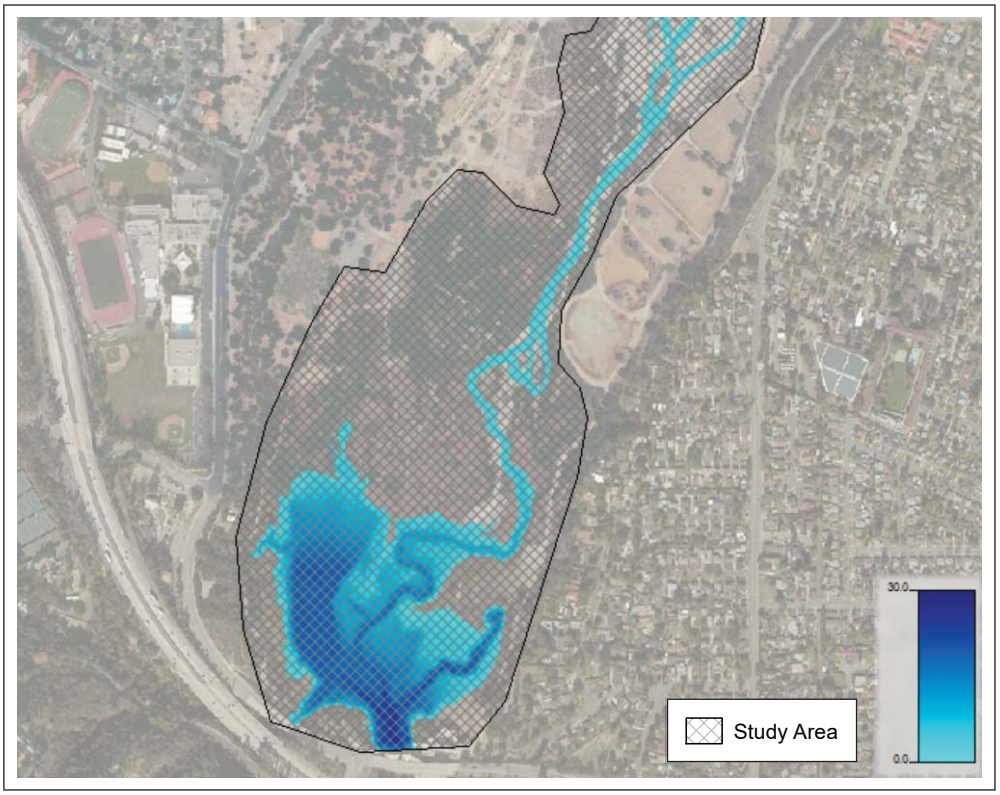
Representative Dry Year Maximum Velocity

Exhibit 6

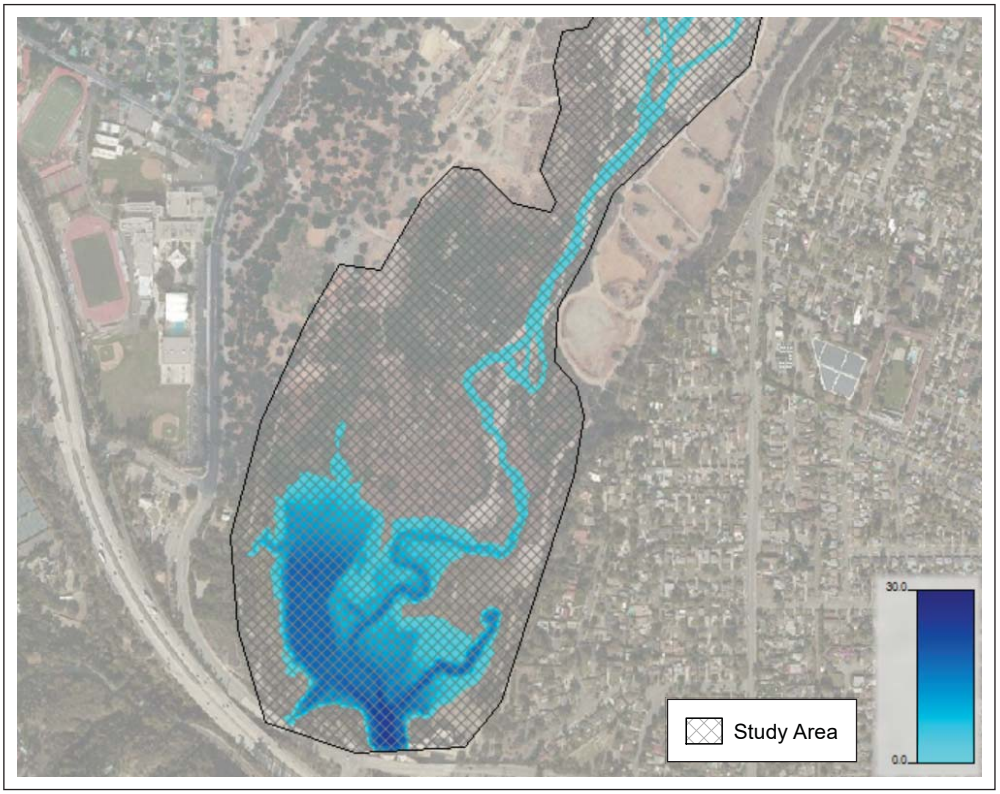
Arroyo Seco Diversion Hydraulics Analysis

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Representative dry year maximum depth without diversions.



Representative dry year maximum depth with diversions.

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Representative Dry Year Maximum Depth

Exhibit 7

Arroyo Seco Diversion Hydraulics Analysis

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6.3 AVERAGE YEAR VELOCITY

The representative average year and representative average year with-diversions maximum velocity are shown in Exhibit 8, Representative Average Year Maximum Velocity. Unlike the dry scenarios, the maximum velocity in the without-diversion scenario is higher than in the with-diversion scenario in some locations immediately upstream of the Dam. In the primary stream channel upstream of the Dam, the maximum velocity doubles from approximately 2.5 fps in the with-diversion condition to approximately 5.5 fps in the without-diversion scenario. In addition, this is an approximate doubling of velocity in some portions of the backwater area upstream of the Dam from approximately 0.6 fps in the with-diversion scenario to approximately 1.0 fps in the without-diversion scenario.

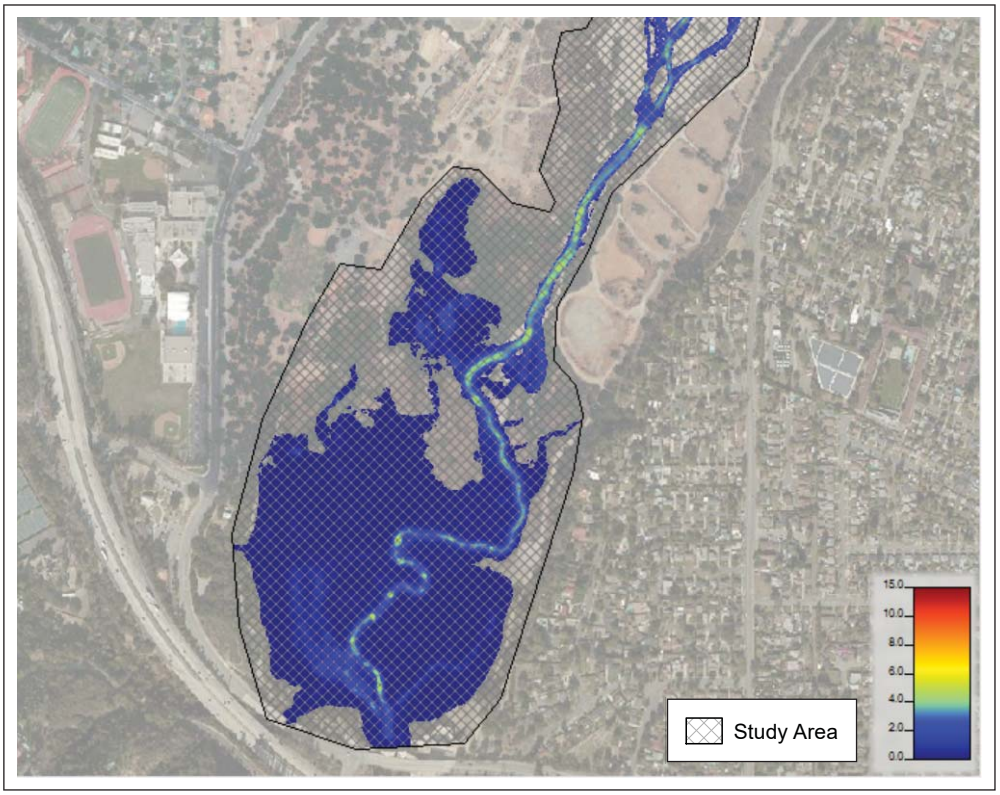
The reason for these differences is similar to that in the representative dry year scenarios, except that the reservoir has relatively high ponding in the with-diversion scenario compared to the without-diversion scenario before a significant (Q>>25 cfs) event occurs. In the representative average year scenario, the resulting maximum velocities are relatively higher than in the representative dry year scenario (5.5 fps vs. 4.2 cfs, respectively). It appears from Exhibit 5 that the difference in modeled maximum velocity in this location is a function of hydrograph shape (rate of flow versus time) as opposed to other hydraulic or hydrologic factors.

6.4 AVERAGE YEAR DEPTH

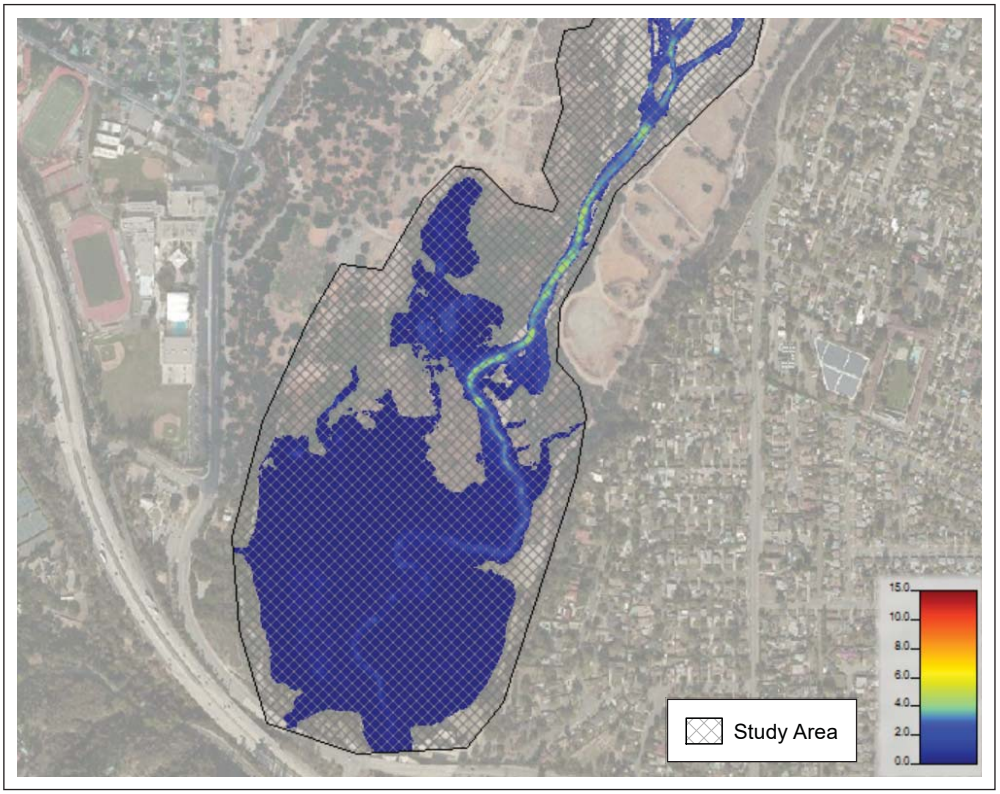
The representative average year without diversion and representative average year with diversions maximum depth is shown in Exhibit 9, Representative Average Year Maximum Depth.. The images are indistinguishable from one another because the maximum water surface elevation is the same, approximately WSE (water surface elevation) = 1,035 feet. In these scenarios, the factor that controls the depth and WSE is the operation of Devil's Gate Dam. Despite the same maximum depths, the with-diversion scenario has greater inundation durations at the reservoir fringes because the with-diversion scenario reservoir depth reaches the operational curve elevation more slowly than does the without-diversion scenario.

6.5 WET YEAR VELOCITY

The representative wet year without diversion and representative wet year with diversions maximum velocity is shown in Exhibit 10, Representative Wet Year Maximum Velocity.. Like the other representative scenarios, there are differences in maximum velocity upstream of the reservoir. The difference between the representative wet year without-diversion and with-diversion maximum velocity is lower in magnitude than in the similar representative dry and average scenarios. This appears to be a function of the rate at which the reservoir fills in the represented wet year scenarios. In the wet year scenarios, the difference in maximum velocity in the channel upstream of the reservoir is approximately 3.0 cfs and 1.5 cfs for the with-diversion and without-diversion scenarios, respectively. One interesting difference between the representative wet year scenarios and other scenarios is how far upstream the differences are observed. In the case of the wet year scenarios, the differences in velocity are observed in the channel upstream of the ponded reservoir, while in the representative average scenarios the differences are confined to downstream of the infiltration basins on the east bank. A review of the model output indicates that the difference in extent of impacts is a function of the extent of ponding and ponded elevation in the reservoir, which alters the backwatering further upstream than in the average scenario conditions. The difference is not attributable to change in hydrology resulting from diversions since the largest discharges (Q>100 cfs) are not impacted by the diversions.



Representative average year maximum velocity without diversions.



Representative average year maximum velocity with diversions.

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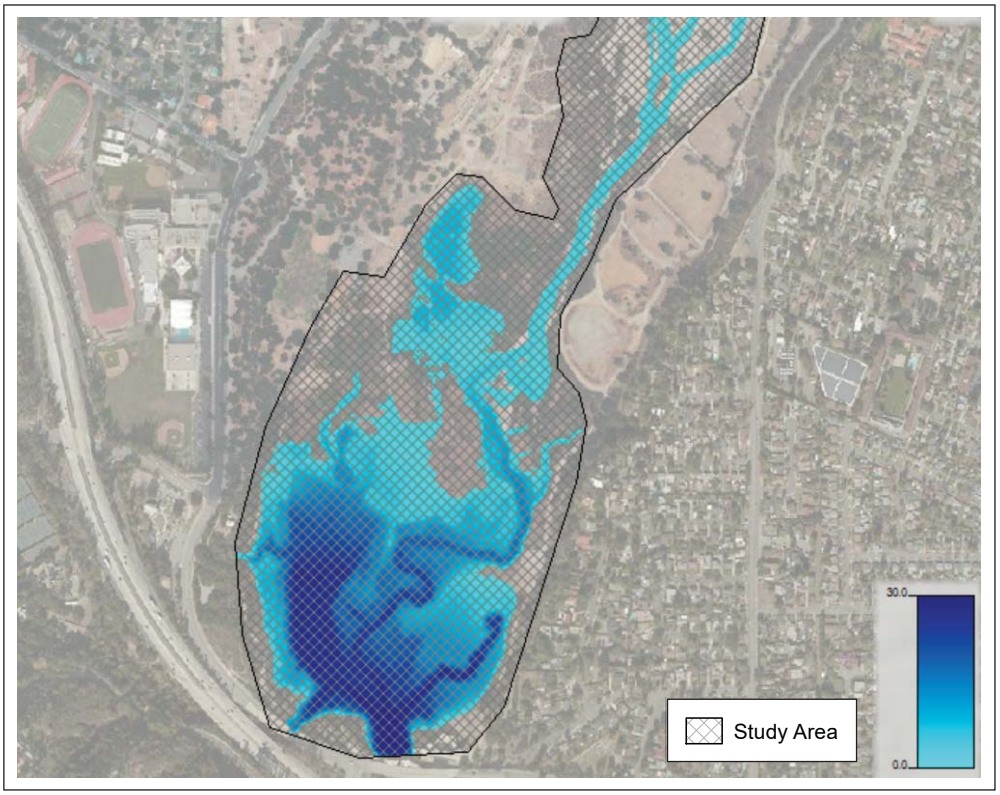
Representative Average Year Maximum Velocity

Exhibit 8

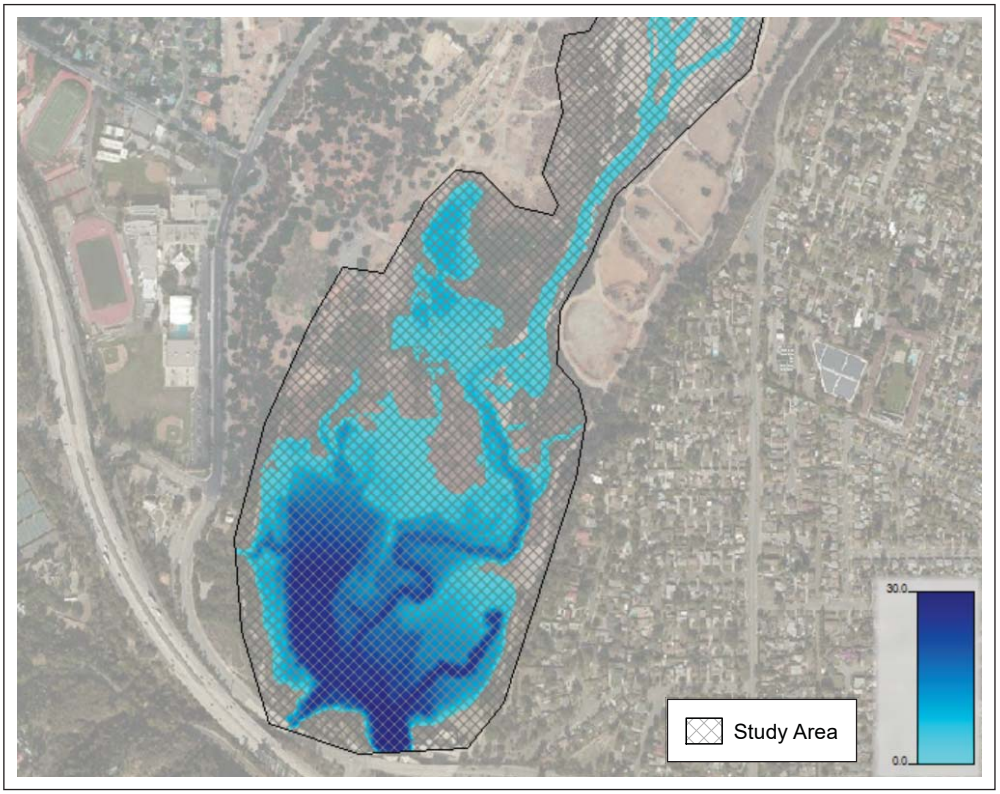
Arroyo Seco Diversion Hydraulics Analysis

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Representative average year maximum depth without diversions.



Representative average year maximum depth with diversions.

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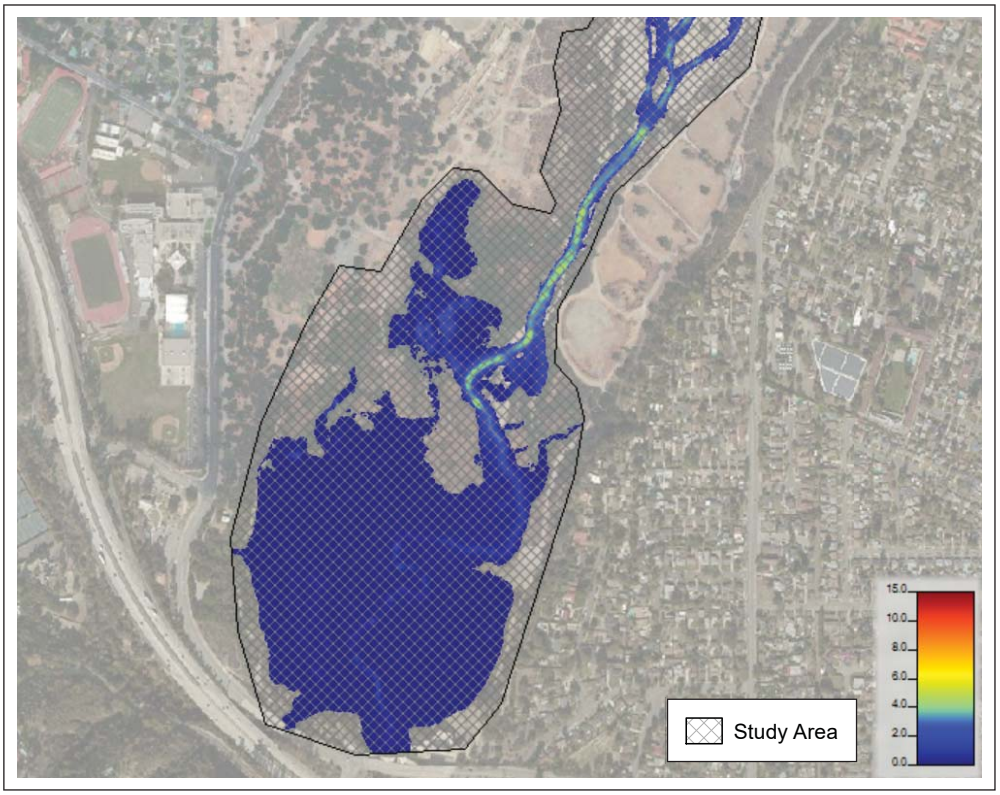
Representative Average Year Maximum Depth

Exhibit 9

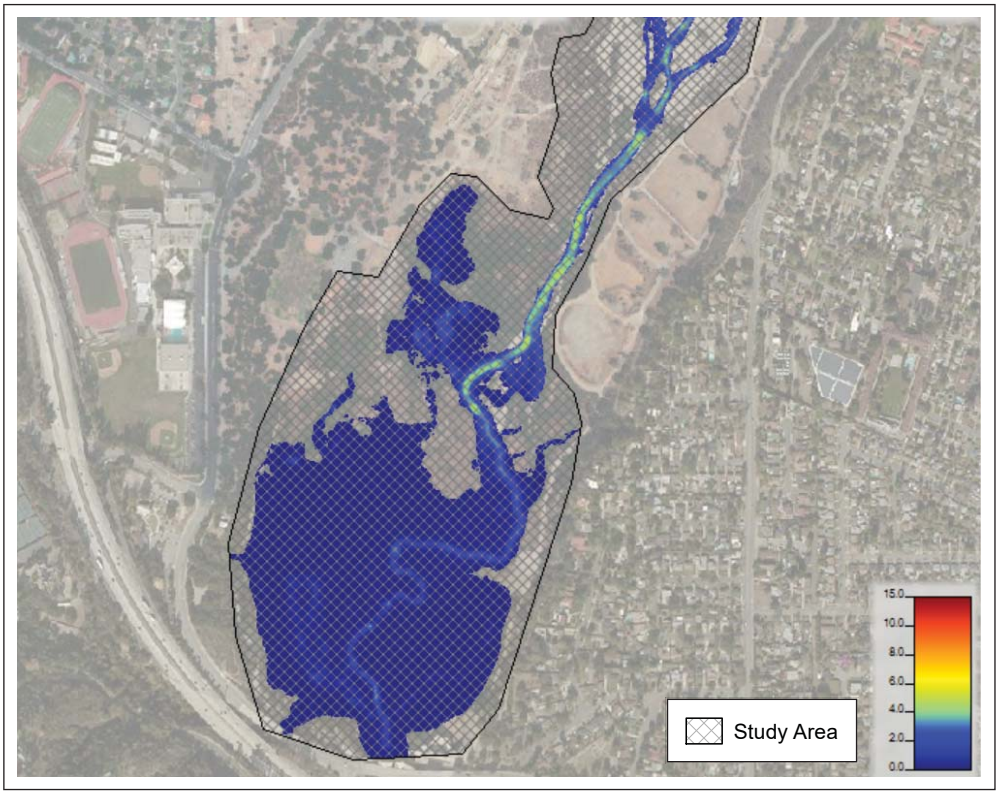
Arroyo Seco Diversion Hydraulics Analysis

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Representative wet year maximum velocity without diversions.



Representative wet year maximum velocity with diversions.

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Representative Wet Year Maximum Velocity

Exhibit 10

Arroyo Seco Diversion Hydraulics Analysis

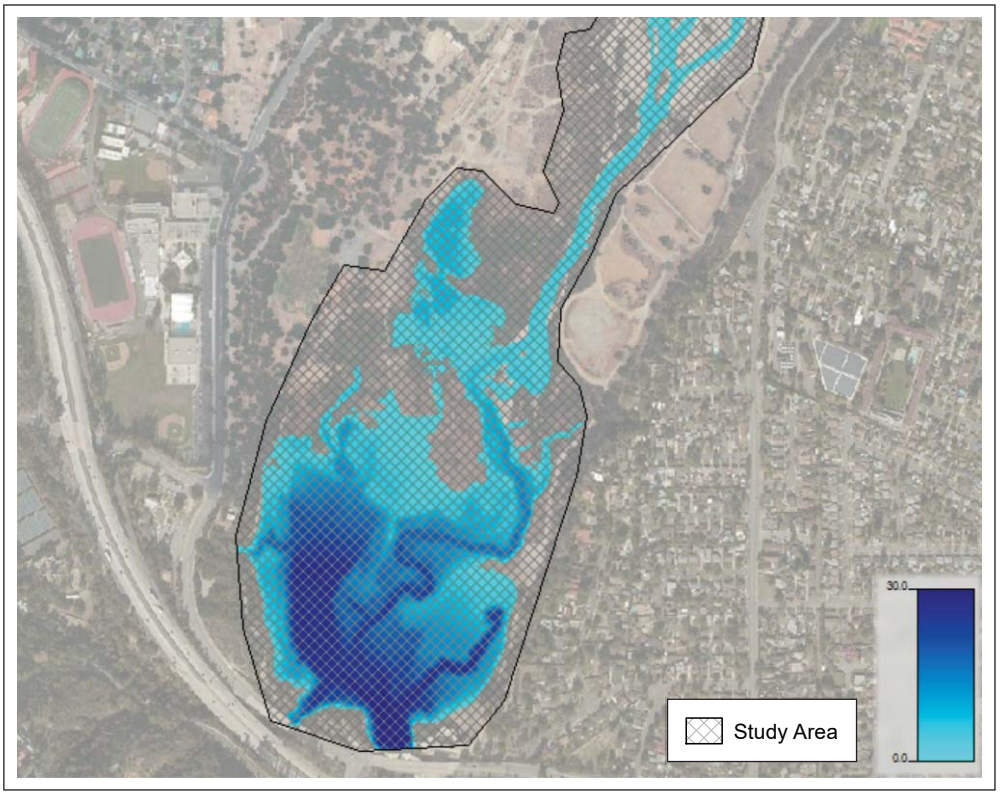
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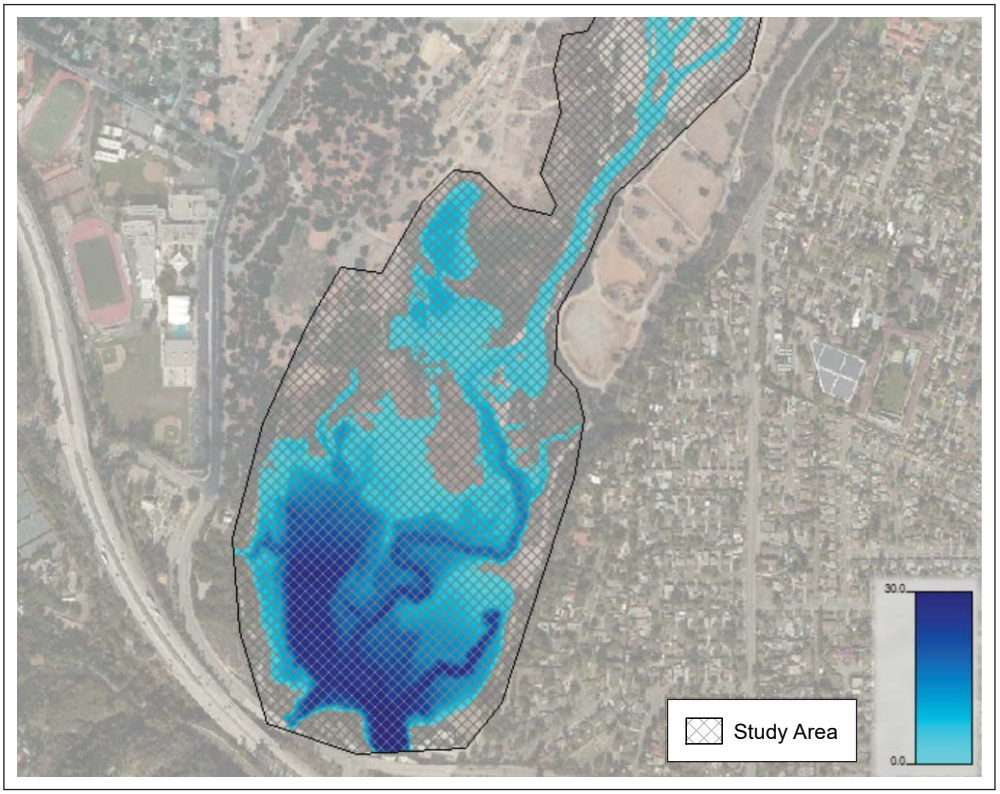
6.6 WET YEAR DEPTH

The representative wet year without-diversions and representative wet year with-diversions maximum depth is shown in Exhibit 11, Representative Wet Year Maximum Depth. Like the representative average year scenarios, the representative wet year maximum depth exhibits are indistinguishable because the Dam operational curve is controlling the maximum depth in the reservoir, approximately WSE=1,035 feet. Like the average year scenarios, the with-diversion scenario has greater inundation durations at the reservoir fringes because the with-diversion scenario reservoir depth reaches the operational curve elevation more slowly than does the without diversion scenario.

All model input and output can be found in Attachment B.



Representative wet year maximum depth without diversions.



Representative wet year maximum depth with diversions.

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Representative Wet Year Maximum Depth

Exhibit 11

Arroyo Seco Diversion Hydraulics Analysis

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7.0 SEDIMENT TRANSPORT MODEL

7.1 MODEL DESCRIPTION

General adjustment was estimated in this study using the U.S. Army Corps of Engineers (USACE) SAM steady-state numerical model. Here, SAM was employed to provide a first calculation of sediment transport potential within Arroyo Seco. The SAM Sediment Hydraulic Package is an integrated system of programs developed through the Flood Damage Reduction and Stream Restoration Research Program to aid in the analyses associated with designing, operating, and maintaining flood control channels and stream restoration projects. SAM combines the hydraulic information and the bed material gradation information to compute the sediment transport capacity for a given channel or floodplain hydraulic cross-section for a given discharge at a single point in time. Several sediment transport functions are available for this analysis and SAM can assist in selecting the most appropriate sediment transport equation.

The three primary fluvial components of SAM are SAM.HYD, SAM.SED and SAM.AID. SAM.HYD provides a steady state, normal-depth, one-dimensional representation of channel hydraulics. The SAM.SED module combines the hydraulic parameters with the bed material gradation curve to compute bed material discharge rating curves by size classification. The SAM.AID module provides the user with recommended sediment transport equations based on the best matches between hydraulic parameters and grain size distribution of the study reach with parameters from widely accepted and published research.

The SAM numerical model is built upon hydraulic and fluvial components. The hydraulic components include representations of river bed characteristics that are input into an analytical procedure. The fluvial component includes representation of bed gradation as percent finer statistics and a selection of up to twenty sediment transport equations. SAM's hydraulic component will accept either average reach parameters or cross-section data imported from HEC-2/HEC-RAS/HEC-6 models. Hydraulic modeling is based on a uniform flow equation where discharge is the dependent variable such that,

$$Q = f(D, n, W, z, S)$$

where Q is discharge in cfs, D is flow depth in feet, n is the Manning's number, W is bottom width in feet, z is the channel side slope, and S is the energy slope. The bottom width is representative of the total moveable bed width of the channel and Manning's number is a composite value. Normal depth is calculated using Manning's equation, and effective values of width and depth are calculated following normal depth calculations.

The fluvial component is based on sediment transport functions to calculate the bed portion of the sediment discharge-rating curve. The sediment transport equations are of the form,

$$GS_i = f(V, D, S_e, B_e, d_e, \rho_s, G_{sf}, d_s, i_b, \rho_f, T)$$

where GS_i is the transport rate for sediment size class i; the hydraulic terms V, D, S_e, and B_e, are the average velocity, effective flow depth, energy slope, and effective flow width, respectively; the sediment particle parameters d_e, ρ_s, and G_{sf} are the effective particle size, particle density, and grain size shape factor, respectively; the sediment mixture properties, d_s and i_b are the geometric mean particle size of sediment class i and fraction of class i in the bed, respectively; and the fluid properties ρ_f, and T, the water density and temperature, respectively. Twenty well known, published, peer-reviewed transport equations are available including Ackers-White, Colby, Laursen-Copeland, Laursen–Madden, MPM, Toffaleti, Yang, Van Rijn and others. Once the data assembly is complete, the SAM.SED module can be used to create a sediment discharge-rating

curve based on grain size distribution. The reader is referred to the SAM user's documentation for further reference.

It is important to note that the SAM model is a zero-dimensional computational package that is only based on a single cross-section at a point in time. As such, SAM simulations can only represent a reach average during a steady state discharge. Because SAM applies sediment transport to a point, no variability in size distribution in either space or time is calculated. With these limitations in mind, in this study SAM is intended to provide a first approximation to sediment transport to which other more sensitive calculations can be compared.

7.2 MODEL INPUT

In this study, hydraulic representation of the streambed is accomplished in several distinct steps. First, the HEC-RAS numerical model is used to develop a representative cross section for analysis. Second, the HEC-RAS geometry is combined with hydraulic data for the representative cross section. Next, the hydraulic data and cross section are entered into the SAM.HYD subroutine and the model is run. The sediment data, described below, is entered into the model, the SAM.AID subroutine is run, and a transport equation is selected. Once the equation is selected the SAM.SED subroutine is run.

7.3 SEDIMENT DATA

To characterize the sediment of the streambed and by extension, the possible bed load of sediment during discharge events, a sediment grain size analysis was conducted. The goal of the analysis is to gain a statistical representation of the size distribution of soil components of the streambed. Grain size distribution analysis is a powerful tool because the results can represent both a qualitative description of soil make up as well as quantitative input for further predictive measures, such as fluvial modeling.

Sediment sampling was conducted by R. T. Frankian & Associates (2018). Sampling was conducted at a total of 6_locations, approximately every 2,000 feet within the stream bed from 200 feet upstream of the existing diversion structure to 200 feet upstream of the Dam face, which is a distance of approximately two miles. A total of three samples were taken within the stream bed at each of the proposed sample locations; each sample location was taken from a depth of approximately 18 inches. Samples were only obtained in surface-dry areas of the stream bed. Access to each of the sample locations was limited to foot traffic from various access points. The excavation and sampling of sediments were limited to the use of hand-operated equipment. Excavated sediments were stockpiled on heavy tarps during the process of excavation, sampling, and classification. The remnant excavated sediments were used to backfill each of the sample locations. Field samples obtained from each of the test pits were laboratory sieved for grain size distribution testing in general accordance with ASTM Test Method D422. The portions of the samples tested were limited to that portion of each sample greater than the No. 200 Sieve.

Since SAM is a single point model, two specific locations were chosen for modeling. The first model location is approximately 200 feet upstream of the JPL Bridge, while the second model location is approximately 1,100 feet downstream from the bridge. Both locations are relatively distant from the influence of confluences and structures, and neither is located in the reservoir, which is not appropriate for modeling with SAM. Sample Location No. 2 and No. 3 were taken at these sites, respectively, and the average grainsize distribution at each location was used for SAM modeling. The average grainsize distribution of Sample Location No. 2 and No. 3 is shown in Exhibit 12. One benefit for selecting these sites is that the upstream location is within the more confined channel reach, while the downstream location is below the grade break in the stream where Arroyo Seco begins to widen and acquires characteristics of an alluvial surface. Therefore,

these two locations are representative of the two primary stream morphologies found in the study area. All Frankian sediment data is presented in Attachment C.

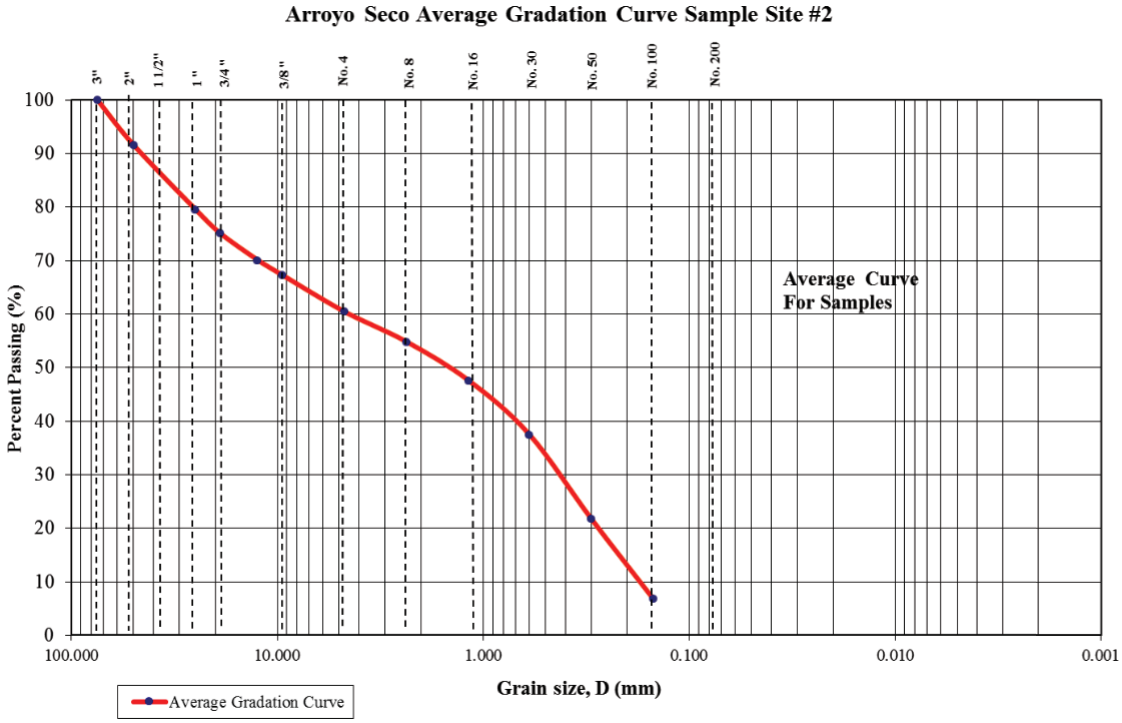
7.4 TRANSPORT EQUATION SELECTION

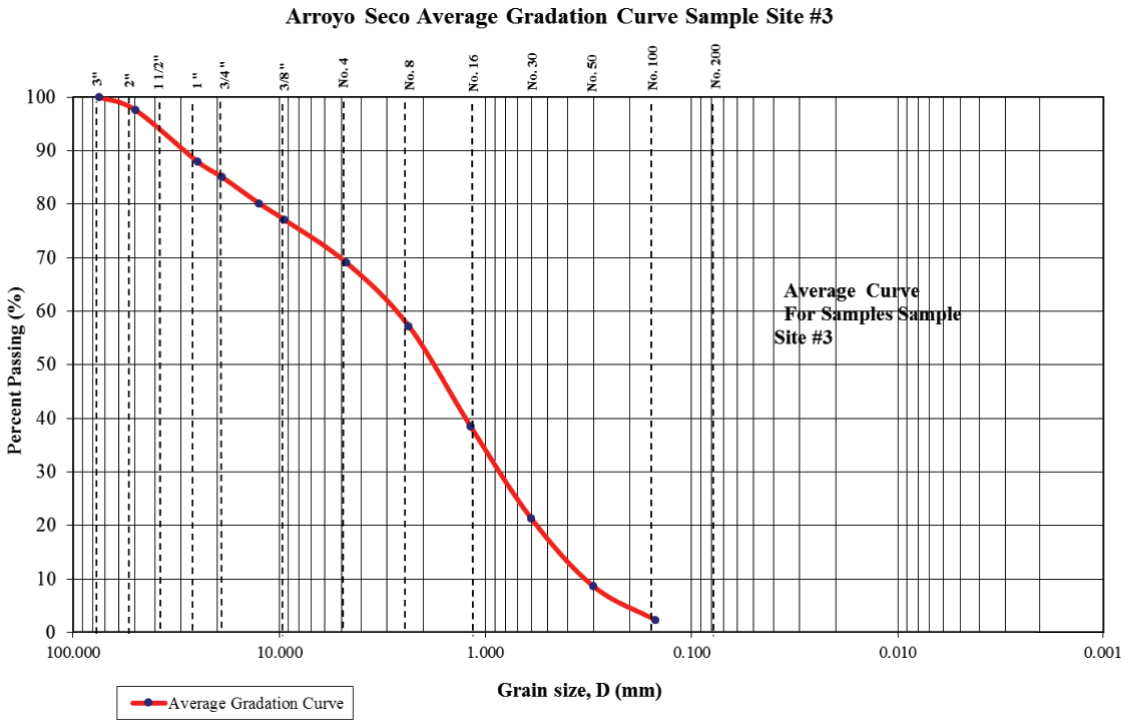
Sediment transport equations used in all SAM modeling were chosen with the assistance of the U.S. Army Corps of Engineers' (USACE's) SAM.AID subroutine. The SAM.AID subroutine determines the most representative transport function based on the hydraulic parameters and soil gradation data for a section of Arroyo Seco by comparing model data with the results of 20 peer-reviewed and widely acknowledged sediment transport studies. To accomplish the task of guiding the user in selecting an appropriate transport function, SAM.AID assumes that the function that best represents sediment transport in a gauged stream would also best represent transport in an ungauged stream with similar sediment and hydraulic characteristics. SAM.AID begins by comparing study parameters (V, D, S_e, B_e, D_{50}) with parameters in the transport function database. Comparison begins by determining if D_{50} falls within one of the ranges identified in the database. Once the initial matches have been made in the database, the three best-matched sediment transport functions for the study reach are listed along with the parameters that matched the data set. Once the best transport equation matches have been determined by SAM.AID, the most representative equations are run in SAM.SED.

The Yang and Ackers-White equations were found to be the representative transport equation for a discharge of 25 cfs, the proposed diversion discharge. A discussion of sediment transport applicability (Yang and Huang 2001) suggests that Ackers-White is more appropriate for sand transport than is the Yang equation. Therefore, all analysis is based on Ackers-White, but the Yang equation results are included for completeness. All SAM model input and output can be found in Attachment C.

7.5 SAM MODEL RUNS

The SAM model was run at Sample Location No. 2 and No. 3 for 25 cfs, the proposed diversion discharge. The SAM runs were intended to indicate the possible change in sediment transport potential at the two model locations resulting from the proposed diversions. Representative hydraulics from each location were taken from the HEC-RAS model and sediment data was taken from Frankian sieve data, as described above.





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Average Grain Size Distributions

Exhibit 12

Arroyo Seco Diversion Hydraulics Analysis

PSOMAS

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8.0 SEDIMENT TRANSPORT MODEL OUTPUT

The sediment transport potential at Sample Location No. 2 and No. 3 are, respectively, 37,680 and 169 tons per day for the Ackers-White equation and 3,788 and 148 tons per day for the Yang equation. A large portion of the difference appears to be related to Location No. 2's ability to generate sufficient transport potential in the 2.828 mm size class for Ackers-White, which does not occur at Location No. 3. Additionally, the transport potential for all size classes is approximately one order of magnitude greater at Location No. 2 than Location No. 3 for Ackers-White for almost all grain size classes. Similar results are observed for Yang's equation, although Yang predicts sediment transport potential up to 5.657 mm at Location No. 2, but only up to 2.828 mm at Location No. 3.

A review of the hydraulics at each location identifies the cause of the disparity in transport potential between the two locations. The steeper, narrower Location No. 2 has higher velocity, steeper slope and narrower top width relative to Location No. 3, which is below the channel's grade break. This finding matches the finding of PWA (2000) that significant sediment deposition occurs in what is referred to as the "upper reservoir." The implication for this finding is that the lower portion of the Arroyo Seco study area behaves in a similar way to an alluvial fan below the hydrographic apex whereby sediment is deposited in patterns associated with flow path uncertainty, and sediment transport below the grade break is strongly a function of local hydraulics (e.g. Leopold et al. 1992).

9.0 HYDRAULIC AND SEDIMENT MODELING CONCLUSIONS

In dry, average, and wet representative years, modeled diversions from Arroyo Seco have an effect on velocity in select areas of the reservoir upstream of Devil's Gate Dam. The effects on velocity are small in absolute terms ($\Delta v_{maximum} < 3$ *fps*), and in some cases the change in velocity represents a decrease from the existing conditions. Numerical modeling indicates that the factors that control change in velocity in the reservoir are the magnitude (peak discharge) and shape (number of peaks and duration of individual runoff hydrographs) of the earliest storms in a given season and the extent to which ponded water fills the lower reservoir. In cases where diversions do not effect early-season large runoff events, differences in maximum velocity can be expected to be negligible between the without and with diversion scenarios for any representative year. In contrast, the extent which the reservoir is full in either the without or with diversion scenario may affect the change in velocity by creating a backwater condition in the reservoir. Modeling suggests that the direct effect on velocity from diversions is for events where the maximum discharge is near or below 25 cfs. However, as was identified by Inman and Jenkins (1999), the dominant driver of runoff in coastal southern California is large winter storms. Therefore, only in years where the primary source of water to the Devil's Gate Reservoir is runoff events near or below 25 cfs are velocities expected to be affected by diversions. It should be noted that the representative dry year is only minimally affected in this manner.

Effects on maximum depth in dry, average, and wet representative years in Arroyo Seco are largely mediated by the amount of ponding in Devil's Gate Reservoir. Ultimately, the ponding in the reservoir is a function of the rate, frequency and volume of inflow, and the dam operation outflow. In representative average and wet years, the modeled extent of ponding is a function primarily of dam operations for both the without and with diversions. In represented dry years, numerical modeling indicates that maximum depth is primarily driven by the volume of water entering the reservoir in the absence of reaching the dam operational curve elevation. In representative dry years, diversions may have an effect on maximum water depth in the reservoir, and modeling indicates that maximum depth in these years is partially a function of when in the season the largest runoff events occur. That is, representative dry years with diversions and a few relatively large runoff events will have a similar maximum depth in the reservoir compared to representative dry years without diversions. In contrast, in representative dry years without a few relatively large events, modeling predicts that the difference in reservoir maximum depth will be greater. Finally, in representative wet and average years the duration of inundation can be impacted on the fringes of the reservoir by diversions. Diversions in these years appear to increase the inundation duration somewhat by increasing the volume of runoff required to initiate dam operations.

The numerical modeling presented here indicates that relatively small effects on maximum velocity and maximum depth occur from proposed diversions upstream. These effects (change in velocity) are limited generally to the stream channel within the lower reservoir and the backwater area immediately upstream and to the west of the dam. Additional minor effects (change in duration of inundation) are indicated at the reservoir edge and appear to be strongly a function of dam operations as well as diversions.

SAM modeling of two locations within the study area indicates that there is greater sediment transport potential at 25 cfs in upper portions of Arroyo Seco, which are steep and narrow, compared to portions below the topographic break, which are wider and flatter. This finding echoes that of PWA (2000) that found that significant sediment deposition occurs in the "upper reservoir." **The implication for the present study is that for low discharges in Arroyo Seco, the reduction in discharge of 25 cfs is expected to be unimportant to overall sediment transport potential because the controlling elements of sediment transport are geologic factors.** Moreover, in large runoff events that are typically the dominant delivery mechanism of

sediment in southern California (Inman and Jenkins 1999) no diversions are presently proposed and are therefore not expected to be impactful to stream sediment yield to the reservoir.

10.0 GROUNDWATER ASSESSMENT

10.1 PHYSIOGRAPHY

The Arroyo Seco Watershed is bounded on the north by the San Gabriel Mountains, which consist of steep, rocky ridges broken by numerous irregular canyons. The elevations of these mountains vary from about 1,200 feet along their base to a maximum of more than 6,000 feet above sea level at the headwaters of the Arroyo Seco.

The Arroyo Seco stream empties out into a broad piedmont plain that slopes downward from the base of the San Gabriel Mountains to Devil's Gate Reservoir, the lowest ground surface point of the Raymond Groundwater Basin within the Project area (see Exhibit 13). The Arroyo Seco continues south until it empties into the Los Angeles River near the intersection of the 5 and 110 freeways. The Raymond Basin (see Hydrogeology Section) forms along the southern flank of the San Gabriel Mountains and extends into the project area beneath Devil's Gate Reservoir.

10.2 GEOLOGY

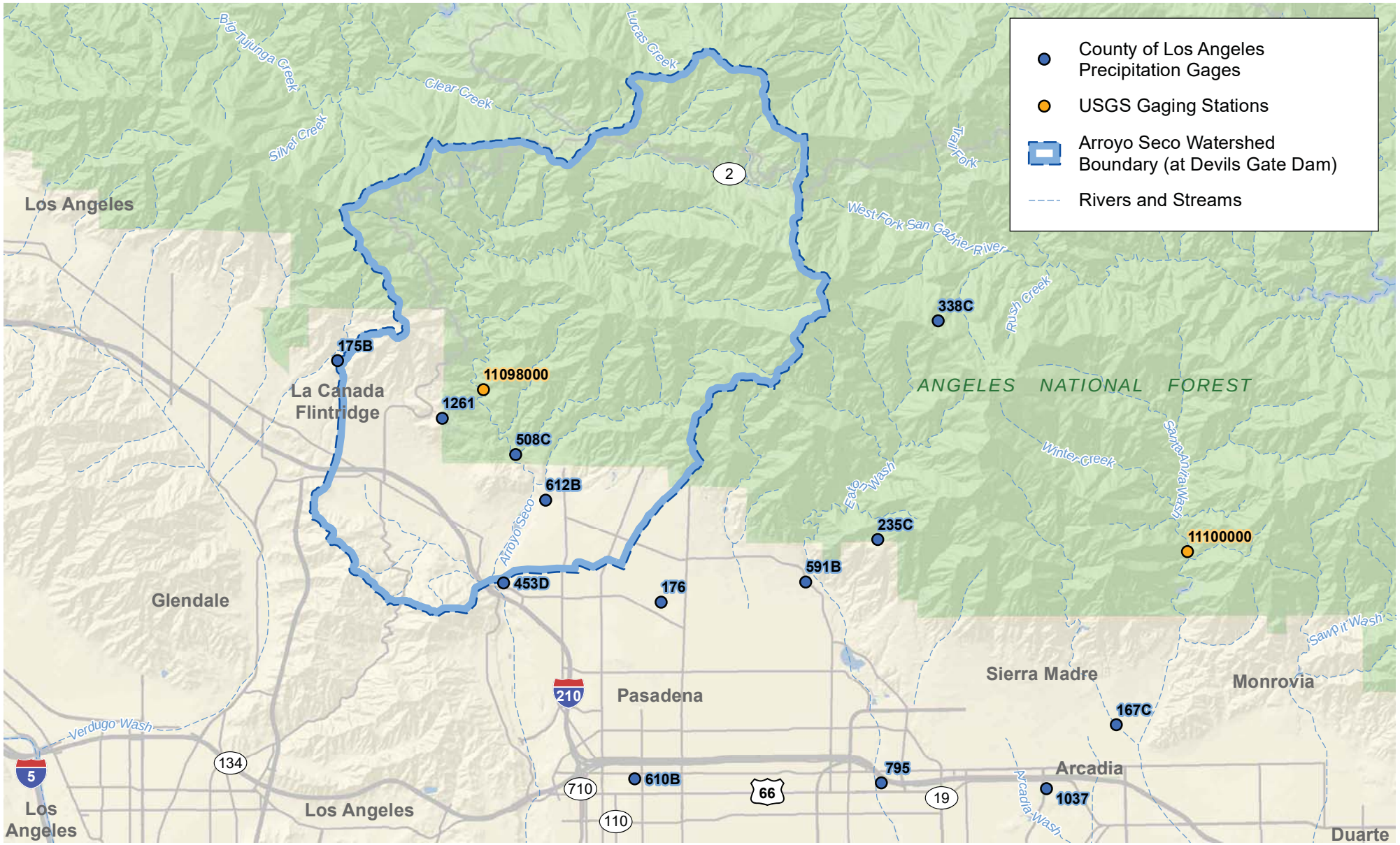
10.2.1 General Geology

The Raymond Basin lies in the northwestern part of the San Gabriel Valley, bounded by the San Gabriel Mountains to the north, the San Rafael Hills to the west, and ending to the south and east at the Raymond Fault. The San Gabriel Mountains, along with the San Bernardino Mountains to the east and the Santa Monica Mountains to the west, make up a major portion of the east-west trending Transverse Range geologic province of California. The San Gabriel Mountains are primarily composed of Cretaceous to Tertiary crystalline rocks, including diorites, granites, monzonites, and granodiorites, with a complex history of intrusion and metamorphism. The Sierra Madre fault system separates the San Gabriel Mountains to the north from the San Gabriel Valley to the south. Within the valley lies Quaternary alluvium, made up of sand, gravel, clay, or some mixture of each. Underlying the alluvium is the crystalline basement complex, comprised of the same general rock types that are exposed in the San Gabriel Mountains to the north (Foster Wheeler Environmental Corporation [FWEC], 1999).

Raymond Fault, the southern boundary of the triangle, crosses the San Gabriel Valley floor for a distance of about nine miles, connecting a granitic spur from the San Gabriel Mountains at the eastern end of the Raymond Basin with Tertiary sediments outcropping in its southwestern corner. The Raymond Fault separates the Raymond Basin from the Main San Gabriel Basin in the vicinity of the southeasterly boundary. The fault zone is not impervious and groundwater can flow across this boundary into the Main Basin (NASA 2003). The general geology of the Raymond Basin is shown in Exhibit 14.

The low water-bearing formations in the project area include the Basement Complex rocks and Tertiary sediments of the Topanga, Modelo and Puente formations (Exhibit 14 and Attachment D).

The Basement Complex is comprised of pre-Cretaceous series of crystalline rocks that comprise the basal formation of the region. These are chiefly igneous plutonic rocks of granitic type, together with their metamorphic phases, such as schists, gneisses, and also various intrusive dikes. The Basement Complex comprises the majority of San Gabriel Range to the north and the San Rafael Hills to the west. The Basement Complex protrudes above the alluvium at Monk Hill



Arroyo Seco Watershed Boundary

Exhibit 13

Arroyo Seco Diversion Hydraulics Analysis

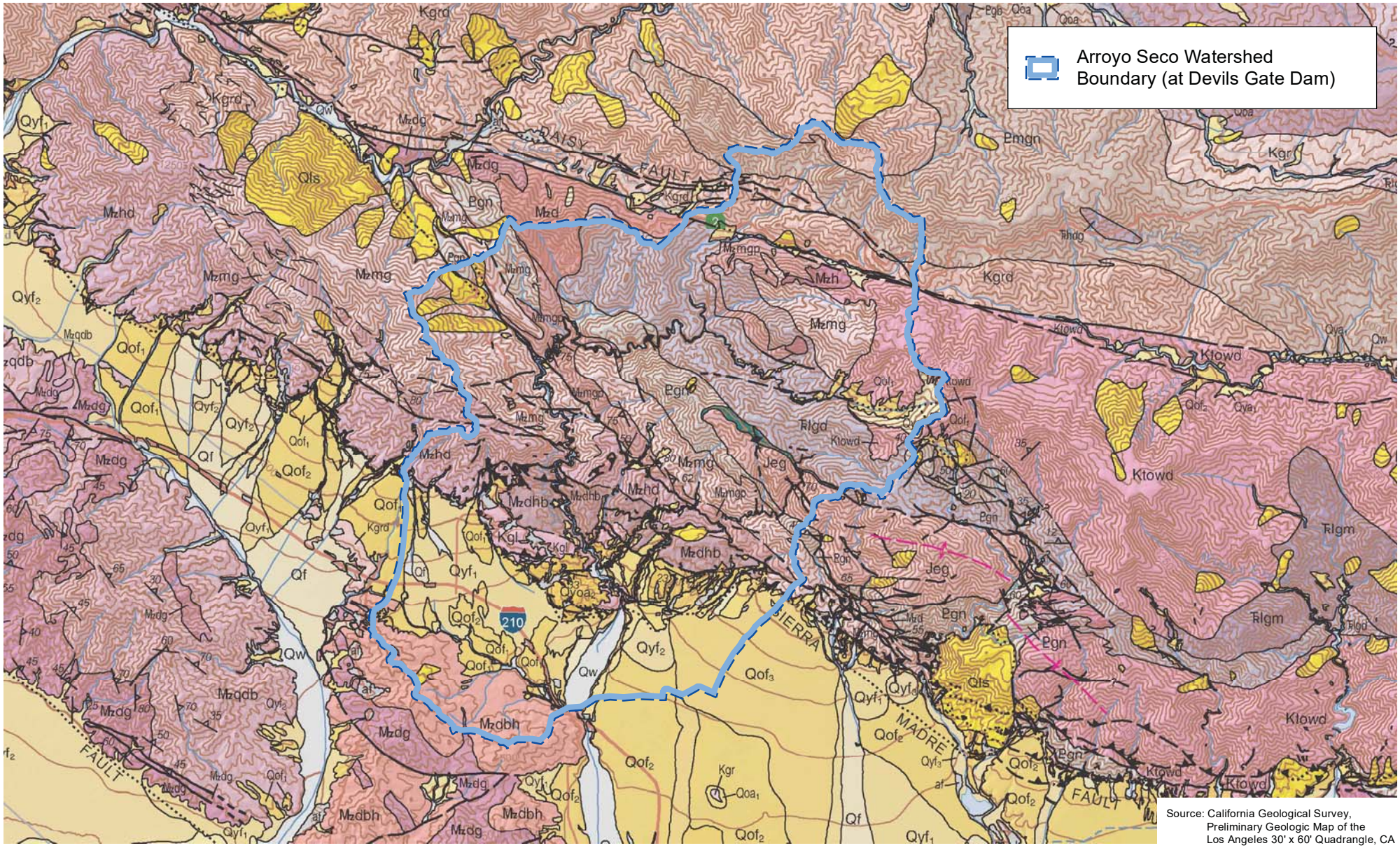
N W E S

1.75 0.875 0 1.75 Miles

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Surficial Geology of the Upper Arroyo Seco Area

Exhibit 14

Arroyo Seco Diversion Hydraulics Analysis

N
W E
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1.6 0.8 0 1.6 Miles

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and near the head of Eaton Wash demonstrating that it is continuous beneath the area. The Topanga Formation, Tertiary age sedimentary rocks, is represented in the Raymond Basin by fairly well bedded shales, sandstones, and conglomerates that are well consolidated. The exposed Topanga beds are limited to the southwesterly corner of the area along a fault block where the formation is exposed for a mile in the channel of Arroyo Seco just north of the Raymond Fault and for about one and one-quarter miles easterly from the Arroyo Seco to Raymond Hill (RBMB, 2016).

The CDWR (1966) characterized the water-bearing formations of the Raymond Basin as alluvial fill having characteristics of the coarse deposits found in the small basins near the mountain margins. The deposits are coarsest at the base of the mountains where they contain boulders several feet in diameter, but even in the southerly part of the basin, cobbles, stones, and boulders are not uncommon. There are practically no true sand beds in the northerly part of Raymond Basin. The average sand content in the basin sediments as determined from well logs is only 2.8 percent. The deposits are characterized throughout by an abundance of weathered material. Decomposed yellowish gravels, clayey yellow and red gravels, and red or brown residual soil clays are the typical deposits.

The older alluvium found within the area is nearly continuous along the entire southerly flank of San Gabriel Range with little change in composition or structure. Within the Raymond Basin, it constitutes practically all of the water-bearing series and is not only dominant at the surface but appears to continue with depth to bedrock, although at depth, it may be in contact with some of the late Tertiary sediments. The older alluvial fill consists of a small portion of sand and almost equal proportions of gravel and clay. Older alluvial fill is of great thickness and its deposition has occurred through a long period. Weathering, disintegration, and cementation have been continuous and the results have varied with local conditions and there is considerable spatial variation in the water yielding characteristics of this formation (RBMB, 2016).

Recent alluvium occupies channels, washes, and flood plains of Arroyo Seco, Eaton Creek, and Big and Little Santa Anita Creeks, and to a lesser extent, exists as veneers scattered along the slope of the valley resulting from flood discharges of intermittent streams (Exhibits 13 and 14). For the most part, the recent alluvium is believed to be shallow, but in the upper portions of Little Santa Anita Wash, the indications are that the recent alluvium may extend to a depth of about 150 feet. These sediments are similar to those found in the older alluvium but contain a much smaller proportion of clay and are unconsolidated.

10.2.2 Structural Features and Faults

According to the CDWR (1943), the geologic structure of Raymond Basin is complicated. The rough surface topography of the Basement Complex outside the area indicates that the bedrock floor beneath the alluvium undulates, although the present mountain block undoubtedly exhibits a more rugged topography due to its recent rejuvenation with accompanying accentuation of erosive forces, then the old erosion surface was buried and protected by alluvial deposits of the area. However, within the area, except at the boundaries, and the granitic protrusions at Monk Hill and near the north end of Eaton Wash, there is no surface expression of undulations of bedrock which might indicate possible impediments to groundwater movement.

The San Gabriel Fault cuts through the central portion of San Gabriel Mountains and has an east-west trend. It is one of the main faults in the mountain block but is so distant that its effect upon the Raymond Basin area is only indirect (RBMB, 2016).

The Sierra Madre Fault system is a broad zone of faulting with an east-west trend roughly parallel to the southern edge of the San Gabriel Mountains, swinging to the northwest in the vicinity of the City of Sierra Madre. The main trace of this zone leaves the southern edge of the foothills at a

point west of the mouth of Eaton Wash, penetrating the mountain block in a north-westerly direction for some distance before it again swings to the west. The bedrock contours as a result of the geophysical survey indicate a uniform northerly slope of the buried bedrock surface from San Rafael Hills (RBMB, 2016).

Hydrogeologic investigations and groundwater modeling work at the Jet Propulsion Lab (JPL) (NASA, 2003) identified a thrust fault crossing Arroyo Seco just as Arroyo Seco enters the Raymond Basin. Preliminary work indicated that the fault was a partial barrier to groundwater flow.

The Raymond fault forms the boundary between the Raymond Basin and the Main San Gabriel Basin from the City of South Pasadena on the west to the City of Monrovia on the east. It is likely a thin, impervious gouge formed in alluvium because it creates a several hundred-foot difference in water level elevation in approximately 2,700 feet between Del Mar Well of California American Water Company and Well No. 3 of San Gabriel County Water District (RBMB, 2016). In addition to the difference in water level elevation, the barrier effect of the Raymond fault is indicated by the presence of artesian conditions during periods of high water levels, and by the creation of ponds and swampy areas north of the fault line. The Raymond fault appears to impede groundwater movement southward from the Raymond Basin into the Main San Gabriel Basin (RBMB, 2016).

10.3 WATER RESOURCES

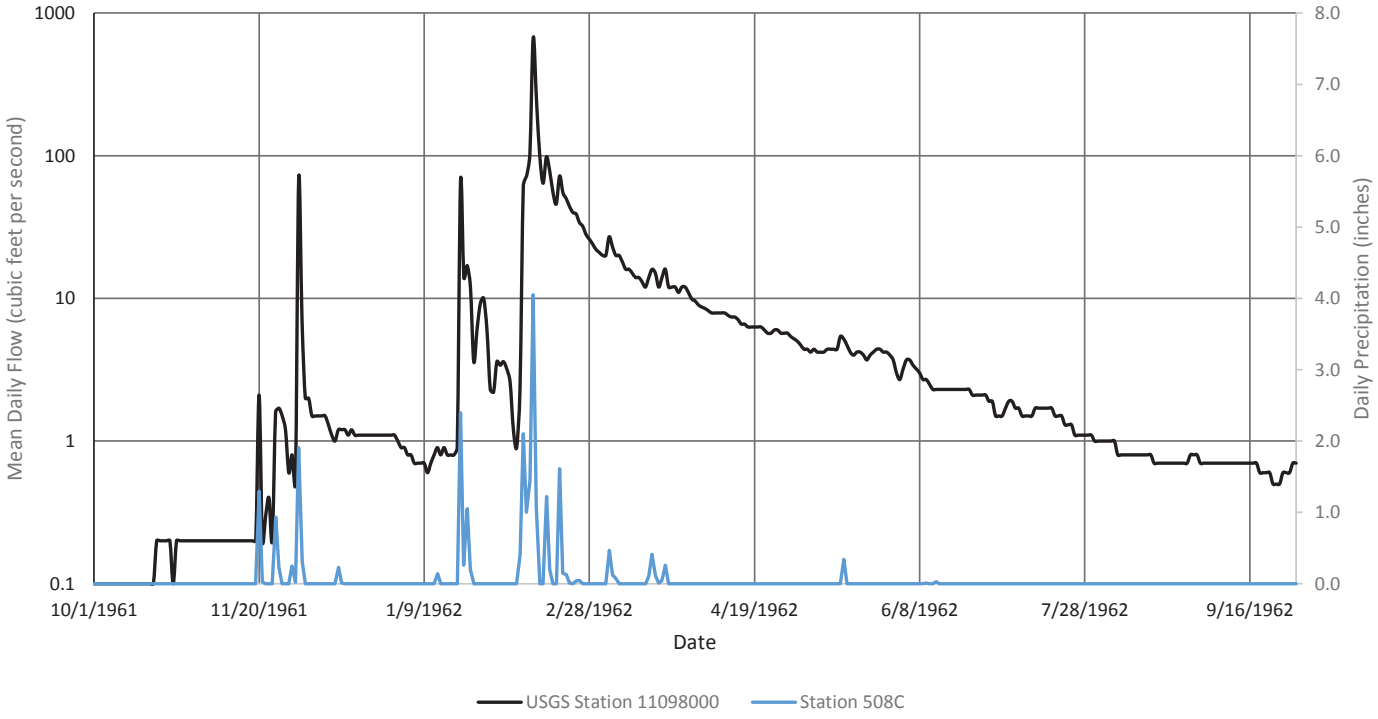
10.3.1 Precipitation

The Raymond Basin is located within a region of both semiarid and Mediterranean climate, with warm, dry summers and mild winters with intermittent rain. The majority of the annual rainfall occurs between December and March. Precipitation in the Arroyo Seco area has been monitored by a network of precipitation stations operated by Los Angeles County, Department of Public Works (LACDPW). Annual precipitation within the Raymond Basin is more variable in the mountain watershed than in the valley floor. The mountain watershed (28.40 inches) averages about 7 inches more annual precipitation than the valley floor (21.33 inches) (RBMB, 2016).

As previously indicated, RBMB (2016) conducted an evaluation of precipitation in both the mountain areas and the valley floor areas and noted about 7 inches of more precipitation in the mountain region. No existing operational precipitation gages are located in the upper portion of Arroyo Seco, however an historic gage was located at the Arroyo Seco Ranger Station (LA County gage 508C) and operated from 1914 to 1974 (see Exhibit 13). A comparison was made with LA County gage 175 (La Canada Irrigation District) to find an average year for precipitation during the same period that LA County gage 508C was operational. The period selected was October 1961 to September 1962 where LA County gage 175 recorded 26.00 inches (20-year average was 26.96 [as reported by RBMB, 2016]) and LA County gage 508C recorded 24.75 inches and is presented in Exhibit 15.

10.3.2 Surface Water

The entire Raymond Basin area lies within the watershed of the Los Angeles River (CDWR, 1966), and surface runoff from the San Gabriel Mountains enters the area through numerous streams, principally the Arroyo Seco, Eaton Wash, and Santa Anita Wash. About one-third of the surface runoff is conveyed by the Arroyo Seco, the largest of the streams, which flows across the Monk Hill Subarea and the Pasadena Subarea, and joins the Los Angeles River by cutting through the San Rafael Hills. Outflow from the western portion of the Monk Hill Subarea reaches the Los Angeles River through the Verdugo Wash. The balance of the surface runoff primarily flows in



Precipitation Reported from LA County Gage 508C

Exhibit 15

Arroyo Seco Diversion Hydraulics Analysis

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Eaton Wash and the Santa Anita Wash to the Rio Hondo and ultimately drains to the Los Angeles River.

The U.S. Geological Survey (USGS) maintains a surface water gaging station no. 11098000 and referred to as Arroyo Seco near Pasadena, CA (see Exhibit 13). Table 2 provides the mean monthly flow, measured by the USGS gage at the Arroyo Seco site.

TABLE 2
MONTHLY MEAN FLOW FOR ARROYO SECO NEAR PASADENA, CA
(USGS STATION NO. 11098000)

	Mean Monthly Flow (cubic feet per second)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1911				27.7	9.55	4.37	1.78	1.04	3.6	2.38	1.86	1.7
1912	1.9	1.5			15	9.94	2.77	0.565		0.694	0.66	0.642
1913	7.66			4.08	2.36	1.62	0.942	0.561	0.253	0.51	5.12	4.82
1914	131.9	343.8	46.8	16.9	9.18	5.62	2.23	1.52	1.77	1.58	0.667	12.9
1915	22.5	64.1	16.6	9.3	11.9	4.75	1.37	0.755	0.82	0.765	1.72	
1916				9.73	6.16	3.07	1.36	0.894	0.827	5.8	2.57	15.4
1917	12.9	25.5	16	7.05	5.25	2.02	0.59	0.365	0.14	0.213	0.54	0.89
1918	1.02	11.6	62.7	9.08	3.97	1.71	0.561	0.284	0.403	0.552	1.89	4.2
1919	1.54	6.18	6.22	2.19	1.77	0.69	0.1	0.1	0.24	0.639	0.91	4.47
1920	1.52	6.93	29.2	10.3	3.66	1.73	0.4	0.074	0.127	0.271	0.8	1.12
1921	4.85	3.11	12.2	2.94	17.7	6.89	1.7	0.242	0.2	0.326	0.427	132.4
1922	74.3	111.5	49.8	28.4	15.2	7.45	3.34	1.69	0.877	1.11	3.21	15.6
1923	5.37	9.23	5.78	7.03	3.04	1.74	0.413	0.268	0.273	0.358	0.543	0.784
1924	1	0.934	4.54	3.91	1.19	0.36	0.2	0.129	0.16	0.197	0.387	0.871
1925	0.813	1.08	1.8	10.2	1.43	0.843	0.1	0	0	0.171	0.253	1.02
1926	0.79	15.6	1.77	76.3	5.96	1.76	0.745	0.077	0	0	1.69	2.73
1927	2.11	75.3	18.9	9.23	4.72	2.44	0.713	0.1	0.1	0.271	1.27	3.74
1928	2.71	7.13	2.35	1.99	1.14	0.36	0.1	0.048	0.05	0.048	0.2	1.86
1929	1.69	3.1	5.63	8.53	1.31	0.59	0.081	0	0	0.048	0.07	0.139
1930	3.03	0.964	11	1.97	7.5	1.39	0.165	0.019	0.02	0.071	0.427	0.665
1931	1.62	13	1.42	4.49	2.35	0.907	0.045	0.019	0.01	0.061	0.473	9.47
1932	5.3	56.2	9.94	4.27	2.57	1.45	0.145	0.019	0.04	0.071	0.087	0.255
1933	22.5	10.9	5.68	3.14	2.1	0.943	0.181	0.019	0.02	0.1	0.06	7.36
1934	24.6	9.61	4.27	1.55	0.574	0.707	0.145	0.052	0.02	4.48	2.5	43.7
1935	26	15.9	10.5	30.6	8.6	3.77	1.67	1.37	0.28	0.468	0.903	1.29
1936	1.19	40	7.77	5.99	2.43	1.2	0.213	0.1	0.1	1.31	1.01	15.5
1937	19	63.7	54.1	25.7	10.9	5.64	2.31	1.1	0.757	0.858	1.26	3.82
1938	4.43	51.9	234.5	29.3	17	8.73	5.56	2.9	1.92	2.26	2	30.1
1939	8.98	7.05	8.79	4.84	3	1.64	0.926	0.539	7.33	3.09	1.51	1.75
1940	12.5	25.8	8.87	7.15	3.01	1.52	0.6	0.432	0.317	0.626	0.997	9.09
1941	5.35	126.9	132.5	91.5	30	13.4	7.44	4.58	3.59	3.64	3.39	7.88
1942	5.03	4.54	4.28	5.39	2.8	1.82	0.839	0.839	0.687	0.7	0.973	1.35
1943	123.2	65.2	107.1	24.4	12.6	7.65	4.41	3.47	2.19	2.32	2.35	12.9
1944	7.34	77.9	79	21.1	10.5	7.32	3.67	2.58	2.37	2.06	21.9	4.76
1945	3.67	26	16.3	10.8	5.39	3.61	1.93	1.21	0.907	1	1.54	20.8
1946	4.16	5.5	19.7	18.5	6.02	2.28	1.35	0.777	0.513	1.82	26.6	28.7
1947	16.1	7.31	5.99	4.56	2.65	1.93	1.15	0.558	0.567	0.706	0.77	1.81

TABLE 2
MONTHLY MEAN FLOW FOR ARROYO SECO NEAR PASADENA, CA
(USGS STATION NO. 11098000)

	Mean Monthly Flow (cubic feet per second)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1948	1.4	2.5	4.15	4.04	2.04	1.32	0.552	0.345	0.19	0.284	0.327	0.987
1949	3.35	3.49	5.89	2.16	2.29	1.25	0.465	0.245	0.18	0.226	1.53	3.41
1950	4.63	6.38	3.14	2.8	1.72	0.927	0.394	0.219	0.203	0.187	0.307	0.535
1951	1.3	1.5	1.47	1.55	1.12	0.613	0.194	0.148	0.137	0.245	1.4	9.58
1952	65.7	9.86	52.8	26.9	11.3	5.73	2.83	1.83	1.02	0.861	2.63	5.44
1953	5.76	2.03	2.12	1.96	1.45	1.12	0.59	0.248	0.317	0.265	0.31	0.506
1954	13.3	9.98	11.7	8.46	3.33	1.73	0.771	0.213	0.1	0.11	0.107	0.906
1955	5.57	2.99	3.46	2.09	4.38	1.12	0.368	0.029	0.023	0.087	0.183	0.897
1956	18.5	3.92	2.04	4.86	3.62	1.19	0.255	0.048	0	0.1	0.113	0.4
1957	3.65	4.23	4.03	1.93	4.1	0.81	0.077	0.019	0	0.155	0.627	8.64
1958	5.98	42.2	34.2	77.8	11.3	5.22	2.35	1.25	0.693	0.758	1.07	1.14
1959	3.38	14.7	2.89	1.96	1.21	0.413	0.081	0.023	0.053	0.097	0.277	0.777
1960	2.86	3.24	2.06	2.06	1.04	0.423	0.042	0.048	0.01	0.087	5.34	1.1
1961	2.12	1.4	1.16	0.69	0.503	0.35	0.152	0.1	0.127	0.126	0.48	3.6
1962	5.39	72.3	15.9	6.99	4.36	2.52	1.47	0.803	0.657	0.981	0.857	0.984
1963	1.18	11.2	3.81	4.59	3.25	2.25	0.803	0.426	0.46	0.813	2.25	0.994
1964	4.17	1.72	2.68	6.79	1.95	0.953	0.458	0.174	0.2	0.119	1.26	2.22
1965	1.7	1.44	1.27	21.8	3.59	2.05	0.752	0.384	0.66	0.674	97.4	55.6
1966	36.6	18.9	11.3	6.5	5.41	3.34	2.59	1.76	2.02	2.05	4.76	62.8
1967	29.6	19.3	43.5	51.2	31.9	15.8	9	6.25	4.57	3.56	25.2	10.2
1968	7.27	9.37	11.8	6.66	5.19	2.96	1.87	1.58	1.56	1.65	2.1	1.91
1969	251.1	249.4	115.6	33.2	16.2	13.4	10.7	6.18	4.74	5.28	5.74	5.06
1970	5.17	13.1	20.5	4.83	2.96	2.3	1.55	1.13	1.01	1.06	14.8	19.3
1971	9.67	7.44	6.86	5.22	4.15	2.86	1.56	1	0.834	1.17	1.7	10.5
1972	3.66	2.05	1.87	1.38	1.1	0.555	0.311	0.3	0.472	0.518	2.67	3.21
1973	7.14	59.6	36.1	13.1	7.28	4.73	2.29	1.5	1.33	1.51	3.56	2.49
1974	31.5	5.71	24	7.84	4.63	2.28	1.37	0.997	0.658	1.13	1.38	3.33
1975	1.83	3.91	18.2	8.16	4.19	1.9	0.849	0.491	0.304	0.481	0.754	0.865
1976	0.866	13.6	8.58	3.26	1.56	0.821	0.339	0.286	8.26	1.55	1.35	1.16
1977	8.72	2.24	2.02	1.32	9.72	1.65	0.475	0.351	0.22	0.25	0.347	11.7
1978	37.6	96.3	188.8	59	23.1	10.5	5.86	4.2	3.81	2.8	4.7	7.19
1979	19.7	20.3	15.2	21	7.71	4.24	2.34	1.22	1.4	2.26	2.01	1.95
1980	30.5	188.7	85.2	22.5	15.1	8.51	4.35	3.19	2.68	2.42	2.38	3.08
1981	7.65	4.14	12.3	4.48	2.87	1.47	0.529	0.388	0.374	0.662	2.28	1.91
1982	8.42	4.1	36.6	30.9	5.24	3.33	1.59	0.679	1.14	1.19	12.8	22
1983	28.5	61	210.7	59.5	48	19.2	10.4	7.7	7.03	8.54	8.56	14.8
1984	7.81	5.52	4.54	2.93	1.78	1.33	0.817	0.583	0.596	0.747	2.73	17.5
1985	5.67	4.92	4	2.48	1.73	0.905	0.341	0.227	0.304	0.384	5.08	3.33
1986	6.53	25.2	24.9	9.54	4.16	1.95	0.735	0.412	1.28	1.27	1.65	1.58
1987	2.8	2.49	3.22	1.49	0.744	0.429	0.247	0.122	0.136	3.01	7.68	5.23
1988	8.85	6.51	9.24	12.9	5.13	2	0.6	0.31	0.207	0.231	0.891	8.47
1989	3.45	10.8	3.41	1.47	1.02	0.686	0.238	0.165	0.197	0.191	0.288	0.405
1990	2.34	5.23	1.85	1.34	0.631	0.39	0.075	0.037	0.026	0.026	0.07	0.124

TABLE 2
MONTHLY MEAN FLOW FOR ARROYO SECO NEAR PASADENA, CA
(USGS STATION NO. 11098000)

	Mean Monthly Flow (cubic feet per second)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1991	0.575	5.7	34.2	10.7	2.93	1.31	1.22	0.605	0.354	0.272	0.534	2.69
1992	7.5	88.8	76.4	32.6	12.2	5.1	4.16	1.42	0.988	2.93	2.06	14.4
1993	181.3	190.5	71.5	27.3	15	10.1	5.92	4.22	2.56	2.28	2.71	3.75
1994	3.93	9.34	6.58	4.21	3.25	1.45	0.523	0.387	0.278	0.674	1.54	1.58
1995	86.4	46.3	101	28.6	14.4	9.31	4.16	1.87	2.12	1.68	1.84	2.34
1996	3.08	38.5	23.8	7.45	3.36	1.49	0.561	0.42	0.279	0.406	2.6	14.7
1997	22.4	12.4	5.45	2.89	1.13	1.35	0.426	0.322	0.277	0.285	1.54	4.69
1998	5.32	141.1	34.6	40.3	77.1	22.9	9.32	5.06	4.15	3.29	3.54	3.43
1999	3.9	5.61	3.59	5.69	2.61	1.9	0.704	0.393	0.303	0.313	0.494	0.804
2000	1.12	19.7	14.3	7.77	3.18	1.16	0.463	0.227	0.191	0.326	0.433	0.75
2001	3.43	19.9	19.1	6.81	2.35	0.913	0.328	0.189	0.117	0.144	0.39	1.15
2002	1.94	1.51	1.02	0.631	0.449	0.276	0.146	0.124	0.091	0.123	1.04	2.16
2003	1.23	10.8	8.91	6.56	5.61	1.9	0.4	0.183	0.093	0.099	0.234	1.95
2004	1.26	10.4	5.31	1.45	0.501	0.314	0.126	0.042	0.032	19.1	4.09	32.4
2005	268.1	191.7	64	23.4	15.4	8.56	4.76	2.46	2.08	3.35	2.86	2.79
2006	14.2	9.29	15.2	26.8	7.74	2.91	1.01	0.676	0.426	0.502	0.637	1.35
2007	1.43	2.06	1.64	1.12	0.563	0.292	0.256	0.193	0.223	0.311	0.234	1.57
2008	60.6	17.6	7.04	3.48	2.14	1.11	0.583	0.214	0.097	0.108	0.395	2.39
2009	1.72	18.9	4.02	1.99	0.974	0.894	0.301	0.126	0.346	0.98	3.23	10.8
2010	34.9	48.8	19.3	22.7	7.2	6.37	4.11	2.69	2.82	3.8	3.51	63.5
2011	29.3	22.6	45.8	36.3	16.1	10.4	5.96	4.11	3.24	4.31	3.8	3.47
2012	3.36	2.93	9.76	9.79	3.37	1.96	1.19	0.82	0.876	0.998	1.56	4.19
2013	3.31	3.27	3.19	1.4	1.47	0.89	0.616	0.439	0.349	0.391	0.43	0.96
2014	0.9	7.3	9.13	1.76	0.822	0.485	0.331	0.319	0.278	0.148	0.237	3.64
2015	2.2	3.27	1.15	0.505	0.846	0.463	7.43	0.335	0.391	0.38	0.352	0.642
2016	5.7	2.66	3.68	1.91	1.31	0.526	0.516	0.228	0.211	0.288	0.217	2.34
2017	28.4	27.3	8.84	4.34	3.48	0.993	0.481	0.177	0.124	0.172	0.216	0.327
Mean	19.6	31.6	25.8	13.3	6.8	3.3	1.7	1.0	1.0	1.3	3.4	8.6

Blank spaces are missing data.

Source: Derived from USGS, 2018.

The majority of the runoff occurs between December and May with the remainder of the period with average monthly flows generally less than 5 cubic feet per second (cfs). The maximum flow measured with the USGS gage, for the period of record (1911 through 2017), was 8,620 cfs (on March 2, 1938) (USGS, 2018). While the largest responses to flow generally occur from precipitation events, the stream maintains flows during non-rainfall periods indicating that it derives some of its flow from springs, groundwater inflow and other sources, such as storm drain outlets.

A comparison was made for an average precipitation period (see Precipitation section) with the daily mean streamflow for USGS station 11098000, Arroyo Seco near Pasadena, CA and presented in Exhibit 15. The comparison indicates the Arroyo Seco quickly responds to precipitation events in excess of 0.5 inches per day which occur between mid-October through February. By mid-March, the stream goes into a baseflow condition declining from 10-20 cfs to

approximately 1 cfs in late summer. This is probably related to the delayed discharge from the fractured bedrock groundwater discharging to the shallow alluvium found in the mountainous portion of Arroyo Seco.

10.3.3 Groundwater

The Raymond Basin is a structural basin filled with permeable alluvial deposits, which is underlain and surrounded by relatively impermeable rock. The Basin aquifer is stratified in some areas by confining or semi-confining layers consisting of impermeable or less-permeable materials such as clay or silt. In these areas, the Basin aquifer is an aquifer system that may include an unconfined or water-table aquifer overlying individual confined or artesian aquifers separated by semi-confining or confining layers. In general, the Basin aquifer is classified as an unconfined to semi-confined aquifer system because the semi-confining or confining layers are not continuous across the Basin (RBMB, 2016).

The base of the water bearing zones is considered bedrock with elevations ranging from approximately 500 feet below sea level to 2,000 feet above mean sea level. The Raymond Basin is divided into three separate hydrologic sub-areas: the Pasadena Subarea, the Santa Anita Subarea, and the Monk Hill Subarea (MHSA) (see Exhibit 16, Groundwater Subareas within the Raymond Groundwater Basin). The diversion point lies just outside of the MHSA while the spreading grounds lie just inside the eastern edge of the MHSA adjacent to the City of Pasadena production wells. Downgradient of the MHSA, groundwater elevations range from 500 to 900 feet above mean sea level (msl) and have a southern flow direction, which then curves to the southeast in the southern part of the basin. The direction of groundwater flow within the basin varies depending on the subarea. Estimates of regional hydraulic gradient range between 40 and 200 feet per mile (0.008- to 0.04-foot/foot) (RBMB, 1985). The total storage capacity of the Raymond Basin is estimated to be approximately 1.37 million acre feet (maf). The amount of water in storage in 2003 was approximately 800,000 af with an unused storage space of about 570,000 (RBMB, 2016).

The Raymond Groundwater Basin is an adjudicated groundwater basin managed by Raymond Basin Management Board. The adjudication (originally completed in 1944 and amended over the years) determined who had a right to extract water and the maximum annual amount of water allowed to be pumped by each producer. This “safe yield” concept allows an annual fixed amount of water to be used by the 16 water producers served by the Raymond Basin (RBMB, 2016 and 2018).

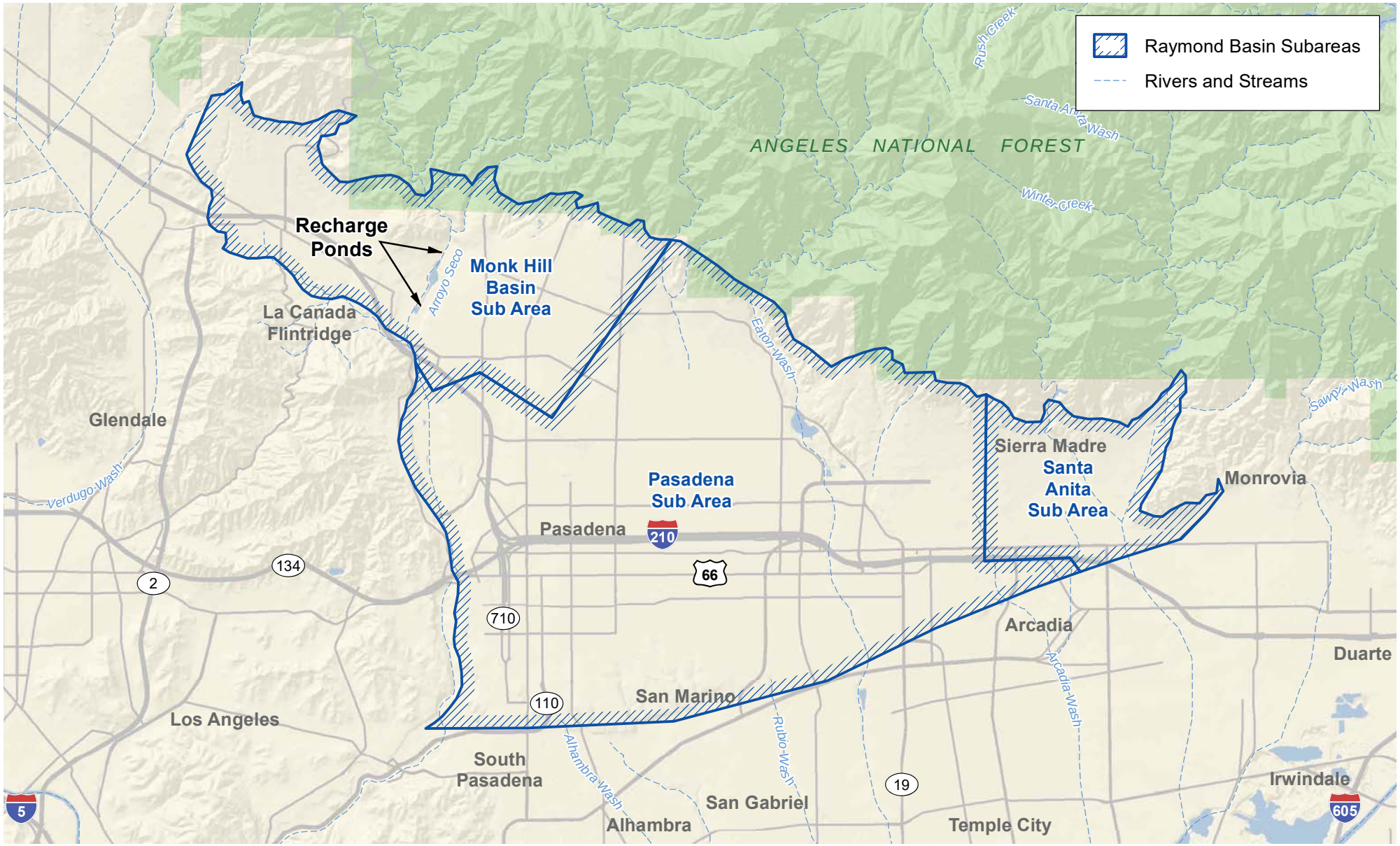
Groundwater Levels and Flow

Groundwater levels in the Raymond Basin range from about 350 feet above Mean Sea Level (MSL) in Santa Anita Subarea to more than 1,050 feet above MSL in the MHSA. Groundwater generally flows southeast from the MHSA in the northwest to the Raymond fault in the southeast (RBMB, 2016).

Monk Hill Subarea

Groundwater levels in the MHSA have fluctuated, but remained relatively stable since 2000 (RBMB, 2016). In general, groundwater flows from the MHSA into the Pasadena subarea (RBMB, 2016).

NASA (2003) reported that the water table elevation varies significantly over the JPL site, which is located immediately west of Arroyo Seco, by as much as 130 feet. The groundwater elevation high point was measured in MW-1, located at the mouth of the Arroyo Seco. The significant



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Groundwater Subareas within the Raymond Groundwater Basin

Exhibit 16

Arroyo Seco Diversion Hydraulics Analysis

N W E S

1.6 0.8 0 1.6 Miles

PSOMAS

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change in average hydraulic head between the monitoring wells located near the mouth of the Arroyo Seco and the monitoring wells to the southwest and west of the mouth of the Arroyo Seco. The change in flow regime across this area, significant difference in water levels over the relatively short distance, and lack of response of water levels near the mouth of the Arroyo Seco to pumping suggests the presence of either a very low conductivity area within the mouth of the Arroyo Seco or a hydraulic barrier that affects groundwater flow from this area (NASA, 2003).

Subsurface Flow

CDWR (1966) addresses subsurface inflow from the Raymond Basin into the Main Basin and states in part "…*Underflow into San Gabriel Valley across the Raymond fault varied from 2,000 to 12,000 acre-feet per year during the base period [from 1943-44 to 1959-60]. This subsurface flow did not occur at the same rate along the length of the fault, but varied from west to east. The lowest rates occurred near the western edge of the basin where the Raymond fault constitutes a nearly impervious barrier to groundwater movement, and the highest rates occurred near Santa Anita where the barrier effect is negligible. Estimates of underflow across the Raymond fault were based on values of groundwater gradients between water levels north of the fault."*

Monk Hill Subarea

Subsurface inflow from the Verdugo Basin into the MHSA has ranged from 890 acre-feet to 3,990 acre-feet over the period from 1994-95 to 2011-12. The long-term (31-year) average annual subsurface inflow has been 2,270 acre-feet. Subsurface outflow from the MHSA into the Pasadena Subarea has ranged from 5,750 acre-feet to 7,270 acre-feet over the period 1994-95 through 2011-12. The mean subsurface outflow to the Pasadena Subarea was 6,700 acre-feet (RBMB, 2016).

Groundwater Recharge

Monk Hill Subarea

Artificial recharge of the MHSA historically has occurred as a result of infiltration of stormwater runoff and, to a lesser degree, injection of treated imported water. Artificial recharge (through the spreading grounds) has ranged from 450 acre-feet to 9,700 acre-feet during the period of 1994-95 through 2011-12. Injection of treated imported water has ranged from zero acre-feet to 1,480 acre-feet during the period of 1994-95 through 2011-12. Average combined annual recharge from artificial recharge and injection has been 3,400 acre-feet (RBMB, 2016).

Accordingly, the diversion of water from Arroyo Seco north of the MHSA into the spreading grounds that are located inside of the MHSA has caused a mounding effect in the groundwater table in the MHSA (NASA, 2003).

10.4 GROUNDWATER CONCLUSIONS

Both surface water of Arroyo Seco and groundwater in the underlying alluvium of Arroyo Seco drainage north of the MHSA eventually discharge into the Monk Hill Subarea. The diversion of water upgradient of the MHSA from Arroyo Seco and placement into the Arroyo Seco spreading grounds (in the MHSA) adjacent to the existing Pasadena production wells is essentially assisting in the enhancement of groundwater replenishment and management of the Raymond Basin which is consistent with the requirements of the adjudicated Raymond Groundwater Basin. **As a result, it is unlikely that groundwater levels within close proximity of riparian resources would have any measurable effect on rootzones because of the relative depth of the groundwater.**

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ATTACHMENT A

TOPOGRAPHY

A link to allow download of this data can be provided upon request.

ATTACHMENT B

HEC-RAS MODELS

A link to allow download of this data can be provided upon request.

ATTACHMENT C

SAM MODELS

A link to allow download of this data can be provided upon request.

ATTACHMENT D

PRELIMINARY GEOLOGIC MAP OF THE LOS ANGELES QUAD

Preliminary Geologic Map of the Los Angeles 30’ x 60’ Quadrangle, California

Version 2.0

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INTRODUCTION

The Los Angeles 30’ x 60’ quadrangle covers approximately 5,000 km^2 including much of the densely populated urban and suburban areas of the southern California megalopolis. The quadrangle is about 90 km east-west and about 55 km north-south, extending from Fillmore and Thousand Oaks in the west to Acton in the northeast and Montebello in the southeast. It covers the urban San Gabriel Valley and San Gabriel Mountain foothill communities from Monrovia to Pasadena, as well as Glendale, downtown Los Angeles, Hollywood, Santa Monica, Malibu, and all the communities in the San Fernando Valley, Simi Valley, and the upper Santa Clara River Valley. Population of these urban and suburban areas, as listed in the 2000 Census, totals approximately 5.6 million, and property value is estimated to total hundreds of billions of dollars. The quadrangle also includes large areas of wilderness in the Angeles and Los Padres National Forests, the Santa Monica Mountains National Recreation Area, and the Sespe Condor Sanctuary. The relief in the quadrangle ranges from about a hundred meters subsea (in Santa Monica Bay) to more than 2,000 meters above sea level at Pacifico Mountain in the high San Gabriel Mountains. Residents and visitors are subject to potential hazards from earthquakes, debris flows and other landslides, floods, wildfires, subsidence from ground water and petroleum withdrawal, and swelling soils; and coastal areas are exposed to flooding and erosion by storm and tsunami waves. This geologic map is intended to illustrate the distribution of the rocks and surficial deposits of the area and their structural and stratigraphic relations to one another. It provides a regional geologic framework as an aid to better evaluations of the potential for hazard from active earth processes. As a digital product it includes some areas mapped in greater detail than others; however, it is not sufficiently detailed to serve as a basis for site-specific evaluations.

SOURCES OF GEOLOGIC MAPPING

The map has been compiled from many scientific studies in different parts of the quadrangle, and represents the work of many geologists. Compilation of the Los Angeles 30’ x 60’ quadrangle was completed by Yerkes and Campbell (2005) and published by the U.S. Geological Survey. That map, which can be considered version 1.0 of the digital geologic map of the Los Angeles 30’ x 60’ quadrangle, involved digitization of original field mapping, and digitization and assembly of numerous published and unpublished source geologic maps. This effort, led by Robert Yerkes between 1985 and completion of the map in 2005, provides a foundation for the additions and further refinement presented here.

This map, version 2.0 of the digital geologic map of the Los Angeles 30’ x 60’ quadrangle, represents an update of the map by Yerkes and Campbell with extensive revisions and additions. Many of these revisions and additions resulted from studies by the California Geological Survey to define Seismic Hazard Zones, where development must consider the potential hazards from liquefaction and earthquake-induced landslides. The listing of sources of geologic mapping below includes geologic maps that were used by Yerkes and Campbell (2005), additional geologic maps included in this compilation, and reports describing the liquefaction zoning and earthquake-induced landslide zoning for each quadrangle. Although the Seismic Hazard Zone Reports referenced below are focused on the details of delineation of the hazard zones, virtually all reports resulted in revised mapping of some geologic units. Revised mapping of younger Quaternary units, including the contact between late Quaternary alluvium and

bedrock, was a focus of the seismic hazard zoning effort because these contacts can define the boundaries of Liquefaction Hazard Zones. New mapping of Quaternary units was generally based on geomorphic expression, supplemented by descriptions of the subsurface materials in numerous boreholes from throughout the valley areas (Wills and Hitchcock, 1999, Hitchcock and others, 1999). Quaternary units are designated using the terminology of Matti and Cossette (2007).

The process of creating earthquake-induced landslide zoning resulted in compilation of bedrock units that in some cases differed from the compilation of Yerkes and Campbell (2005). This effort also included re-mapping of landslides for the region, except for areas within National Forests. In preparing this compilation, we have used the compilations from the Seismic Hazard Zonation Program, reconciled those with the source maps used by Yerkes and Campbell (2005), added additional detail based on source maps not used by either the Seismic Hazard Zonation Program or Yerkes and Campbell (2005) and added selected landslides mapped by the Seismic Hazard Zonation Program. Due to the scale of this map, most small landslides and all landslides considered "questionable" in the original landslide inventories are not shown. CGS landslide inventory maps, and related 1:24,000-scale maps, show a more complete depiction of landslides. Landslides that are too small to show on 1:24,000-scale maps can be hazardous and damaging, so no regional map should be used to evaluate the landslide hazard to a particular location or parcel.

In addition to revisions to geologic contacts based on the Seismic Hazard Zonation Program, this map includes extensive revisions to the crystalline bedrock of the San Gabriel Mountains. Yerkes and Campbell (2005) completed a generalized compilation of the San Gabriel Mountains. In their compilation, they modified the nomenclature of the basement rock units to conform with the IUGA Subcommission on Systematics of Igneous Rocks (Streckheisen, 1973), and to provide continuity with the compilation in the San Bernardino 30' x 60' quadrangle (Morton and Miller, 2003), which adjoins the Los Angeles 30' x 60' quadrangle on the east. They did not, however, attempt to reconcile the various more detailed maps of this area. For this compilation, we have attempted to use as much detailed original mapping as possible and describe the units in as much detail as possible. Where the detailed mapping and unit descriptions are from a single source, such as within the anorthosite complex described by Carter (1980, 1982), this map represents a complete, consistent interpretation. In other areas, detailed mapping and description of map units are lacking or are provided by different authors who had differing interpretations. In some cases, we have extended units described by one author based on contacts by another. Although the resulting compilation is more detailed than that by Yerkes and Campbell (2005), there are significant areas where map unit boundaries, descriptions, and correlations could be improved by new mapping.

In addition to the major updates noted above, CGS has updated numerous other local areas based on map sources not used in the map by Yerkes and Campbell (2005). These more local updates include new mapping of parts of the active Hollywood, San Cayetano, and Simi Faults, updates to mapping and stratigraphy of the Plio-Pleistocene sedimentary rocks of the Ventura basin (see Appendix A), and updates to the Tertiary units in the Soledad basin.

The major sources of mapping are listed below by the 7.5-minute quadrangles shown in Figure 1. Sources are underlined if they are a major source of geologic unit boundaries shown on this compilation, and in italics if they were not used in the compilation by Yerkes and Campbell (2005). Seismic Hazard

Zone (SHZ) Reports for each quadrangle are also listed, along with landslide inventory maps that resulted from the Seismic Hazard Zonation Program, which are published as part of the CGS Landslide Inventory Map Series (LSIM).

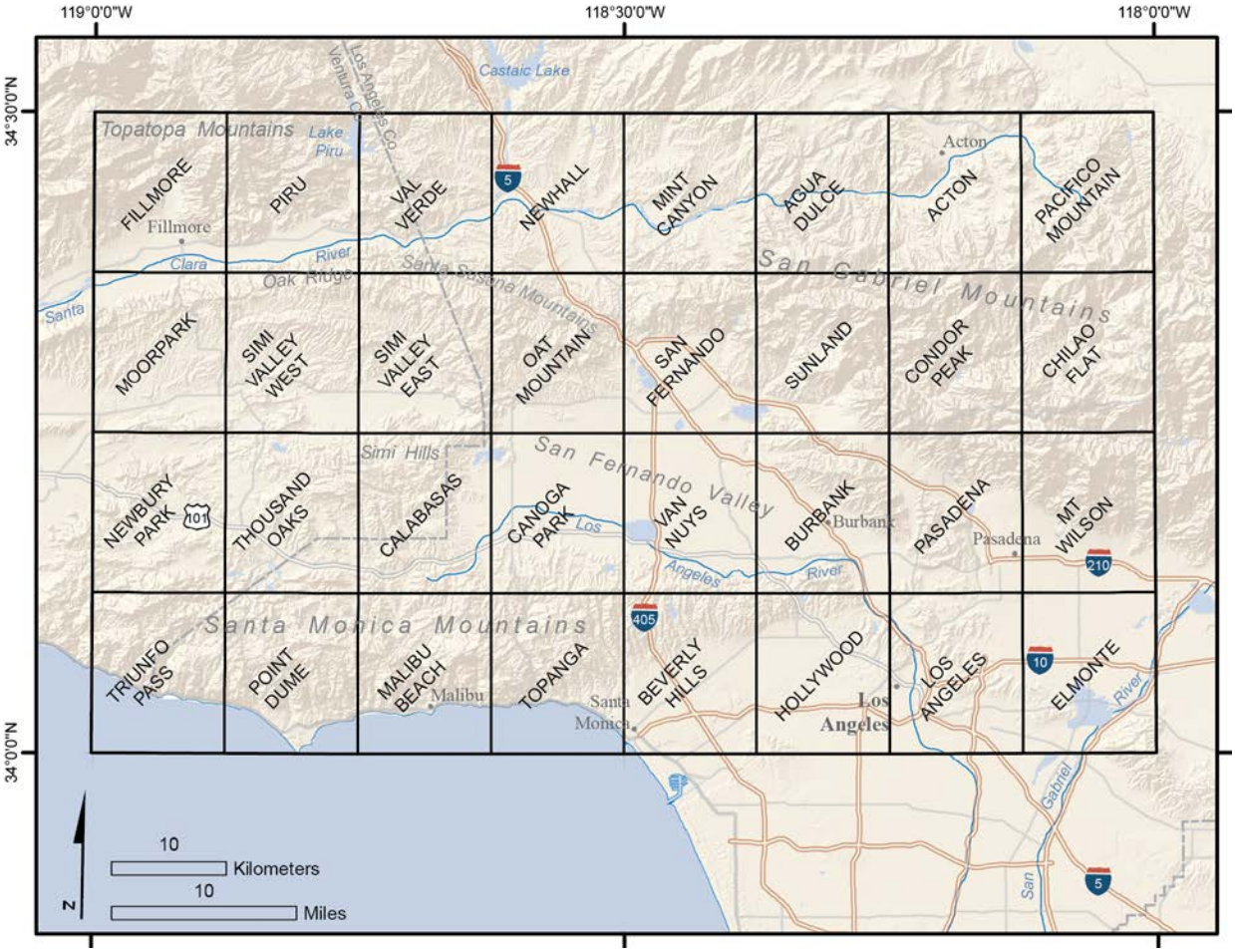


Figure 1. Index map of 7.5 minute quadrangles within the Los Angeles 30'x60' quadrangle.

Acton: Carter, 1980; *Dibblee, 1996a*; Ehlig, 1981; Jahns and Muehlberger, 1954; Morton and Streitz, 1969.
SHZ Reports: Mattison, and Hernandez, 2003a; Wilson, and Hernandez, 2003a, LSIM Series: Hernandez, 2006a.

Agua Dulce: Carter, 1980*; Dibblee, 1996b*; Jahns and Muehlberger, 1954; Morton and Streitz, 1969; Oakeshott, 1958.
SHZ Reports: Mattison and others 2003a; Wilson and others, 2003a; LSIM Series: Hernandez, 2006b.

Beverly Hills: *Dibblee, 1991a*; Hoots, 1931; Hsu and others, 1982; Poland, and others, 1959; Tinsley and others, 1985.
SHZ Reports: DeLisle 1998; Silva and Irvine, 1998a.

Burbank: Dibblee, 1991b, 1991e*; Hitchcock and Wills, 2000*; Hoots, 1931*; Jennings and Saul, 1969*; Lamar, 1970; *Neuerburg, 1953*; Weber, 1980.
SHZ Reports: Wills and Barrows, 1998a; Silva and others, 1998; LSIM Series: Treiman and Wills, 2013.

Calabasas: *Hitchcock and Wills, 2000*; Squires, 1983a; Weber, 1984; Yerkes and Showalter, 1993.
SHZ Reports: Wills and Barrows, 1997a; McCrink and others, 1997c.

Canoga Park: *Hitchcock and Wills, 2000*; Hoots, 1931; Soper, 1938; Weber and Frasse, 1984; Weber, 1983; Yeats and Shields, 1977b; Yerkes and Campbell, 1995a.
SHZ Reports: Wills and Barrows, 1997b; Silva and Irvine, 1997.

Chilao Flat: *Carter, 1980; Barth, unpublished; Dibblee, 2002a*; Ehlig, 1981; Powell and others, 1983; Morton and Streitz, 1969.

Condor Peak: *Carter, 1980*; Crook, and others, 1987*; Dibblee, 2002b*; Ehlig, 1981; Morton and Streitz, 1969*; Powell and others, 1983; Weber, 1982*.
SHZ Reports: Mattison and others, 2003b; Wilson and others, 2003b.

El Monte: Bullard and Lettis, 1993; Daviess and Woodford 1949; McCalpin 1988; Quarles, 1941; Tan, 1997; *Treiman, 1991*.
SHZ Reports: Loyd, 1998; Perez and others, 1998.

Fillmore: Bailey, 1951; *Dibblee, 1990a*; Cemen, 1977; Eschner, 1969; *Kahle, 1986*; Morton, 1972.
SHZ Reports: Loyd and Barrows, 2002a; Silva and others, 2002a.

Hollywood: *Dibblee, 1991a*; Hernandez and Treiman, 2014; Hoots, 1931; Hsu and others, 1982; Lamar, 1970; Neuerburg, 1953; Tinsley and others, 1985.
SHZ Reports: Mattison and Loyd, 1998a; Silva and Irvine, 1998b; LSIM Series: Irvine, 2013.

Los Angeles: Bullard and Lettis, 1993; Hsu and others, 1982; Lamar, 1970; *Land and others, 2004*; Tinsley and others, 1985.
SHZ Reports: Mattison and Loyd, 1998b; Silva and others, 1998.

Malibu Beach: Yerkes, and others, 1971; Yerkes and Campbell, 1980.
SHZ Reports: Woods, 2001a; Silva and Irvine, 2001a.

Mint Canyon: *Carter, 1980; Dibblee, 1996c*; Jacobson, 1990; Jahns and Muehlberger, 1954; Saul and Wootton, 1983; Saul, 1985; Weber, 1982.
SHZ Reports: Haydon, 1998; Wilson and Haydon, 1998.

Moorpark: *DeVecchio and others, 2012b; Irvine, 1995*; Weber, 1972*; William Lettis and Associates, 1999*.
SHZ Reports: Loyd, 2000a; Silva and Irvine, 2000a.

Mount Wilson: Bryant, 1978; Crook and others, 1987; Ehlig, 1981; McCalpin, 1988; Morton, 1973b; *Powell and others, 1983*; Saul, 1976.
SHZ Reports: Loyd and Wills, 1998; Wilson and Wills, 1998a; LSIM Series: Treiman and Wills, 2007a.

Newbury Park: *Dibblee and Ehrenspeck, 1990a*; Sonneman, 1975; Weber, 1972; Weber, 1984; Yerkes and Campbell, 1997b.
SHZ Reports: Loyd, 2002; Silva and Rosinski, 2002.

Newhall: Smith, 1984; Stitt, 1979*; Allan E. Seward Engineering Geology Inc., 2008, Treiman, 1986; Treiman 1987a*; Weber, 1982; Winterer and Durham, 1962.
SHZ Reports: Haydon and Barrows, 1997; Wilson and others, 1997.

Oat Mountain: *Dibblee 1992c*; Evans and Miller, 1978*; Hitchcock and Wills, 2000*; Saul, 1979*; Treiman, 1987b*; Winterer and Durham, 1962.
SHZ Reports: Wills and others, 1997; Schlosser and others, 1997.

Pacifico Mountain: *Barrows and others, 1985; Barth, unpublished*; Carter, 1980*; Dibblee, 2001*; Ehlig, 1981*; Ehlig, unpublished*; Jahns and Muehlberger, 1954; Morton and Streitz, 1969.
SHZ Reports: Mattison and Hernandez, 2003b; Wilson and Hernandez, 2003b.

Pasadena: *Byer, 1968*; Crook and others, 1987; Ehlig, P.L., 1981; Lamar, 1970; McCalpin, 1994(?); Morton and Streitz, 1969*; Powell and others, 1983*; Smith, 1982; Winterer and Durham, 1962.
SHZ Reports: Wills, 1998b; Wilson and Wills, 1998b; LSIM Series: Treiman and Wills, 2007b.

Piru: Huftile and Yeats, 1995; Morton, 1972; Olson, 2012.
SHZ Reports: Loyd and Barrows, 2002b; Silva and others, 2002b.

Point Dume: Campbell, and others, 1996.
SHZ Reports: Woods, 2001b; Silva and Irvine, 2001b.

San Fernando: Barrows, and others, 1974*; Hitchcock and Wills, 2000*; Oakeshott, 1958*; Oakeshott, unpublished*; Weber, 1982.
SHZ Reports: Wills, 1998c; Schlosser and Haydon, 1998a.

Simi Valley East: Butler, 1977*; Dibblee 1992d*; Hanson, 1981*; Haydon and Loyd, 1997; Irvine, 1990*; Squires, 1983a*; Treiman, 1998*; Weber, 1972; Winterer and Durham, 1962.
SHZ Reports: Haydon and Loyd, 1997; McCrink and others, 1997a.

Simi Valley West: *Dibblee 1992e*; Ehrenspeck, 1972; Hanson, 1981*; Haydon and Loyd, 1997; Irvine, 1990*; Ricketts and Whaley, 1975; Squires, 1983a*; Treiman, 1998*.
SHZ Reports: Haydon and Loyd, 1997; McCrink and others, 1997a.

Sunland: Barrows and others, 1974*; Carter, 1980; Hitchcock and Wills, 2000*; Oakeshott, 1958*; Oakeshott, unpublished; Smith, 1978*; Weber, 1982.
SHZ Reports: Wills, 1998d; Schlosser and Haydon, 1998b.

Thousand Oaks: Blackerby, 1965; Squires, 1983a; Weber, 1984; Yerkes and Campbell, 2005.
SHZ Reports: Loyd, 2000b; Silva and Irvine, 2000b.

Topanga: Hoots, 1931; McGill, 1989; Yerkes and Campbell, 1980; Yerkes and Campbell, 1995b.
SHZ Reports: Wills and McCrink, 1997; McCrink and others, 1997b.

Triunfo Pass: Guynes, 1959; Sonneman, 1975; Yerkes and Campbell, 2005.
SHZ Reports: Woods, 2002; Silva and Wiegers, 2002.

Val Verde: Barrows, 1986; Morton 1972*; Allan E. Seward Engineering Geology Inc., 2008*; Yeats and others, 1985.
SHZ Reports: Loyd and Barrows, 2002c; Silva and Hernandez, 2002.

Van Nuys: *Dibblee, 1991a, 1991d; Hitchcock and Wills, 2000*; Hoots, 1931; Tan, 1995.
SHZ Reports: Wills and Barrows, 1997c; Irvine and Silva, 1997.

THE TRANSVERSE RANGES AND THE SAN ANDREAS FAULT

Nearly all of the Los Angeles quadrangle lies within the south-central part of the Transverse Ranges geomorphic province, a band of west-trending mountain ranges and valleys, varying from 50 km to 130 km in width that extends about 400 km from Point Arguello on the west to the eastern San Bernardino Mountains on the east (Fig. 2). The east-west grain of the Transverse Ranges Province presents a stark and abrupt interruption of the general northwesterly trends of the Peninsular Ranges Province (including the California Continental Borderland) to the south and the northwesterly to northerly grain of the California Coast Ranges, the Great Valley, the Sierra Nevada, and the Mojave Provinces to the north. The southeastern corner of the Los Angeles quadrangle includes the northern part of the Los Angeles basin, which lies at the northern end of the Peninsular Ranges Province. The northwestern quarter of the Los Angeles quadrangle includes the eastern part of the Ventura basin and its southeastern extension, the San Fernando basin. These basins were the sites of very thick accumulations of marine sediments in the late Miocene and Pliocene. The southern boundary of Transverse Range structures is commonly placed at the Anacapa-Santa Monica-Hollywood-Raymond-Cucamonga zone of interconnected north-dipping thrust faults. West of Santa Monica, the southern limit of Transverse Range structures is the offshore Anacapa Fault, which lies a few kilometers south of the southern boundary of the quadrangle. Northwesterly trending faults in the Peninsular Ranges Province, such as the Newport-Inglewood zone, the Elsinore-Whittier Fault, and several faults in the offshore Continental Borderland, appear to be truncated by the east-west zone of interconnected faults, although the apparent step between the Hollywood and Santa Monica Fault zones along the projection of the Newport-Inglewood Fault suggests that the boundary has been modified locally.

The Transverse Ranges are a major anomaly embedded across the general grain of the North American Continent and, although middle Miocene and younger tectonism is responsible for much of the present rock distribution and physiographic relief, the distributions of different crystalline basement rocks, and their Cretaceous and Paleogene superjacent strata, suggest the influence of earlier tectonic episodes. The geologic history remains imperfectly understood, and many interpretations concerning specific aspects are actively disputed among earth scientists (e.g., Campbell and others, 1966; Dibblee and Ehrenspeck, 1993). The distinctive physiographic and structural characteristics of the provinces are superimposed on a preexisting framework of Proterozoic through early Cretaceous igneous and metamorphic basement rocks, which occur chiefly in fault-bounded blocks. This simple relationship has been modified in places so that rocks that are commonly associated with one province can be found in an adjacent province. For example, strata found south of the Malibu Coast Fault and west of the Newport-Inglewood zone of faulting and folding include probable Catalina Schist basement overlain by Miocene volcanics and Monterey facies sedimentary strata in a sequence best correlated with that of the Palos Verdes Peninsula-Santa Catalina Island area of the northern Peninsular Ranges. Although Catalina Island and the Palos Verdes Peninsula are dominated by northwesterly trending structures, and are included in the Peninsular Ranges Province, an east-trending band, bounded by the Malibu Coast Fault on the north and the offshore Anacapa-Santa Monica Fault, is characterized by east-trending folds and north-over-south thrust faults and, therefore, is included in the Transverse Ranges province. Some province-bounding faults take advantage of pre-existing structures in places, but not everywhere.

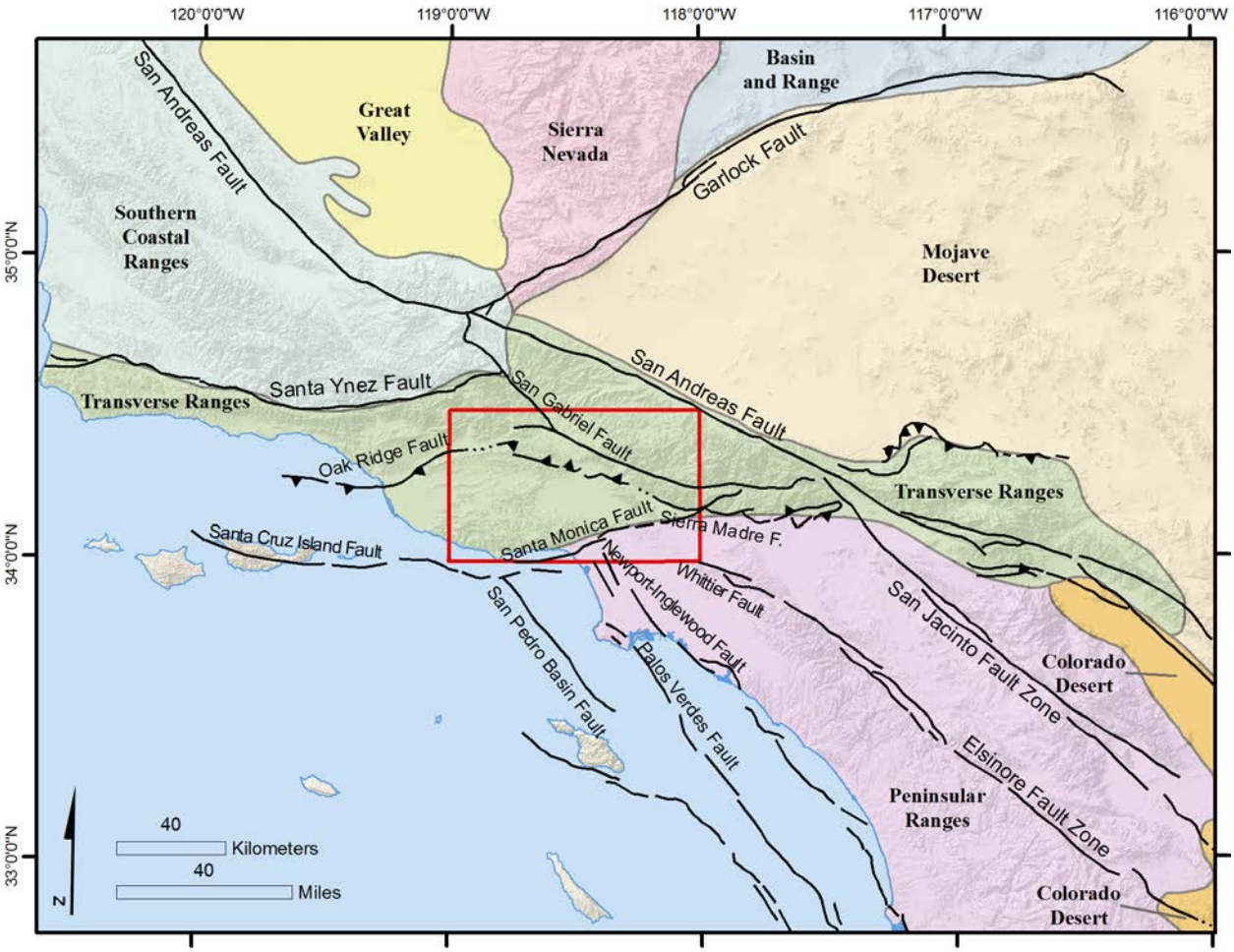


Figure 2. Area of the Los Angeles 30' x 60' quadrangle in reference to geomorphic provinces of southern California.

Major basement rock boundaries are not confined to the margins of the Transverse Ranges, but are also found within the province. For example, the northwest-trending Verdugo Fault separates the cratonic Precambrian to Cretaceous crystalline basement of the San Gabriel Mountains from the oceanic Jurassic metasedimentary basement of the Santa Monica Mountains. Similarly, the Raymond-Cucamonga segment of the southern frontal fault system of the Transverse Ranges approximates the boundary between the San Gabriel Mountains crystalline basement and the oceanic Jurassic basement in the Santa Ana Mountains (northern Peninsular Ranges). The Santa Monica Slate resembles similar Jurassic rocks in the Santa Ana Mountains. Although Jones and others (1976) note that sparse Jurassic fossils from the Santa Monica Mountains are younger than Jurassic fossils from the Santa Ana Mountains, both sections are very thick and represent millions of years of accumulation of pelitic sediment in abyssal to bathyal environments, and they are probably broadly correlative. This relatively simple pattern is further complicated by evidence that the cratonic rocks of the San Gabriel Mountains have been thrust over the Pelona Schist, for which the protolith is inferred to be Jurassic oceanic crust (Ehlig, 1981).

Many workers have attempted to reconstruct the rock distribution in the region as it was before the middle Miocene beginning of major structural deformation (e.g., Campbell and Yerkes, 1976; Crouch, 1979; Hornafius and others, 1986; Powell, 1993; Wright, 1991; Yeats, 2004) using recognized

translations and rotations of fault-bounded blocks. The paleomagnetic evidence that the western Transverse Ranges were rotated approximately 60 degrees clockwise in Miocene time (Kamerling and Luyendyk, 1979) should be kept in mind with regard to descriptions of pre-Pliocene sedimentary and structural trends. For example, northeasterly-trending faults that are truncated by the base of the Modelo and older units have been rotated from initial northwesterly orientations after their last movements. Similarly, north-trending shorelines and pinch-outs in Paleogene and Miocene strata (Yerkes and Campbell, 1976) have been rotated from westerly trends (McCulloh and others, 2002; McCulloh and Beyer, 2004). It seems logical that reconstruction should result in an unbroken western margin for the North American Continent that connects the rocks and structure to the north with those to the south of the Transverse Ranges. However, the pre-middle Miocene positions of individual fault blocks have not been comprehensively established. Partial reconstructions using extensive subsurface data, precise age dating, and well-established minimum fault movements and rotations have demonstrated the difficulty in accurately modeling the early Miocene margin of the North American continent (McCulloh and Beyer, 2004).

The San Andreas Fault crosses the Transverse Ranges Province with an east-southeasterly trend, in sharp contrast to its northwesterly trends to the north, in central California, and to the south, along the east side of the Salton Sea and the Imperial Valley. From Tejon Pass to Wrightwood, the San Andreas approximates the northern boundary of the Transverse Ranges (San Gabriel Mountains), and a short segment of the fault crosses the extreme northeastern corner of the Los Angeles quadrangle. Farther east it separates the San Gabriel Mountains from the San Bernardino Mountains, emerging from the south side of Cajon Pass to mark (approximately) the southern boundary of the Transverse Ranges (San Bernardino Mountains), and continues on that trend for another 45 km (approximately) southeasterly to the vicinity of North Palm Springs.

The presently recognized trace of the San Andreas Fault was probably not a single continuous fault before the end of the (Miocene-Pleistocene) tectonism that resulted in the modern Transverse Ranges Province. Some segments that are now connected show displacements that probably predate the late Miocene. The San Gabriel Fault probably was a major strand of the San Andreas in late Miocene through early Pliocene time that is now much less active (Crowell, 1952). The modern through-going San Andreas Fault consists of connected segments of varying ages and tectonic origins, and may be linked by fault segments that did not exist before the opening of the Gulf of California in the late Pliocene. Although the San Andreas Fault is seen only in the extreme northeast corner of the Los Angeles quadrangle, it is an important component of the geologic structure in the quadrangle, and is probably the principal control for the north-south compressive stress field presently imposed on the central Transverse Ranges. The ongoing deformation and associated earthquakes (Working Group on California Earthquake Probabilities, 2008) are generally considered to be the result of the northwest-trending right-lateral movement of the North American Plate relative to the Pacific Plate as constrained in upper crustal rocks by the geometry of the modern San Andreas Fault.

GEOLOGIC UNITS IN DEPOSITIONAL BASINS AND STRUCTURAL BLOCKS

The geologic map units are divided into several columns in the explanation and brief description of map units on the map sheet, reflecting different sequences of units in different depositional basins. The

units are arranged in a single sequence in the “Description of Map Units” below. The designations of different units in different areas is partly semantic; that is, different authors may have used different names for correlative strata in different parts of the quadrangle; or have used the same names for map units that may be only partly correlative. However, real differences in lithologic character are also represented by the use of different names for strata of correlative ages. We have not been able to identify all the map unit names that should be extended and those that should be restricted. However, it seems clear that the present distribution of rock units is the result of the convergence of tectonic elements of diverse geologic histories. The subdivision of the unit abbreviations and brief descriptions into different columns on the map sheet is our attempt to illustrate the spatial diversity as objectively as possible, while retaining the stratigraphic elements shared in common.

Rocks of the Transverse Ranges Province are subdivided into geographic areas where similar rock sequences are exposed, these geographic areas reflect, at least in part, fault-bounded structural blocks: (1) Topatopa Mountains and the eastern Santa Ynez Range, (2) Oak Ridge, Santa Susana Mountains, Simi Hills, and Santa Monica Mountains, (3) Castaic Valley-Soledad Canyon and western San Gabriel Mountains (Figure 3). The rocks of the northern Peninsular Ranges Province are described in a frame of two middle Miocene and older structural blocks: (1) eastern Los Angeles basin, and (2) western Los Angeles basin. Within the Oak Ridge, Santa Susana Mountains, Simi Hills, Santa Monica Mountains block, middle Miocene and older strata are described separately for the Santa Susana Mountains-Simi Hills area and the central and western Santa Monica Mountains, chiefly because of large changes in thickness of the Conejo Volcanics and nomenclatural differences that represent relatively minor facies changes in the middle Miocene and older rocks. In the central Santa Monica Mountains, the strata in the upper plate of the Malibu Bowl Detachment Fault include a number of tongues of the Conejo Volcanics that have not been specifically correlated with the lithologic subdivisions of that unit in the lower plate. The eastern and western Los Angeles basin blocks correspond to the Northwestern and Central structural blocks of Yerkes and others (1965).

The bedrock units of the area are commonly described in two principal groups: 1) Basement rocks – early Cretaceous and older, crystalline metamorphic and igneous rocks; and 2) The superjacent sequence of late Cretaceous and Tertiary strata. The greatest contrast in basement character is at the boundaries of the San Gabriel Mountains-Soledad basin block. The San Gabriel Mountains form a basement massif that includes components of Proterozoic, Paleozoic, and pre-middle-Cretaceous Mesozoic metamorphic and plutonic rocks. These are the oldest basement rocks in the Los Angeles quadrangle and appear to represent old continental crust at the western margin of the North American craton that has been thrust over Jurassic oceanic crust of a different metamorphic facies than is found in adjacent blocks. In the eastern Los Angeles basin, to the south of the San Gabriel Mountains, and in the Santa Monica Mountains, to the west of the San Gabriel Mountains, the basement rocks are metasedimentary and metavolcanic rocks of Jurassic age that were probably deposited on a Jurassic oceanic crust and accreted to the margin of the North American craton. They have been intruded by early Cretaceous granitic bodies of the same age as similar rocks in the San Gabriel Mountains, but the relationship between these granite bodies is not clear. The basement rocks of the western Los Angeles basin also are associated with a Jurassic oceanic crust; however, their metamorphic character is significantly different, including blueschist facies schists that represent metamorphism in a subduction zone. The basement in the Topatopa Mountains block is unknown, but in the Santa Ynez Mountains, a

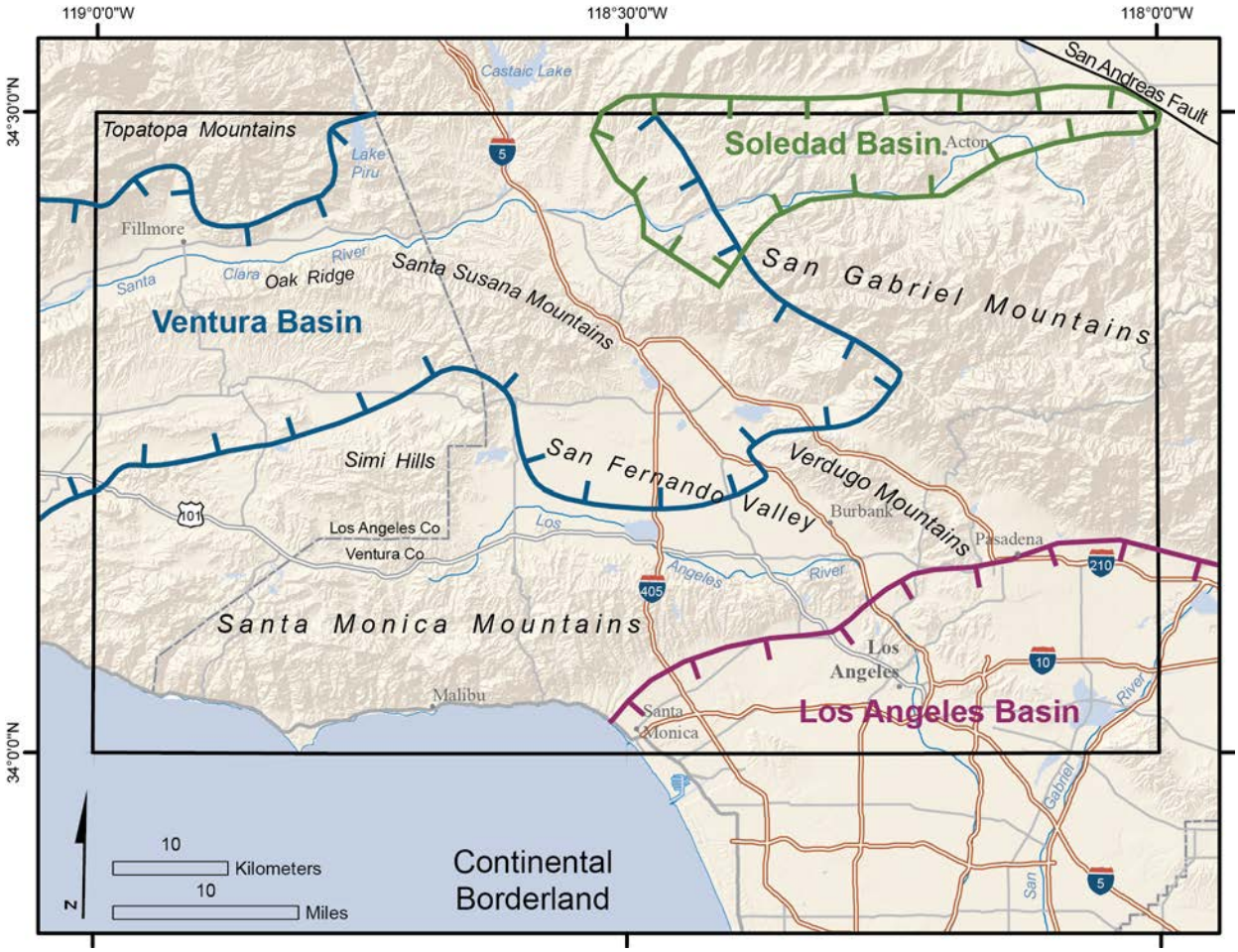


Figure 3. Principal late Tertiary to Quaternary depositional basins and upland areas where bedrock units are exposed within the Los Angeles 30'x60' quadrangle. The Soledad basin is represented by Miocene strata, which are truncated to the southwest by the San Gabriel Fault and subsequently overlapped by Pleistocene deposits of the Ventura basin; the Ventura and Los Angeles basin boundaries represent the limits of associated Pliocene and Pleistocene formations.

few miles to the west, the basement is Franciscan Formation, including schists very much like those of the western Los Angeles basin basement rocks.

The superjacent sequence consists of Upper Cretaceous and Tertiary sedimentary and volcanic strata that rest unconformably on the crystalline basement. The regional unconformity at the base of the Upper Cretaceous is expressed only in the central Santa Monica Mountains, where the Trabuco Formation overlies basement rocks. Another regional unconformity, at the base of the Paleogene section, can be seen in the western Santa Monica Mountains and the Simi Hills where the Simi Conglomerate overlies the Upper Cretaceous sequence. The middle Miocene disruption of the pre-middle Miocene sequence and the formation of more localized basins is expressed by more restricted unconformities at the bases of late-middle Miocene and younger strata and extreme variations in thickness of late Miocene and younger units.

DESCRIPTION OF MAP UNITS

The arrangement of map unit descriptions on the map sheet illustrates the correlation of map units among different depositional basins. The map area straddles two major physiographic provinces, the Transverse Ranges and the Peninsular Ranges, and the southwest margin includes rocks commonly associated with the Southern California Borderland. The modern provinces are largely the products of Neogene tectonics, volcanism, and sedimentation, but each province contains fault-bounded blocks of Paleogene and older rocks that correlate over a larger area.

Similarities and differences among rock units are incompletely reflected in the nomenclature and labeling of the rock units, which evolved from many geologic investigations over the past century. The majority of the units on this map have been adopted from the source maps used in compilation. Named Formations of sedimentary strata are made up of multiple episodes of individual depositional events and each event need not be distributed over exactly the same area. This can lead to significant differences in the age range of a rock stratigraphic unit from one area to another.

Map labels are abbreviations that indicate age and origin of surficial deposits, or age and formally recognized names of formations and members. Where stratigraphic assignment is tentative, a query (?) is added to the label in the database. Where informal subunits are represented by subscripted numbers, numbers increase with decreasing age (i.e., of subunits 1-4, 4 is the youngest and 1 is the oldest). Quaternary deposits are found in all provinces and subareas; however they are relatively local in extent, and deposits are commonly associated with distinctive geomorphic features such as fans, flood plains and terraces. For a complete listing of geologic units and the 7.5’ quadrangles on which they occur, refer to Appendix B.

af **Artificial fill (late Holocene)—**Deposits of sand silt and gravel resulting from human construction, mining or quarrying activities; includes compacted engineered and noncompacted nonengineered fill. Only large deposits are shown. Fills emplaced after source maps were completed are generally not shown.

Qa **Alluvium (late Holocene)**—Unconsolidated gravel, sand and silt in active or recently active floodplains, locally including related alluvial fans and streambeds where those are not mapped separately; chiefly stream deposited, but includes some debris-flow deposits. Locally corresponds with or encompasses areas of historic flooding, including deposits behind flood-control structures.

Qw **Wash deposits (late Holocene)**—Unconsolidated gravel, sand and silt in active or recently active streambeds; chiefly stream deposited, but includes some debris-flow deposits; episodes of bank-full stream flow are frequent enough to inhibit growth of vegetation.

Qb **Beach deposits (late Holocene)**—Loose fine- and medium-grained sand of active beaches chiefly between elevations of lower-low water and storm strands).

Qe **Eolian deposits (late Holocene)**—Loose, fine- to medium- grained sand, silty sand and silt; forms transitory dunes against beach-facing cliff.

Qf **Alluvial fan (Holocene)**—Unconsolidated bouldery, cobbly, gravelly, sandy, or silty alluvial deposits on active and recently active alluvial fans and in some connected headward channel segments.

Qls **Landslide deposits (Holocene and late Pleistocene?)**—Only selected landslide deposits shown on this map as described below. Deposits represent rock detritus from bedrock and surficial materials, broken in varying degrees from relatively coherent large blocks to disaggregated small fragments, deposited by landslide processes. Most deposits are Holocene, some dissected landslides may be as old as late Pleistocene. Landslide deposits shown on this map were compiled primarily from landslide inventories prepared by CGS for the Seismic Hazard Zonation Program. For this map, only landslides described as definite or probable and larger than 50,000 square meters are shown to preserve the clarity of the underlying bedrock geology. Selected historically active landslides between 10,000 and 50,000 square meters are shown, but no landslides smaller than 10,000 square meters are shown on this map. Exceptions to these rules include small or questionable landslides surrounded by larger probable or definite landslides.

Qya **Young alluvium, undivided (Holocene and late Pleistocene)**—Unconsolidated, generally friable, stream-deposited silt, sand and gravel on flood plains, locally including related alluvial fans and streambeds where those are not mapped separately. Deposits are clearly related to depositional processes that are still on-going. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qya_4 **Young alluvium, Unit 4 (Holocene)**—Youngest of as many as 4 subunits of Qya that can be distinguished in some areas.

Qya_3 **Young alluvium, Unit 3 (Holocene and late Pleistocene)**—Older young alluvium, older than Unit 4, younger than Unit 2.

Qya_2 **Young alluvium, Unit 2 (late Pleistocene)**—Older young alluvium, older than Unit 3, younger than Unit 1.

Qya_1 **Young alluvium, Unit 1 (late Pleistocene)**—Oldest young alluvium.

Qyf **Young fan deposits, undivided (Holocene and late Pleistocene)**—Unconsolidated gravel, sand and silt, bouldery along mountain fronts; deposited chiefly from flooding streams and debris flows. Deposits are clearly related to depositional processes that are still on-going. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qyf_5 **Young alluvial-fan deposits, Unit 5 (Holocene)**—Youngest of four subunits of Qyf that can be distinguished in some areas. Designated Qyf_5 because of continuity with young alluvial fan designated Qyf_5 on map of San Bernardino 30’x60’ quadrangle to east.

Qyf_3 **Young alluvial-fan deposits, Unit 3 (Holocene to late Pleistocene)**—Young fan deposits, older than Unit 5, younger than Unit 2.

Qyf_2 **Young alluvial-fan deposits, Unit 2 (Holocene to late Pleistocene)**—Older young fan deposits, older than Unit 3, younger than Unit 1.

Qyf_1 **Young alluvial-fan deposits, Unit 1 (Holocene to late Pleistocene)**—Oldest of as many as four subunits of Qyf that can be distinguished in some areas.

Qoa **Old alluvium undivided (late to middle Pleistocene)**—Unconsolidated to moderately indurated gravel, sand and silt deposited on flood plains, locally including related alluvial fans and streambeds where those are not mapped separately. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Surfaces may be dissected in varying degrees; and can show moderately to well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qoa_3 **Old alluvium, Unit 3 (late Pleistocene)**—Youngest of as many as three subunits of Qoa that can be distinguished in some areas.

Qoa_2 **Old alluvium, Unit 2 (late Pleistocene)**—Intermediate of as many as three subunits of Qoa that can be distinguished in some areas.

Qoa_1 **Old alluvium, Unit 1 (middle Pleistocene)**—Oldest of as many as three subunits of Qoa that can be distinguished in some areas.

Qof **Old fan deposits, undivided (late to middle Pleistocene)**—Slightly to moderately consolidated silt, sand and gravel deposits on alluvial fans. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Morphology of original alluvial fan surface usually well preserved, though dissected in varying degrees; surfaces can show moderately to well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qof_4 **Old fan deposits, Unit 4 (late Pleistocene)**—Youngest of as many as four subunits of Qof that can be distinguished in some areas.

Qof_3 **Old fan deposits, Unit 3 (late Pleistocene)**—Intermediate subunit of Qof that can be distinguished in some areas, older than Qof_4 and younger than Qof_2.

Qof_2 **Old fan deposits, Unit 2 (late Pleistocene)**—Intermediate subunit of Qof that can be distinguished in some areas, older than Qof_3 and younger than Qof_1.

Qof_1 **Old fan deposits, Unit 1 (late Pleistocene)**—Oldest of at least four subunits of Qof that can be distinguished in some areas.

Qoft **Alluvial fan deposits on wave-cut surface (late Pleistocene to Holocene)**—Unconsolidated to moderately indurated, clay, silt, sand, and angular gravel including clasts to boulder size; chiefly debris-flow deposits, but probably includes some stream-deposited material; surfaces can show slight to moderate pedogenic soil development. Overlies elevated wave-planed bedrock and marine terrace deposits along the coast.

Qom **Old shallow marine deposits on wave-cut surface (late Pleistocene)**—Unconsolidated (but with small areas locally calcite-cemented) sand, silty sand and gravel; commonly overlies wave-cut bedrock surfaces at two or more altitudes above present sea level; surfaces can show slight to moderate pedogenic soil development; locally carries molluscan fauna referred to the late Pleistocene (Addicott, 1964).

Qoab **Old alluvium and breccia (late Pleistocene to Holocene)**—Deposit of angular shale chips and colluvium derived from Modelo Fm. Mapped adjacent to San Fernando Fault, age relationships with other alluvial units unknown.

Qob **Old breccia, (late Pleistocene to Holocene)**—Fine to coarse sand with well-rounded pebble gravel and shale chips and colluvium derived from Modelo Fm. Mapped adjacent to San Fernando Fault, age relationships with other alluvial units unknown.

Qvoa **Very old alluvium, undivided (middle to early Pleistocene)**—Slightly to moderately consolidated silt, sand and gravel deposits. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Environment of deposition may include axial valley, floodplain or alluvial fan, but morphology of original deposit may not be preserved. Surfaces may be significantly dissected and show well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation.

$Qvoa_2$ **Very old alluvium, (middle to early Pleistocene)**—Younger subunit of Qvoa that can be distinguished in some areas.

$Qvoa_1$ **Very old alluvium, (middle to early Pleistocene)**—Older subunit of Qvoa that can be distinguished in some areas.

Qvof **Very old alluvial-fan deposits (middle to early Pleistocene)**—Slightly to moderately consolidated silt, sand and gravel deposits on alluvial fans. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Morphology of original alluvial fan surface preserved to some extent. Surfaces may be significantly dissected and show well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation.

$Qvof_2$ **Old alluvial-fan deposits, Unit 3 (late Pleistocene)**—Subunit of Qvof with distinct alluvial fan morphology, overlies and is therefore younger than $Qvoa_1$.

Qpa **Pacoima Formation (middle Pleistocene)**—Fanglomerate or sedimentary breccia with a dark-brown to reddish-brown clayey sand matrix; weakly indurated; crudely bedded; poorly sorted with angular, pebble- to boulder-size clasts composed primarily of crystalline rock locally derived from the San Gabriel Mountains, as described in the type area at the mouth of Pacoima Canyon. The Pacoima Formation exposed in the Mint Canyon quadrangle contains more rounded clasts than the type area and the color varies to light yellowish brown; farther west in the Newhall quadrangle the overall clast size decreases and clast composition varies as a result of facies changes associated with greater distance from the San Gabriel Mountain source area and influx of sedimentary clasts shed from the uplifting Santa Susana Mountains to the south (Treiman and Saul, 1986). The Pacoima Formation is an unconformity bounded unit deposited in the eastern Ventura basin that is typically gently inclined; distinguished from the underlying Saugus Formation by poorer bedding and sorting, clast angularity, and angular discordance in most areas; distinguished from younger terrace deposits and overlying older alluvium primarily by degree of erosion and weathering, and the occurrence of locally intense folding and faulting.

The maximum thickness is about 500 to 1,000 ft. (152 to 305 m). The Pacoima Formation was initially described by Oakeshott (1952) and subsequently mapped by Oakeshott (1958) and Barrows and others (1974) in the northern San Fernando Valley and south of the San Gabriel Fault in the eastern Santa Clarita Valley area. Saul (1979, 1990) and Saul and Wootton (1983) followed this usage in mapping of the Mint Canyon quadrangle, and Treiman (1986, 1987a) extended the formation into the Newhall quadrangle in place of older alluvial deposits mapped by Kew (1924) and Winterer and Durham (1962). The Pacoima Formation is younger than about 0.4 Ma based on the estimated youngest age of the underlying Saugus Formation studied in the Santa Clarita Valley by Levi and others (1986) and Treiman and Saul (1986) estimated that deposition of the Pacoima Formation was essentially completed by about 0.3 Ma.

Eastern Ventura Basin, including San Fernando Basin

QTs/Qs **Saugus Formation, undivided (late? Pleistocene to late Pliocene)**—Weakly to moderately cemented, medium- to coarse-grained, light-gray to yellowish-gray sandstone and pebble conglomerate and light greenish-gray sandy siltstone deposited in the Ventura basin; moderately sorted; commonly cross bedded and channeled; interbedded with moderate-brown to reddish-brown poorly sorted sandy mudstone and local claystone seams in the type area and other portions of the eastern Ventura basin, reflecting overbank deposits and paleosols; fluvial near the basin axis, transitioning to alluvial fan environment near the basin margins; interfingers with shallow marine sands to the west. The Saugus Formation is chiefly nonmarine as defined by Hershey (1902b) and Winterer and Durham (1962), but mapping compiled herein may locally include shallow marine interbeds. Transitional to brackish water deposits at the base of the section observed in the eastern Ventura basin are assigned to the Sunshine Ranch Member. This formation has a gradational to interfingering conformable contact with underlying shallow marine strata of the Pico Formation near the axis of the Ventura basin, but the contact is time transgressive and is progressively younger to the west. Near the basin margins, the base is unconformable with the Pico Formation and locally overlaps older strata and basement rock. The upper contact shows distinct angular discordance with the overlying Pacoima Formation in most areas, but discordance is more subtle west of Valencia and middle Pleistocene deposition in this area may be nearly continuous. The thickness varies greatly across the Ventura basin; Kew (1924) reports a thickness of 2,000 ft. (610 m) but Winterer and Durham (1962) report that up to 12,000 ft. (3,660 m) of Saugus strata were encountered in a well southeast of San Fernando Pass; a thickness of 2,000 m is reported in the western Ventura basin below the Santa Clara River, but DeVecchio and others (2012b) report a thickness of only 40 to 60 m in the Camarillo area near the southwest margin of the basin. In the eastern Ventura basin, the base of the Saugus is estimated at about 2.3 Ma west of Valencia and in the Mission Hills (Levi and Yeats, 1993) to about 2.6 Ma near Gold Canyon in the northern San Fernando Valley (Beyer and others, 2009). Unfossiliferous deltaic deposits mapped as Saugus in the Elsmere Canyon area by Dibblee (1991d, 1992c) and Squires (2012) may be significantly older based on their position below Sunshine Ranch strata and mapped interfingering relationships with older Pico and Towsley Formation strata. The top of the Saugus in the eastern Ventura basin is estimated at about 0.5 Ma by Levi and Yeats (1993) and is younger to the west. North

of Ventura, Lajoie and others (1982) report an age of 0.2 Ma in marine sands underlying the Saugus and an age of 85 ka in overlying marine terrace deposits. In the Moorpark area, Wagner and others (2007) report an age of 780 to 850 ka at a Mammoth fossil site. In the Camarillo and Las Posas Hills area, DeVecchio and others (2012a, 2012b) report that Saugus strata overlie marine sands as young as about 125 ka and may be as young as 25 ka south of the Camarillo Hills based on OSL dating. Based on reported ages, Saugus strata west of Fillmore and west of the Tapo Canyon area are considered post-Pliocene in age and therefore mapped as Qs rather than QTs. Clasts within the Saugus Formation are typically plutonic, metamorphic and volcanic rocks, derived primarily from the San Gabriel Mountains, and transported westward by the ancestral Santa Clara River; however, distinctive clast assemblages have locally been recognized and mapped as informal members or facies by various workers. These include upper Saugus (QTsu); volcaniclastic breccia-conglomerate (Qsv) and Camarillo member (Qsc); additional facies are defined by Weber (1982) in the Santa Clarita area based on the presence or absence of San Francisquito Formation sandstone, Pelona Schist, or anorthosite clasts. The Saugus Formation was initially defined by Hershey (1902b) as the "Saugus division" for continental strata exposed in railroad cuts east of Bouquet Junction near Saugus (type area). These deposits were subsequently lumped into the Fernando Formation by Eldridge and Arnold (1907). Kew (1923, 1924) formally adopted the term Saugus Formation for the upper section of the Fernando Group and extended usage into the western Ventura basin. Kew generally followed Hershey's nonmarine definition except that he also included underlying coarse-grained shallow marine deposits within the Saugus Formation. The unit was redefined and remapped by Winterer and Durham (1962) in the eastern Ventura basin, who reassigned most of the shallow marine strata to the Pico Formation, conforming to Hershey's nonmarine definition of the Saugus. This nonmarine definition has been adopted by most workers in the eastern Ventura basin (e.g. Saul, 1975, 1979; Weber, 1982; Yeats and others, 1985; Saul and Wootton, 1983; Treiman, 1986, 1987a; Dibblee Foundation maps; Squires and others, 2006; Squires, 2012). Maps covering areas south and west of the area mapped by Winterer and Durham commonly include marine deposits as part of the Saugus based on Kew's definition (e.g. Weber and others, 1973; White, 1985; Squires and White, 1983; Groves, 1991). The restricted usage of Winterer and Durham (1962) in the type area is adopted herein and shallow marine strata formerly assigned to the Saugus Formation in the Santa Susana Mountains and Oak Ridge located east of, and down section of, the Grimes deltaic unit (QTpg) are reassigned as an upper informal member of the Pico Formation (QTpcu) (see Appendix A for details). Nonmarine strata of similar age are mapped as the La Habra Formation in the Los Angeles basin (Eckis, 1934), and as the Casitas Formation in the Santa Barbara basin (Upson, 1951). Mapped members include:

QTsu **Saugus Formation, upper member (middle Pleistocene)**—On the south flank of the Santa Susana Mountains this unit consists of nonmarine sandstone and conglomerate with clasts composed primarily of shale and sandstone derived from the Modelo and Towsley Formations (Oat Mountain 7.5' quadrangle); the most representative section is at Horse Flats. This clast assemblage is interpreted to represent uplift, emergence and initial erosion of the Santa Susana Mountains, as described in Saul (1975), Shields (1977a), Saul (1979), and Levi and Yeats

(1993); Qt of Bishop (1950) and Jennings (1957). Strata mapped as upper Saugus west of Valencia and southwest of Castaic Junction consist of moderately sorted, yellowish-gray to light yellowish-brown sandstone, conglomerate and silty sandstone, and poorly sorted sandy mudstone beds; the conglomerate beds also contain clasts derived from the Santa Susana Mountains; less lithified and sorted than underlying Saugus Formation strata. Most of this section was assigned to the Saugus Formation by Winterer and Durham (1962) and by Dibblee (1996d), but was assigned to the Pacoima Formation by Treiman (1986). This unit appears to be a transitional facies between the two formations, both structurally and lithologically; angular discordance with the underlying Saugus varies from locally distinct along the southeastern portion of the contact, where it coincides with a monoclinal warp, to negligible to the northwest at the Santa Clara River. The contact with the overlying Pacoima Formation is a subtle angular unconformity or disconformity. This unit may correlate with the upper Saugus strata on the south flank of the Santa Susana Mountains based on the appearance of clasts derived from the newly emergent Santa Susana Mountains.

Qsc **Saugus Formation, Camarillo member (late Pleistocene)**—Thickly bedded, reddish, pebble-bearing siltstone; paleosols with carbonate-cemented rhizoliths common; clasts are dominantly composed of locally derived Miocene shale and volcanic clasts, with subordinate granitic and metamorphic clasts. Defined informally by DeVecchio and others (2012b) for their chronostratigraphic units Qs_2 and Qs_3 exposed in the Camarillo and Las Posas Hills area; locally derived clast assemblage distinguishes this member from older sections of the Saugus Formation to the north and is interpreted by DeVecchio and others (2012b) to indicate that uplift of South Mountain and Oak Ridge had diverted the ancestral Santa Clara River to the north, thereby preventing crystalline clasts derived from the San Gabriel Mountains from reaching this area; DeVecchio and others (2012b) report IRSL dates of 78 ± 6 ka to 125 ± 9 ka for this member; thickness 40 to 60 m.

Qsv **Saugus Formation, volcaniclastic breccia-conglomerate (Pleistocene)**—Massive to crudely bedded, breccia-conglomerate composed of angular to subrounded, pebble- to boulder-size, weathered and fresh clasts of Conejo Volcanics in a poorly consolidated matrix of caliche, clay, silt and sand. Amount of matrix material is variable; some exposures consist only of angular, monolithologic volcanic clasts coated with caliche and contain little or no other matrix material. Previously mapped as part of the Conejo Volcanics. May represent remnants of debris shed from Conejo Volcanics highland into local basin during deposition of Saugus Formation (T. F. Blake, pers. com., 1993). (Dibblee, 1992a and 1992b; Irvine, 1995).

QTsg **Saugus Formation, conglomerate (early Pleistocene)**—Conglomerate mapped at the base of the formation. Clasts are predominantly crystalline igneous and metamorphic rocks recognizable as presently exposed in the northwestern San Gabriel Mountains. (Saul and Wootton, 1983).

QTsr **Saugus Formation, Sunshine Ranch Member, undivided (early Pleistocene to late Pliocene)**—Sulfur-yellow to light-brown and light-gray sandstone, conglomerate and silty sandstone, greenish-gray sandy siltstone and mudstone, and local limestone beds; sandstone and conglomerate commonly cross bedded or channeled; considered primarily paralic

nonmarine or transitional brackish lagoon or estuary deposits with local interfingering marine beds; the greenish-gray fine-grained interbeds are considered the most characteristic lithologic type of the member (exposed in the Oat Mountain, San Fernando, Newhall, and Mint Canyon 7.5' quadrangles). The thickness of the Sunshine Ranch Member is estimated to be about 3,000 ft. (915 m) in the type area. This member is primarily late Pliocene in age based on fossil horse teeth, but likely early Pleistocene in part based on revised time scale of Gibbard and others (2010). It was initially named informally by Hazzard (1940) in an unpublished report as the "Sunshine Ranch formation" for distinctive transitional strata at Sunshine Ranch in the Mission Hills area of the northern San Fernando Valley. Oakeshott (1950, 1958) published formal descriptions and mapping of this unit, which he assigned as an upper member of the Pico Formation; subsequently reassigned as a lower member of the Saugus Formation by Winterer and Durham (1958, 1962) and this usage has been adopted by most subsequent workers in the area (e.g. Barrows and others, 1974; Saul, 1975; Treiman 1987b; Dibblee Foundation maps); Saul and Wootton (1983) excluded all fossiliferous marine beds and subdivided the Sunshine Ranch into an upper and lower facies. Diagnostic greenish-gray mudstone and peaty siltstone occur locally in the lower Saugus Formation south and east of Newhall, leading Treiman (1987b) and Dibblee (1991d, 1992c) to map these outcrops as the Sunshine Ranch Member. The diagnostic beds are uncommon and laterally discontinuous, however. Winterer and Durham (1962) concluded that it is not practical to delineate this member in this area. These possible areas of the Sunshine Ranch Member are shown as queried.

QTsru **Saugus Formation, Sunshine Ranch Member, upper facies**—Nonmarine, poorly consolidated grayish-green clayey sandy siltstone and mudstone, light-brown silty sandstone, light-gray to yellowish-gray pebbly arkosic sandstone and sandy conglomerate, and thin beds of white sandy and nodular limestone; thickness as much as 300 m. Saul and Wootton (1983) note that this facies best characterizes the member and is mapped by them north of the San Gabriel Fault (southwest part of Mint Canyon 7.5' quadrangle).

QTsrl **Saugus Formation, Sunshine Ranch Member, lower facies**—Nonmarine sulfur-yellow, brown or gray arkosic sandstone, silty sandstone, pebbly sandstone, and conglomerate (Saul and Wooton, 1983); thickness about 120 m; occurs on both sides of the San Gabriel Fault (southwest part of Mint Canyon 7.5' quadrangle).

QTse **Saugus Formation, Elsmere Canyon delta plain facies (Pliocene)**—Sandstone and conglomerate with subordinate siltstone and sandy siltstone interbeds; typically weathers light gray and gray to light greenish gray but is locally brown on fresh surfaces due to oil impregnation; light-brown to brown iron-oxide staining locally common; clasts pebble to local boulder size, subrounded to rounded, and composed primarily of crystalline rock derived from the adjacent San Gabriel Mountains; small-scale, low-angle to larger-scale trough cross bedding and channels with erosive bases common (Squires, 2012); foreset beds locally apparent; commonly forms resistant exposures and cliffs in the Elsmere Canyon area; over 450 m thick. Squires (2012) interprets this unit as a braid delta where a braided river flowing from the ancestral San Gabriel Mountains entered the ocean; strata in the Elsmere Canyon area are interpreted as braided river deposits on the delta plain that interfinger to the southwest with

delta front and offshore marine deposits of the Pico and Towsley Formations west and south of the Antelope Valley (14) Freeway. This facies may interfinger with Sunshine Ranch-like mudstone beds northeast of Whitney Canyon and is overlain to the northwest by possible Sunshine Ranch member strata per Treiman (1987b). Squires (2012) notes a possible marine transgression at the top of this unit. This section previously mapped as Pico Formation by Winterer and Durham (1962) and Treiman (1987b), but assigned to the Saugus Formation by Dibblee (1991d, 1992c) and by Squires (2012) based primarily on the lack of marine fossils. This unit is assigned here to the Saugus Formation following the definitions of Winterer and Durham (1962) based on the lack of marine fossils and interpreted nonmarine depositional environment (Squires, 2012); however, differentiation of the lateral transition from marine to nonmarine aspects of the delta is problematic in this area and some unfossiliferous marine delta front deposits may be included west of Highway 14. This facies is mapped because of the unique combination of its nonmarine character and stratigraphic position below Sunshine Ranch member strata; based on this position and interfingering relationships with the Pico and possibly even the Towsley Formations, this unit is likely entirely Pliocene in age.

Qlp **Las Posas Formation (middle to late early Pleistocene)**—Shallow marine, light-gray to light yellowish-gray, fine- to locally coarse-grained sandstone, silty sandstone and pebbly sandstone with greenish-gray mudstone and subordinate conglomerate interbeds in the type area; invertebrate fossils and bivalve-dominated hash beds locally common; sands commonly quartz rich; pebbles composed of well-rounded plutonic, metamorphic and volcanic clasts derived primarily from the San Gabriel Mountains; moderately well sorted; medium bedded to locally laminated; poorly cemented. The Las Posas Formation crops out on either side of the Las Posas Valley in the Las Posas Hills and on the south side of South Mountain/Oak Ridge west of Long Canyon, and west of Fillmore on the north side of the Santa Clara River (western Ventura basin). A prominent basal conglomerate is commonly present in the South Mountain area (Lung, 1958) and northwest of the Santa Clara River at Adams Canyon (basal Saugus of Driver, 1928; Irvine, unpublished mapping 1991). It overlies or interfingers with the Mudpit shale north of the Santa Clara River. In the South Mountain area, it conformably overlies or locally interfingers with upper Pico Formation siltstone and is distinguished from older shallow marine strata of the upper Pico Formation (QTpcu) to the east by its stratigraphic position above the Grimes Canyon deltaic unit (QTpg), whereas QTpcu is generally below QTpg; to the south, it unconformably overlies the Sespe Formation and Conejo Volcanics in the Las Posas Hills. The Las Posas Formation is up to 300 m thick below Las Posas Valley (Dibblee, 1992g). Its age is estimated at 450 ka to 750 ka based on amino acid racemization (Wehmiller, 2010 in DeVecchio and others, 2012b), but DeVecchio and others (2012b) report an OSL date of 141 ± 10 ka near the base of the section in the Las Posas Hills. Sarna-Wojcicki and others (1984) estimate the base of the shallow marine sands (their “San Pedro”) is at about 1.0 Ma in the South Mountain area, but also report an age of about 0.4 Ma in the Ventura area. This unit was originally mapped as Fernando Formation by McLaughlin and Waring (1914) after the definition of Eldridge and Arnold (1907) and subsequently assigned to the Saugus Formation by Kew (1924). The Las Posas “formation” was coined by Pressler (1929) for sands in the Las Posas Hills type area, and nearby South Mountain, Oak Ridge and Camarillo Hills that are

stratigraphically above the “Santa Barbara horizon” and contain warm water “Saugus” fauna of Kew (1924) and Waterfall (1929). Pressler subdivided this unit into a lower Kalorama member (which Bailey, 1935 subsequently included in his Santa Barbara Formation) and an upper Long Canyon member. Subsequent workers referred to this section either as a marine member of the Saugus following Kew, 1924 (e.g. Pasta, 1958; Lung, 1958; Jakes, 1979), as the San Pedro Formation (e.g. Grant and Gale, 1931; Bailey, 1943, 1951;State Water Resources Board, 1953; Weber and others, 1973), or as the Las Posas Sand or Formation (e.g. Dibblee Foundation Maps; DeVecchio and others, 2012a and b); the term Las Posas Formation is adopted because the term San Pedro is restricted to the Los Angeles basin and the term Saugus Formation is restricted to nonmarine deposits following the original definitions of Hershey (1902b) and Winterer and Durham (1962).

Los Angeles Basin

Qsp **San Pedro Formation (middle Pleistocene)**—Unconsolidated sand with local gravelly sand, silty sand and silt interbeds; shallow marine invertebrate fossils common. Woodring and others (1946) report a maximum stratigraphic thickness of about 300 ft. (90 m). The San Pedro Formation has an estimated age range of 200 to 500 ka, as summarized in Jacobs, (2007). The San Pedro Formation was defined at San Pedro Hill (Palos Verdes Peninsula) and extended to other portions of the Los Angeles basin. Fossils were noted at San Pedro Hill by early workers (e.g. Trask, 1855b; Lawson, 1893) but Dall (1898) is credited as the first to use the term “San Pedro beds” (Wilmarth, 1938). Arnold and Arnold (1902) and Arnold (1903) distinguished a “lower” and “upper” San Pedro series and the “lower series” was subsequently assigned the name San Pedro “formation” by Kew *in* Tieje (1926). Terminology for the San Pedro Formation was formalized by Woodring and others (1946) and their usage is adopted herein. This term was extended into the subsurface by Poland and others (1956, 1959) and additional background is summarized by Powell and Ponti (2007). The term San Pedro has also been extended by some workers in the past to granular Pleistocene strata in the western Ventura basin based on molluscan fauna (e.g. Grant and Gale, 1931; Bailey, 1935); however, this extended usage is not used here, as suggested by Ponti (pers. comm., 2012), based on the presence of an intervening depositional basin boundary.

Qi **Inglewood Formation (early Pleistocene)**—Shallow marine, well-consolidated clay-siltstone and interbedded very fine-grained sandstone, commonly with calcareous, limonitic concretions; relatively dense and moderately expansive where weathered. This unit is now recognized as one from which most of the landslides in the Baldwin Hills are derived (Hsu and others, 1982).

QTms **Sedimentary rocks of the Pacific Palisades area (early Pleistocene to late Pliocene)**—A few small exposures of marine siltstone and very fine-grained silty sandstone; very soft and slightly indurated, locally very fossiliferous, fossils referred to the late Pliocene or early Pleistocene; maximum thickness about 120 m (Hoots, 1931; McGill, 1989).

Soledad Basin and San Andreas Fault Zone

QTjh **Juniper Hills Formation (early Pleistocene to late Pliocene) undifferentiated**—Pink, buff', light-brown, or red, pebbly to cobbly, coarse, arkosic sandstone, silty sandstone, lesser conglomerate, and thin-bedded shale. Mapped by Barrows and others (1985) in the San Andreas Fault zone. Sandstone and conglomerate represent fluvial and other continental deposits. Sandstone is poorly to moderately indurated, typically well bedded and poorly sorted. Clasts are sub-angular to well-rounded and include abundant yellow-brown sandstone and a variety of very well-rounded. tough metavolcanic cobbles recycled from the San Francisquito Fm.; abundant volcanic rocks probably recycled from the Punchbowl fm.; leucocratic granitic rocks; silver, gray and spotted Pelona Schist; ferruginous syenite; and medium- to coarse-grained blue-Quartz granite and leucogneiss. This unit is typically folded and internally deformed.

QTjhc **Juniper Hills Formation (early Pleistocene to late Pliocene) Clay shale member**—Greenish-gray, light brown, and black silty clay shale with very thin maroon sandstone layers. Mapped by Barrows and others (1985) in San Andreas Fault zone. Shale is thin-bedded, gypsiferous, with local iron oxide stained bedding. Also contains minor beds of finely laminated gray- to light grayish-brown silty sandstone, white arkose, and white chalky calcareous beds. Clay shale member probably represents lake deposits that are interbedded with other continental deposits. This unit is typically folded and internally deformed. Clay rich units are locally expansive with typical “popcorn” weathering.

QTjhr **Juniper Hills Formation (early Pleistocene to late Pliocene) Red arkose member**—Red to dark-red pebbly arkose and minor white and gray silty sandstone. Localized along Northern Nadeau Fault and is stained, deformed, crushed, and contains fractured clasts. Clasts are predominantly subrounded, light-colored granitic rocks and lesser varicolored volcanic rocks. Strongly resembles Punchbowl Fm. and may have been derived exclusively from a Punchbowl terrane.

QTjhm **Juniper Hills Formation (early Pleistocene to late Pliocene) Mixed clast member**—White to buff, coarse, poorly sorted and locally chaotic, pebbly, arkosic sandstone· and angular cobble to boulder conglomerate with abundant, rounded, leucocratic granitic-rock cobbles; subangular to subrounded clasts of gray mica schist, thinly laminated quartzite, and white quartz from Pelona Schist; yellowish rusty-brown, rounded sandstone cobbles and recycled, tough, metavolcanic clasts from San Francisquito Fm.; and scarce, maroon, fine-grained sandstone pebbles from Vasquez Fm. (?). Volcanic clasts (other than recycled San Francisquito Fm. cobbles) not seen. The presence of abundant (locally 80-90%) large clasts of Pelona Schist is distinctive.

Ventura Basin, including San Fernando Basin

QTp **Pico Formation (middle Pleistocene to Pliocene)**—Thick marine sequence composed of siltstone, sandstone and subordinate conglomerate deposited in the Ventura basin; coarser-grained sediments deposited primarily by turbidity currents and are commonly the dominant lithology along the axis of the basin, in feeder channels on the adjacent basin slopes (Yeats,

1979a; Sylvester and Brown, 1988), and at the eastern margin of the basin south of Newhall (Winterer and Durham, 1962); hemipelagic clayey siltstone is interbedded or interfingering with the turbidity deposits and is locally the dominant lithology; deposited primarily at bathyal depths exceeding 4,500 ft. (1400 m) at the base of the section (Natland, 1967), but grades or interfingers up section into upper bathyal to neritic mudstone (see Mudpit shale - QTpms) and shallow water shelf and delta sandstone, conglomerate, and siltstone, with locally prominent fossil hash beds (see QTpcu and QTpg). The siltstone is typically bluish gray where fresh and olive gray with limonite stains or nodules where weathered; coarse-grained units range from light olive gray to light gray and light brown; compact but typically not well cemented. Siltstone beds typically contain abundant foraminifers and local invertebrate fossils. The upper shallow water deposits also contain locally abundant molluscan fossils and ostracodes. The Pico Formation is widely exposed in the eastern Ventura basin; it is exposed in the central Ventura basin on either side of the Santa Clara River Valley, but is thickest below this valley along the Ventura basin axis, where it is largely concealed by alluvium and faulting. Winterer and Durham (1962) report a maximum thickness of about 5,000 to 6,000 ft. (1500 to 1800 m) in the eastern Ventura basin; however, Bailey (1952) reports a thickness of about 13,900 to 15,400 ft. (4200 to 4700 m) west of the map area in the Ventura area. The lower basinal section pinches out to the south and Pico deposits along the northern margin of the Ventura basin are missing in the upper reaches of the mountains on the north due to uplift and erosion. The basal portion of the formation was reportedly deposited during the Repettian stage in both the western and eastern Ventura basin (e.g. Dibblee, 1988; Beyer and others, 2009), and overlies the Modelo Formation to the west and overlies or interfingers with the Towsley Formation to the east in the type area. The top of the formation is time transgressive and is progressively younger to the west. Near the type section west of Valencia, the Pico Formation is reportedly older than about 2.5 Ma, the age of the base of the Saugus Formation estimated by Levi and others (1986). However, Winterer and Durham (1962) report the presence of the benthic foraminifera *Uvigerina peregrina* and *Bulimina subacuminata* within Pico siltstone, which characterize the early Pleistocene Wheelerian and Venturian stages respectively (Natland, 1952; Squires and others, 2006). McDougall and others (2012) report that these species also occur in the upper Repettian stage. In the western Ventura basin the upper Pico Formation includes early to middle Pleistocene ash beds, and alternatively underlies or includes the 0.6 Ma Lava Creek ash (see QTpms). This section was initially assigned to the Fernando Formation as defined by Eldridge and Arnold (1907) and as mapped by McLaughlin and Waring (1914). Kew (1924) subsequently assigned the lower, marine strata of the Fernando to the Pico Formation (except for coarse-grained shallow marine deposits), with the type section at Pico Canyon. Winterer and Durham (1962) remapped and redefined the formation in the type area and assigned the coarse-grained shallow marine units to the Pico Formation. This usage has been adopted by most workers in the eastern Ventura basin and is adopted here and extended to the Santa Susana Mountains and Oak Ridge. Strata in the Ventura basin containing Repettian-age fauna that are lithologically similar to the type Pico section are included within the Pico Formation. The term Repetto is abandoned entirely as a lithologic formation per the recommendation of Durham and Yerkes (1964). The term Pico is abandoned as a lithologic

formation in the Los Angeles basin following the recommendation of Durham and Yerkes (1959, 1964). The term Fernando Formation is not used in the Ventura basin based on differences in lithologic facies reported between the type Pico section and Pliocene strata in the Los Angeles basin (Durham and Yerkes, 1959, 1964) (see Appendix A for details). Lithologic facies have been mapped locally, including:

QTpg **Pico Formation, Grimes Canyon deltaic facies**—Medium- to coarse-grained sandstone, pebbly sandstone, and pebble conglomerate; cross bedding common to pervasive and foreset beds locally apparent; channeling common as well; weakly cemented to uncemented, clasts typically crystalline and derived from the San Gabriel Mountains, and rounded to well-rounded and smooth; moderately to well sorted; conglomerate locally clast supported; typically light gray; light-brown iron-oxide staining varies from local to prominent; generally unfossiliferous; uncommon greenish-gray sandy siltstone to rare thin claystone interbeds with local invertebrate fossils. This unit is well exposed along Grimes Canyon road and at quarries to the east and west of the road (Moorpark and Simi Valley West quadrangles). It is equivalent to a unit interpreted by Dibblee (1992b) as a delta deposit from west-flowing streams and expanded eastward into Happy Camp Canyon on this map based on additional field mapping. It interfingers with and is underlain by Pico siltstone to the west; underlain by and likely grades into or interfingers with fossiliferous shallow marine sands to the east that are assigned here to the upper coarse-grained marine member of the Pico Formation (QTpcu). Overlain by Las Posas Formation or undifferentiated Saugus Formation. Maximum thickness is about 315 m per Dibblee (1992b) cross section. This section historically assigned either to the Saugus or San Pedro Formations; designated herein as an informal member of the Pico Formation based on the definition of Winterer and Durham (1962) and the interpretation that most of this unit is marine; This interpretation is based on mapped interfingering relationships with offshore marine siltstone of the Pico Formation to the west, the presence of uncommon fossiliferous interbeds, the presence of marine sands up section of this unit near Grimes Canyon Road, the prevalence of well-rounded and nearly polished clasts indicative of extensive abrasion in a littoral environment, and foreset bedding suggestive of a delta front environment; however, differentiation of unfossiliferous marine sands from nonmarine sands is problematic in some areas and some nonmarine paralic strata are likely included in the unit as currently mapped. This unit stratigraphically separates and distinguishes older, shallow marine sands to the east, assigned herein as an informal upper facies of the Pico Formation (QTpcu), from younger, shallow marine sands to the west assigned herein to the Las Posas Formation.

QTpcu **Pico Formation, coarse-grained upper facies**—Sandstone, conglomerate and locally prominent fossil hash/coquina beds overlying Pico offshore deposits; locally cross bedded and channeled; gradational with or underlying the Grimes deltaic unit (QTpg); onlaps older formations to the south; overlain conformably or unconformably by nonmarine Saugus or transitional Sunshine Ranch Member strata in most areas; invertebrate fossils locally common. This facies is interpreted as shallow marine shelf, delta or embayment deposits (White, 1983, 1985; Groves, 1991). This section was initially mapped as the lower portion of the Saugus Formation by Kew (1924), but was reassigned to the upper Pico Formation in the eastern Ventura basin by Winterer and Durham (1962). Shallow marine strata previously assigned to

the lower marine Saugus Formation in the Santa Susana Mountains are reassigned here to this facies following the usage of Winterer and Durham and subsequent workers in the type localities of the Saugus and Pico Formations (see Appendix A for details).

QTpms **Pico Formation, Mudpit shale member (middle to early Pleistocene)**—Marine mudstone and siltstone with locally common sandstone interbeds and conglomerate lenses and rare, thin ash beds; conglomerate beds with hard siliceous clasts common at base; foraminifers common; local invertebrate fossils; typically bluish gray when fresh, weathering to olive gray; poorly bedded to locally laminated; 3,500 ft. (1067 m) thick north of Ventura (Natland, 1967). This member was deposited in the western Ventura basin (Fillmore quadrangle) at bathyal to neritic depths (Natland, 1967). Lower contact is conformable with the underlying Pico Formation. Correlative strata in the South Mountain/Balcom Canyon/Oak Ridge area are not lithologically distinctive relative to typical Pico Formation strata (Lung, 1958) and therefore the Mudpit shale member is not distinguished in this area. The upper contact is reportedly time transgressive and interfingers with shallow marine (Las Posas) sands to the east of Ventura (Bailey 1935; Hopps, 1995). Natland (1967) reports this unit contains lower Hallian and upper Wheelerian benthic foraminifers. Contains the 0.73 to 0.78 Ma Bishop ash and 0.8 to 1.1 Ma Glass Mountain ashes and spans the 0.78 Ma transition from reverse (Matuyama) to normal (Brunhes) polarity. The base occurs in proximity to the 1.2 Ma Bailey ash and the top is alternatively shown either above or below the 0.6 Ma Lava Creek ash (Wehmiller and others, 1978, Lajoie and others, 1982; Sarna-Wojcicki and others, 1984). Mudpit shale strata were originally assigned to the Fernando Formation of Eldridge and Arnold (1907), as mapped by McLaughlin and Waring (1914). These strata were subsequently included in the Pico Formation by Kew (1924) and described as upper Pico Formation by Cartwright (1928) and Driver (1928). Waterfall (1929) noted the similarity of molluscan fauna in this section with the fauna at Bath House beach in Santa Barbara and many subsequent workers assigned this section to the Santa Barbara Formation based on this faunal criteria (e.g. Bailey, 1935, 1951; usage adopted by Weber and others, 1973). Early workers in the Ventura Avenue/Rincon/San Miguelito oil fields referred to this section more informally as the Mudpit shale and Dibblee (1990) assigned it to the informal Mudpit shale member of the Pico Formation. This usage is adopted here (see Appendix A for details).

QTpc **Pico Formation, sandstone and conglomerate**—Sandstone and conglomerate interbeds within typical Pico siltstone (Val Verde quadrangle and Moorpark 7.5’ quadrangles).

Los Angeles Basin

Durham and Yerkes (1964) described two members, upper and lower, in the Puente Hills:

QTfu **Fernando Formation, Upper Member (early Pleistocene to Pliocene)**—In general, the Fernando Formation consists of massive light-gray siltstone, light yellowish-brown fine- to medium-grained sandstone, and light-brown to reddish-brown pebbly conglomerate in the Los Angeles basin; primarily marine but nonmarine conglomerate beds are reportedly included in the upper part of the section (Lamar, 1970); exposed primarily in the Los Angeles and El Monte quadrangles. Name introduced by Eldridge and Arnold (1907) based on unpublished

mapping of Homer Hamlin in the San Fernando Valley and initially extended to Pliocene strata from southern Los Angeles County to Santa Maria. The term Fernando was elevated to group status by Kew (1923, 1924), but was subsequently reclassified back to formational rank to name Pliocene strata of the Los Angeles basin by Durham and Yerkes (1964). See Appendix A for nomenclature details. Locally contains Repettian-Wheelerian (early Pleistocene to early Pliocene per McDougall and others, 2012) foraminiferal zone boundary (Lamar, 1970).

The upper member on this map includes Fernando Formation members 2 and 3 of Lamar (1970): **QTfuc**—pebbly sandstone and conglomerate; **QTfuf**—fossiliferous.

QTfl **Fernando Formation, Lower Member (Pliocene)**—Interbedded silty sandstone and massive pebble conglomerate of the Los Angeles basin. Includes Fernando Formation member 1 of Lamar (1970). See QTfu above and Appendix A for discussion of nomenclature **QTflc**—conglomerate.

Ventura Basin

Tw **Towsley Formation, undivided (early Pliocene to late Miocene)**—Interbedded sandstone, conglomerate, and sandy siltstone and mudstone; the coarse-grained facies is light-colored and commonly lenticular, and is interpreted as turbidity current deposits in a submarine fan; the fine-grained facies is characteristically brown weathering and represents deposition between the fan lobes (Fritsche, pers. comm. 2011). Winterer and Durham (1962) report the presence of numerous transported fossil invertebrates that suggest a depositional water depth in excess of 600 ft. (180 m), and possible depths of 3,000 ft. (900 m) or more based on foram assemblages Strata, up to 4,000 ft. (1200 m) thick, form widespread exposures in eastern Ventura County; overlies Modelo Formation strata in the Topatopa Mountains. The Towsley Formation overlies and interfingers with the Modelo Formation in the Santa Susana Mountains and overlaps Modelo strata to rest directly on basement rocks near and east of San Fernando Pass. Its base is distinguished from the Modelo Formation at the first thick bedded pebbly sandstone. The generally conformable, locally interfingering upper contact with the Pico Formation is chosen at the transition from diagnostic brown-weathering siltstone of the Towsley to olive-gray siltstone with common limonite nodules typical of the Pico. The Towsley Formation is early Pliocene to late Miocene (Winterer and Durham, 1962; Squires and others 2006, fig. 2). This section was initially included in the Modelo Formation by Kew (1924); the section in the Elsmere Canyon area was assigned to the “Repetto formation” by Oakeshott (1950); a new, unnamed formation was proposed by Winterer and Durham (1951), was subsequently named the Towsley Formation in Winterer and Durham (1954), and was formally described and mapped by Winterer and Durham (1962) based on the type section at Towsley Canyon, southwest of Valencia. In the northern San Fernando Valley, east of Pacoima Canyon, a band of strata was shown as Pico Formation by Yerkes and Campbell (2005); Hill (1930) also mapped this section as Pico, but Oakeshott (1958) mapped it as “Repetto formation” and several early Caltech theses note the presence of brown weathering siltstone, which is typical of the Towsley Formation of Winterer and Durham (1962); Barrows and others (1974) mapped it as undifferentiated Towsley/Pico Formation; Dibblee (1991e) maps it as Towsley Formation. This

unit is mapped here as Towsley Formation based on Dibblee and the noted lithology, but is queried due to the possible inclusion of undifferentiated Pico Formation strata. Mapped subunits and members include:

Tws **Towsley Formation, siltstone**—Brown mudstone and siltstone, locally carries foraminifera referred to the Mohnian Stage (late Miocene) of Kleinpell (1938).

Twc **Towsley Formation, conglomerate**—Pale pebble conglomerate and sandstone in lenticular beds.

Twhc **Towsley Formation, Hasley Conglomerate Member**—Basal conglomerate member.

Los Angeles Basin

Tpn **Puente Formation, undivided (early Pliocene and late Miocene)**—Marine siltstone, sandstone, and shale; mostly a Los Angeles basin temporal equivalent of the Modelo Formation, but partly younger; named by Eldridge (*in* Eldridge and Arnold, 1907) from exposures in the Puente Hills; strata are associated with the Los Angeles basin (El Monte, Los Angeles and Hollywood 7.5' quadrangles) as contrasted with Modelo strata, which are associated with the eastern Ventura basin. In the Los Angeles and Hollywood 7.5' quadrangles Lamar (1970) mapped four non-sequential, interbedded, informal lithologic subunits, which have not been specifically correlated with the formal members recognized by Shoellhamer and others (1954).

Tpsl **Puente Formation, siltstone (early Pliocene)**—Well-bedded, light gray siltstone; thickest beds at top of section, also interbeds lower in section (Lamar, 1970, fig. 14).

Tpsh **Puente Formation, siliceous shale (early Pliocene)**—Well-bedded, light gray, siliceous shale and siltstone; regularly interbedded with thin, fine- to coarse-grained sandstone beds; most common in a few discontinuous zones, chiefly in upper-central part of formation (Lamar, 1970, fig. 14).

Tpds **Puente Formation, diatomaceous shale (early Pliocene)**—Well-bedded, dull white diatomaceous shale; a discontinuous single zone in central part of formation (Lamar, 1970, fig. 14).

Tpss **Puente Formation, sandstone (late Miocene)**—Well-bedded, very fine- to very coarse-grained sandstone; medium to light brown and light gray; mostly well cemented but less so in uppermost parts; local discoidal concretions; most abundant in lower part of formation (Lamar, 1970, fig. 14).

Tpnsc **Puente Formation, Sycamore Canyon Member (late Miocene)**—Predominantly sandstone and pebble conglomerate, laterally variable; sandstone is thick-bedded to massive, medium- to coarse-grained, friable; siltstone is massive- to thin-bedded, siliceous; conglomerate is massive, contains pale to brownish-gray pebbles and cobbles; siltstone locally contains bathyl-depth foraminiferal faunas; **Tpnscc** - conglomerate bed. Member named by Schoellhamer and others (1954).

Tpny **Puente Formation, Yorba Member (late Miocene)**—Predominantly siltstone, with sandstone interbeds; named for Yorba Bridge over the Santa Ana River, east of Atwood; white to gray, thin-bedded, micaceous and siliceous siltstone; upper part contains large boulders "floating" in much fine-grained material – interpreted to be a turbidity current deposit. Named by Schoellhamer and others (1954).

Tpnsq **Puente Formation, Soquel Member (late Miocene)**—Predominantly sandstone, minor interbedded siltstone; sandstone is gray to yellowish-gray, massive- to well-bedded, medium- to coarse-grained, poorly sorted; interbedded pebbly sandstone; many such beds are graded, locally pebbly to cobbley conglomeratic; lower part of unit contains ellipsoidal, calcite-cemented boulders as large as 1.5 m. Named by Schoellhamer and others (1954).

Eastern Ventura Basin

Tcs **Castaic Formation, undivided (late Miocene)**—Marine tuffaceous or diatomaceous shale, interbedded pebbly sandstone, sparse limestone concretions with well-preserved foraminifera. Named by Winterer and Durham (1954) for marine sandstone strata of late Miocene age (equivalent in age to the Modelo Formation), north of the San Gabriel Fault and east of Newhall; name extended to north for late Miocene shale with interbedded sandstone and minor pebble conglomerate in Soledad-Ridge basin area by Crowell (1954).

Tm **Modelo Formation, undivided (late and middle Miocene)**—Predominantly gray to brown thin-bedded mudstone, diatomaceous clay shale, or siltstone, with interbeds of very fine-grained to coarse-grained sandstone; proportion and thickness of sandstone interbeds allows lithofacies to be mapped in some areas; generally unconformable on older rocks around northern, eastern and southern margins of the Ventura basin. The base of the Modelo is generally unconformable on middle Miocene and older rocks. The name, Modelo, was introduced by Eldridge and Arnold (1907) for strata exposed in the Topatopa Mountains, north of Piru and further described in the Santa Susana Mountains and San Fernando Pass areas by Winterer and Durham (1962); extended to the eastern Santa Monica Mountains and described in detail by Hoots (1931) where further noted for turbidite features indicating submarine fan deposition (Sullwold, 1960); Along the north flank of the Santa Monica Mountains the unconformity mapped by Hoots (1931) in the eastern part of the range, where Modelo locally overlies Santa Monica Slate, has been mapped continuously westward (Yerkes and Campbell, 1980; Weber, 1984; and unpublished 1:12,000-scale mapping by Yerkes and Campbell, 1965-1974, in the Canoga Park and Calabasas 7.5' quadrangles) as far as the north side of the Ventura Freeway (U.S. 101) at the west side of Las Virgenes Creek, to the west of which it becomes accordant with (and apparently conformable on) subjacent strata of the Calabasas Formation (Weber, 1984); further west, the Modelo and subjacent parts of the Calabasas appear to grade progressively westward into more diatomaceous, clayey, Monterey-like lithofacies. Many of the sandstone and shale beds below (south of) the unconformity (and its westward conformable extension) and above (north) of the Conejo Volcanics are lithologically similar to the Modelo but more intensely folded and faulted; these have been assigned to the Calabasas Formation by Yerkes and Campbell (1979). Fellbaum and Fritsche (1993) include them in the

Modelo Formation; however, their stratigraphic position below the unconformity mapped by Hoots (1931) as the base of the Modelo, and the predominance of middle Miocene foraminifera (Luisian or Relizian?) in the Calabasas, suggests their correlation with Modelo strata is questionable. In the eastern Santa Monica Mountains the Modelo was mapped and described in detail by Hoots (1931), and Kleinpell (1938) used the unconformity at the base, well exposed near Mohn Springs in Topanga Canyon, where it is underlain by predominantly middle Miocene Topanga strata, as the base for his type Mohnian (foraminiferal) Stage (late Miocene). Widespread in eastern Ventura basin; locally extended to include some strata along the south flank of the Santa Monica Mountains in the Pacific Palisades-Westwood area. Five members were described by Cemen (1977) in the Topatopa Mountains and four of them have been mapped as far south as the north flanks of Oak Ridge and the Santa Susana Mountains. Age-correlative strata in the Los Angeles basin are generally referred to the Puente Formation or, west of the Newport-Inglewood zone, to the Monterey Shale. Mapped facies of the Modelo Formation include:

Tmsu **Modelo Formation, upper sandstone unit at Laskey Mesa**—Weber (1984) assigned strata at Laskey Mesa to the Towsley Formation, as shown by Yerkes and Campbell (2005); Truex and Hall (1969) previously assigned most of this section to the Modelo Formation and the uppermost portion to the Santa Margarita Formation, and Brown (1957) mapped it as Modelo Formation; Dibblee (1992b) mapped this section as Tertiary unnamed shale and sandstone; Yeats (1979) reported that Towsley Formation does not occur south of the Santa Susana Fault. Field review of this area did not reveal any brown mudstone or coarse-grained turbidite beds typical of the Towsley Formation and this unit has been reassigned to the upper Modelo Formation herein based on lithologic similarity to Modelo strata to the west and previous usage.

Tm_5 **Modelo Formation, member 5**—Upper shale and siltstone unit; dark brown to gray, moderately to well compacted, thin-bedded to laminated silty shale and siltstone, locally siliceous near base; contains foraminifera assigned to the upper Mohnian and lower Delmontian Stages of Kleinpell (1938); thickness locally exceeds 458 m. (Cemen, 1977) Includes units mapped as Sisquoc Formation by Dibblee (1991).

Tm_4 **Modelo Formation, member 4**—Upper sandstone unit; white to gray, fine to coarse-grained arkosic sandstone, with subordinate thin partings and lenticular interbeds of silty clay shale, locally siliceous; thickness variable, locally as much as 825 m. (Cemen, 1977).

Tm_3 **Modelo Formation, member 3**—Middle shale unit; porcelaneous and calcareous shale and porcelaneous mudstone, brown to buff, thin-bedded to laminated, moderately to well indurated, with thick lenses of gray calcareous sandstone locally; thickness variable but may exceed 763 m.; foraminifera referred to lower part of the Mohnian Stage of Kleinpell (1938) (Cemen, 1977).

Tm_2 **Modelo Formation, member 2—**Lower sandstone unit; grayish white to dark brown, fine to medium-grained sandstone, locally interbedded with dark brown siltstone and claystone; locally as much as 915 m. thick, thins westward and pinches out between the middle and lower shale units (Cemen, 1977).

Tm_1 **Modelo Formation, member 1—**Lower shale unit; cherty to porcelaneous shale and mudstone, locally calcareous, locally diatomaceous, moderately to well indurated, thin-bedded to laminated, generally dark gray to brown; contains foraminifera referred to the Relizian and Luisian Stages of Kleinpell (1938), indicating the unit is age-correlative with the Calabasas Formation and, possibly the upper part of the Topanga Canyon Formation in the Santa Monica Mountains; thickness 214-794 m. (Cemen, 1977).

Tmd **Modelo Formation, diatomaceous shale**—Diatomaceous shale; includes outcrops on the south side of the San Fernando Valley at Pierce College shown as Pico Formation by Yerkes and Campbell (2005), based on the presence of Repettian stage benthic foraminifers (Ingle, 1967; Yerkes and Campbell, 1993); previously assigned to the Modelo Formation by Hoots (1931). Review of these exposures indicates that much of this unit is lithologically more consistent with the Modelo Formation than the Pico Formation. This section is assigned here to the Modelo Formation based on the noted lithology and presence of Modelo Formation mapped on strike to the east and west, but is queried based on the reported presence of Repettian stage fauna.

Tms **Modelo Formation, sandstone**—Sandstone and conglomerate.

Tmb **Modelo Formation, "burnt shale"**—Unusual slag and scoriaceous- to obsidian-like material found within the upper part of the Modelo Formation in the Grimes Canyon area, Big Mountain/Happy Camp Canyon, and upper Las Virgenes Canyon area. It is composed of red, yellowish-orange, purple, brown, and black mudstone, siltstone, and diatomite that has been altered by in-situ combustion of natural gas in layers containing abundant organic material, as described and mapped by Irvine (1995), Brown (1957), and Jestes (1958).

Soledad Basin and San Andreas Fault Zone

Tpbc **Punch Bowl Formation, clay shale member (late Miocene)**—Gray, poorly indurated clayey shale with local gypsum. (Dibblee, 2001).

Tpbv **Punch Bowl Formation, volcanic clast member (late Miocene)**—White to pink, coarse, pebbly to cobbly, arkosic sandstone, thin-bedded silty sandstone, and minor thin-bedded, white, nodular limestone. Si1ty layers range from yellowish tan through greenish brown to red. Sandstone is well-indurated, well-stratified and was probably deposited in alluvial fan and floodplain environments. Clasts are predominately light-colored granitic rock pebbles and cobbles with lesser (up to 40%) tuffaceous and porphyritic volcanic .rocks ranging in composition from rhyolite to andesite. (Barrows and others, 1985).

Tmc **Mint Canyon Formation, undivided (late and middle Miocene)**—First described by Hershey (1902b), named by Kew (1924), mapped in detail by Saul and Wootton (1983) and Saul (1985), who recognized three intertonguing lithofacies. Includes a variety of semi-consolidated nonmarine sediments deposited in fluvial and lacustrine environments. Jahns and Muehlberger (1954) describe two informal members: a lower member including reddish-brown basement rock breccia, conglomerate, sandstone, siltstone and mudstone (thickness ~ 335 m); and an

upper member consisting of thin-bedded brownish or greenish siltstone and interbedded tuff (thickness ~ 790 m).

Tmcd **Mint Canyon Formation, Lacustrine deltaic (foreset) facies**—Predominantly fine- to coarse-grained, sparsely-concretionary, cross-bedded, arkosic sandstone, interbedded with conglomeratic sandstone, gray to brown sandy siltstone and claystone; tuff and tuffaceous sedimentary beds; marly and nodular carbonate. Sparsely fossiliferous: small clam and snail shells, vertebrate bones and teeth. (Saul and Wootton, 1983).

Tmcl **Mint Canyon Formation, Lacustrine bottomset facies**—Interbedded sandstone, silty sandstone, siltstone, claystone and thin beds and lenses of limestone; a few lenses of turbidite sandstone and coarse conglomerate; tuffaceous beds; ostracod shells; bedding planes commonly darkened by finely divided lignite; graded beds common. (Saul and Wootton, 1983).

Tmcm **Mint Canyon Formation, Lacustrine and lake-marginal fluvial facies**—Deposits of arkosic sandstone and conglomeratic sandstone, with interbedded siltstone and mudstone; some nodular carbonate in siltstone; thin beds of limestone common in mudstone. (Saul and Wootton, 1983).

Ttk **Tick Canyon Formation, undivided (middle to early Miocene)**—Reddish, fluvial and lacustrine sandstone, siltstone and claystone, and gray, tan, and reddish, well-cemented and well-bedded conglomerates (Mint Canyon, Agua Dulce and San Fernando 7.5’ quadrangles; Oakeshott, 1958). Named by Jahns (1940), and separated from the overlying lower part of the Mint Canyon Formation on the basis of a distinctively older vertebrate fauna. Includes area east of Tick Canyon and in upper Agua Dulce Canyon mapped by Oakeshott (1958) as Mint Canyon Formation but shown by Jahns and Muehlberger (1954) and Dibblee (1996b,c) as Tick Canyon Fm. Ehlert (2003) found no lithologic differences or unconformity between Tick Canyon and overlying Mint Canyon Formations and suggests that units mapped as Tick Canyon Formation should be considered basal sediments of the Mint Canyon Formation. Original usage retained, but question regarding validity of Tick Canyon Formation noted.

Ttkc **Tick Canyon Formation, conglomerate (middle to early Miocene)**—Dark gray, coarse, poorly-bedded conglomerate, Oakeshott, 1958), Dibblee (1996b,c).

Los Angeles Basin and Continental Borderland

Tmt **Monterey Shale, undivided (late, middle, and early Miocene)**—Marine clay shale, thin interbedded siltstone, minor sandstone and pebble conglomerate, and glassy tuff; siltstone is commonly diatomaceous, locally bituminous, siliceous, or dolomitic; sandstone is commonly quartz arenite; some conglomerates contain clasts of glaucophane schist. Shale is gray to dark brownish gray where fresh, weathers quickly to chalky white; contains foramifera referred to the Relizian, Luisian, or Mohnian Stages (early middle, late middle, or early late Miocene respectively) of Kleinpell (1938). Monterey strata are exposed only south of the Malibu Coast Fault and west of the Newport-Inglewood zone of faulting and folding; rocks of equivalent age north of the Malibu Coast Fault are referred to the Topanga Group and the Modelo Formation; east of the Newport Inglewood zone, strata of equivalent age are referred to the Puente Formation and the Topanga Group. The Monterey is generally considered a distal, deep-basin

facies of the more-proximal Modelo, Puente and other formations of the equivalent age range. Name extended into southern California from type area in Monterey County, central California (Woodring and others, 1936). The upper part of the unit in some areas (chiefly along the Pacific Coast Highway) is late Mohnian in age and locally overlies the early Miocene Trancas Formation unconformably; its relation to middle Miocene Monterey strata on Point Dume is obscured, but could be an intraformational unconformity. The (mostly middle Miocene) section exposed on Point Dume is about 1000 m thick. The Monterey Shale in the northern Los Angeles basin is unconformably overlain by unconsolidated Pliocene, Pleistocene and Holocene deposits; *includes*:

Tmtd **Monterey Shale, deformed (middle and early Miocene)**—Intensely deformed shale, siltstone, and sandstone, commonly dolomitic, locally siliceous, locally very cherty; contains foraminifera referred to the Relizian or Luisian (middle Miocene) Stages of Kleinpell (1938). In upper plate of Escondido thrust fault beds are tightly folded, with vertical limbs and gently east-plunging axes; thickness across folded beds is at least 650 m.

Ventura Basin and Los Angeles Basin

Tt **Topanga Group, undivided (middle and early Miocene)**—First called the Topanga Formation by Kew (1923) for exposures in the central Santa Monica Mountains that include the type locality for the "Topanga Canyon fauna" (about 50 molluscan species) of Arnold (1907a). Durrell (1954) recognized that the three subdivisions identified by Kew (1923) are contiguous westward with extensive units of formation rank, labeling them the Lower Topanga, Middle Topanga and Upper Topanga Formations. Subsequent publication of the North American Stratigraphic Code led Yerkes and Campbell (1979) to change the names to conform, and designated the set of three formations as the Topanga Group, consisting of the Calabasas Formation, the Conejo Volcanics, and the Topanga Canyon Formation, each with two or more members. Elsewhere, middle Miocene strata with similar lithologic and biologic facies have been informally divided: in the eastern Ventura basin and the northern Los Angeles basin beds containing Luisian BFZ foraminifera (late middle Miocene), that are labeled **Tt** are chiefly age-equivalent to the Calabasas Formation; beds containing a "Temblor" or "Topanga" molluscan fauna have also been labeled **Tt**. Middle Miocene volcanic rocks that may be related to the Conejo Volcanics, but are spatially separated, are labeled **Ttb**. The distribution and nomenclature history of the Topanga Group has been reviewed by Campbell and others (2007).

In the Santa Susana Mountains, informal subunits include:

Tt_4 **Topanga Group, Oat Mountain unit 4**—Upper sandstone with interbedded siltstone and local pebble conglomerate; sandstone, medium- to coarse-grained arkose, locally contains *Amusium lompocensis*; thickness about 140 m; (Saul, 1979).

Tt_3 **Topanga Group, Oat Mountain unit 3**—Shale, foram-bearing siltstone, and mudstone, about 122 m thick (Saul, 1979).

Tt_2 **Topanga Group, Oat Mountain unit 2**—Sandstone, fine- to coarse-grained, arkosic, well indurated, massive, about 244 m thick (Saul, 1979).

Tt_1 **Topanga Group, Oat Mountain unit 1**—Shaly siltstone, massive- to well-bedded, minor lenses of conglomeratic sandstone; siltstone locally contains microfauna assigned to the Luisian Stage of Kleinpell (1938) suggesting it is an age-correlative of the Calabasas Formation (Saul, 1979).

In the eastern Santa Monica Mountains informal subunits include:

Ttss **Topanga Group, sandstone**—Sandstone, medium- to coarse-grained, well-bedded, light brown and gray (Lamar, 1970).

Ttsl **Topanga Group, siltstone**—Siltstone, well bedded, medium to dark brown, with interbedded sandstone, shale and chert (Lamar, 1970).

Ttcg **Topanga Group, conglomerate**—Conglomerate, massive- to well-bedded, light brown; includes basal breccia locally (Lamar, 1970).

Ttb **Intrusive and extrusive volcanic rocks**—Chiefly basaltic, interlayered with sandstone and shale assigned to the Topanga Group. In part, may be correlative with Conejo Volcanics of central and western Santa Monica Mountains and adjacent areas to the northwest; but includes rocks that are dated as older than the oldest contiguous Conejo (McCulloh and others, 2002). (eastern Santa Monica Mountains, Hoots, 1931; Santa Susana Mountains, Evans and Miller, 1978; northeastern Verdugo Mountains, Oakeshott, 1958).

In the central and western Santa Monica Mountains divisions include:

Tcb **Calabasas Formation, undivided (early late Miocene and late middle Miocene)**—Interbedded impure, clayey to silty sandstone and silty shale, with local beds of sedimentary breccia; sandstone is thin-, medium- and thick-bedded, mostly medium to coarse grained, poorly sorted, commonly with wacke texture, commonly shows graded bedding; shale, locally diatomaceous; may have small phosphatic pellets, locally abundant fish scales, sparse Foraminifera and rust-colored plant casts, some thicker beds contain zones of large ovoid dolomitic concretions; sedimentary breccia, olistostromes incorporating cobble- to large boulder-size clasts of recognizable older Tertiary strata, some as fossil-bearing clasts of Paleocene, Eocene, early Miocene, and middle Miocene strata. Many of the sandstones are lithologically similar to those in the overlying, less-deformed Modelo Formation. Total thickness is about 1,200 m in the type area. The Modelo is unconformable on the Calabasas in the name area, however, west of Malibu Junction and north of the Ventura Freeway the two formations are accordant, the Calabasas is greatly thinned, and grades westward into finer-grained clayey siltstone and shale much like that of the Modelo in the area, and the two formations are distinguished only by differences in foraminiferal fauna. (The Calabasas there contains foraminifera referred to the Luisian Stage of Kleinpell, 1938; the Modelo contains foraminifera referred to the Mohnian Stage of Kleinpell, 1938). The contact relationships with the underlying Conejo Volcanics are marked by extreme variability, ranging from unconformable to accordant and intertonguing, apparently reflecting marine sedimentation, at least partly contemporaneous with the development of a submarine volcanic edifice and associated tectonic disturbance. Intraformational deformation west of Liberty Canyon, the

angular unconformity east of Medea Creek, and the abruptly thinner Calabasas section near and west of Agoura reflect local tectonic activity during deposition; and the volcanic conglomerate is probably significantly younger than most of the Calabasas section to the east. In the west-central Santa Monica Mountains the Calabasas Formation and older strata are involved in major pre-Modelo deformation that includes detachment faulting. Well-defined upper-plate ramps in Trancas and Topanga Canyons show offsets exceeding many hundreds of feet on faults that bend to follow bedding planes, along which intervening beds are missing or thinned, and establish a style of younger-over-older faulting as a significant structural feature. Outcrops where contact relations can be observed in macroscopic detail, and confirm depositional or shear-surface relations, are extremely rare, but where found indicate little discordance at stratigraphic hiatus or local unconformity contacts between pre-Conejo Tertiary Formations. The Paleogene sequence is similar to that in the adjacent Simi Hills and the more distant Santa Ana Mountains, where variations in depositional environments appear to represent epeiric transgressions and regressions. Therefore, we conclude that contacts lacking local exposures of diagnostic depositional character, where significant parts of the section are missing or dramatically thinned, are one or more of a set of detachment faults. The alternative is to infer Paleogene orogenic deformation on a scale not recognized elsewhere in southern California.

Tcbvc **Calabasas Formation, Volcanic conglomerate (late middle Miocene)**—Volcanic conglomerate, mapped by Weber (1984) as basal Calabasas Formation where it rests unconformably on the Chatsworth Formation (Cretaceous) along the south flank of the Simi Hills, and extends northwestward across the Cretaceous-Paleogene sequence at the west end of the Simi Hills. This conglomerate is probably correlative with volcanic conglomerates that locally forms the base of the Calabasas Formation sandstone and shale exposed along and north of the Ventura Freeway in the Agoura area (Blackerby, 1965), and overlying volcanic strata in the Thousand Oaks area (Weber, 1984). In addition to the informal volcanic conglomerate member, five members were named by Yerkes and Campbell (1979).

Tcbs **Calabasas Formation, Stokes Canyon Breccia Member (late middle Miocene)**—Sedimentary breccia consisting of angular boulders and cobbles of redeposited well-cemented sandstone with molluscan faunas diagnostic of the "Martinez" (Paleocene) and "Domengine" (middle Eocene) Stages; the breccia bed is locally as thick as 60 m; underlain and overlain conformably by Calabasas sandstone and siltstone; locally overlain unconformably by basal conglomerate of the Modelo Formation. Thinner, less continuous breccia beds are present at two other horizons nearby. (Stokes Canyon area, northern Malibu Beach and southern Calabasas 7.5’ quadrangles; Yerkes and Campbell, 1979, p. E22; Yerkes and Campbell, 1980).

Calabasas subunits in the upper plate of Malibu Bowl Detachment Fault include:

Tcbmp **Calabasas Formation, Mesa Peak Breccia Member**—Sedimentary breccia consisting of angular boulders and cobbles of volcanic rock in a very coarse-grained sandstone matrix; maximum thickness approximately 288 m. Overlies the Newell Sandstone Member of the Calabasas Formation in the upper plate of the Malibu Bowl Detachment Fault, west central

Malibu Beach 7.5' quadrangle (Yerkes and Campbell, 1979, p. E23; Yerkes and Campbell, 1980).

Tcbn **Calabasas Formation, Newell Sandstone Member**—Poorly sorted turbidite sandstone and interbedded shaly siltstone with large dolomitic concretions; overlies and wedges out westward into Malibu Bowl Tongue of the Conejo Volcanics; maximum thickness approximately 244 m. (Yerkes and Campbell, 1979, p. E23; Yerkes and Campbell 1980).

Tcbd **Calabasas Formation, Dry Canyon Sandstone Member**—Sandstone (proximal turbidites) and subordinate interbedded siltstone, many thin turbidites, locally prominent dolomitic concretions in siltstone; overlies and tongues eastward into Solstice Canyon Tongue of the Conejo Volcanics; underlies and intertongues westward into Escondido Canyon Shale Member of the Calabasas Formation; overlain by, and locally intertongues with, the Malibu Bowl Tongue of the Conejo Volcanics, and locally overlain by the Newell Sandstone member of the Calabasas Formation; locally overlain by Latigo Canyon Breccia Member of the Calabasas Formation; underlain by Ramera Canyon Tongue of Conejo Volcanics; approximate maximum thickness 686 m (Campbell and others, 1996; Yerkes and Campbell, 1979, p. E24; Yerkes and Campbell, 1980).

Tcbl **Calabasas Formation, Latigo Canyon Breccia Member**—Sedimentary breccia, large angular boulders of Sespe Sandstone and fossiliferous Vaqueros sandstone in sandy, tuffaceous or volcanic breccia; intertongues with epiclastic volcanic breccia; approximate maximum thickness 91 m; underlies the Solstice Canyon Tongue of the Conejo Volcanics and overlies the Escondido Canyon shale member of the Calabasas formation (Yerkes and Campbell, 1979, p. E23; Campbell and others, 1996).

Tcbe **Calabasas Formation, Escondido Canyon Shale Member**—Siltstone, mudstone, shale and minor interbedded thin sandstone turbidites; locally prominent dolomitic concretions; tongues eastward into Dry Canyon Sandstone Member of the Calabasas Formation; westward laps onto and intertongues with Ramera Canyon Tongue of the Conejo Volcanics; approximate maximum thickness 276 m; (Yerkes and Campbell, 1979, p. E24; Campbell and others, 1996).

Tco **Conejo Volcanics, undivided (middle Miocene)**—Basalt, andesitic basalt, basaltic andesite, andesite, and dacite in a thick sequence of extrusive volcanic flows, flow-breccias, agglomerates, and epiclastic volcanic breccias, volcanic sandstones and siltstones; thickest (probably in excess of 3 km) where it underlies the north flank of the western Santa Monica Mountains, and thinning eastward to as little as 200 m of interbedded flows and volcaniclastic sedimentary rocks on the nose of the Topanga Anticline; further east the volcanic rocks are thin and discontinuous, and the name has not been extended eastward for more than a mile east of Topanga Canyon Road. The thick sequence shows a crude compositional layering: pillow basalts, pillow breccias, aquagene tuffs, black volcanic sandstones and interbedded black siltstones are common in the basal part of the Conejo, associated with basalt, andesitic basalt, and basaltic andesite flows, breccias, and agglomerates; andesite and basaltic andesite predominate in the central part of the sequence with interlayered andesitic basalt; and an upper zone, dominated by andesitic and basaltic andesite but including dacite flows in some areas as

well as epiclastic volcanic conglomerates containing andesite and dacite clasts. The map by Durrell (1954) called the volcanics that intervene between lower Miocene and upper-middle Miocene sedimentary strata the “Middle Topanga Formation”; but his students Sonneman (1956) and Blackerby (1965) adopted the name "Conejo Formation” and “Conejo Volcanics", following the usage of Taliaferro (1924) for rocks in the Conejo Mountain area. This usage was formalized by Yerkes and Campbell (1979). In the vicinity of boundary between the Triunfo Pass and Point Dume quadrangles the contact with the upper part of the underlying Topanga Canyon and Vaqueros Formations is a buttress unconformity against a degraded half graben or caldera wall that laps eastward conformably onto shelf sediments at a higher stratigraphic level. Weigand and Savage (1993) have summarized the geochemistry of the Conejo Volcanics, comparing them with other southern California Miocene volcanic suites. The range in initial $^{87}Sr/^{86}Sr$ is reported as 0.60294-0.70320, indicating parent magmas derived from the upper mantle without important crustal rock contamination (Weigand and Savage, 1993, p. 105,106). K-Ar ages on plagioclases from basalt and andesite, reported by Turner and Campbell (1979), range from 15.5±0.8 m.y. near the base of the Conejo to 13.9±0.4 m.y. near the top. McCulloh and others (2002, p. 3) have recalculated the older date using updated decay constants to yield a 15.9±0.8 m.y. age.

Along the north flank of the Santa Monica Mountains, lithologic subunits include:

Tcode **Conejo Volcanics, dacite-bearing epiclastic lenses**—Epiclastic volcanic rocks, but including basalt, andesite and dacite pyroclastic flows and flow breccia; forms relatively thin layers and lenses interbedded in lower part of Calabasas Formation, which locally includes volcanic sandstone and volcanic conglomerate (north of Ventura Freeway, Thousand Oaks 7.5’ quadrangle; after Blackerby, 1965).

Tcod **Conejo Volcanics, dacite-bearing upper zone**—Interlayered dacite (including trachytic dacite), andesite and basalt flows and pyroclastics; minor volcanic sandstone. Malibu Junction Member of Conejo Volcanics of Blackerby (1965) (south of Ventura Freeway, Thousand Oaks 7.5’ quadrangle).

Tcoa **Conejo Volcanics, andesitic central zone**—Interlayered porphyritic and microporphyritic andesite, andesitic basalt, and basaltic andesite flows, agglomerates and flow breccias; includes some crystal tuff, vesicular andesite, pyroclastics and volcanic sandstone; includes Ladyface Member and Medea Member of Blackerby (1965), as well as Potrero and Triunfo Members of Sonneman (1956) and Guynes (1959). (Blackerby, 1965 and unpublished mapping 1965-1973; Campbell and others, 1996, and unpublished mapping 1962-1976; Sonneman, 1956; Guynes, 1959; and Weber, 1984). Lithologically recognized subunits, which occur at various stratigraphic levels, and do not form a consistent stratigraphic sequence, include:

Tcoaf **Conejo Volcanics, andesitic central zone, andesitic flows**—Andesite flows, mapped as Potrero Member of the Conejo Formation by Sonneman (1956) and Guynes (1959).

Tcoaa **Conejo Volcanics, andesitic central zone, andesitic agglomerate**—Andesite agglomerate and tuff, mapped as part of Potrero Member of the Conejo Formation by Guynes (1959).

Tcoab **Conejo volcanics, andesitic central zone, andesite breccia**—Andesitic and basaltic breccia and some agglomerate; mostly equivalent to rocks mapped as the Triunfo Member by Sonneman (1956) and Guynes (1959), and includes rocks mapped as Medea Member by Blackerby (1965). (Yerkes and Campbell, 1980; Campbell and others, 1970; Sonneman, 1956; Guynes, 1959; Weber, 1984; and unpublished 1:12,000-scale mapping by R. H. Campbell and B. A. Blackerby, 1967-1972).

Tcob **Conejo Volcanics, basaltic lower zone, basalt and andesitic basalt**—Chiefly basalt, olivine basalt, basaltic andesite, and andesitic basalt; ranges from trachytic olivine basalt to porphyritic quartz andesite; as flows, breccias, agglomerates, pillow basalts, pillow breccias, and basaltic sand and silt; includes Olivine Basalt and Seminole Members of Blackerby (1965); (Malibu Beach, Point Dume, Triunfo Pass, and Thousand Oaks 7.5' quadrangles; Yerkes and Campbell, 1980; Campbell and others, 1996; Blackerby, 1965; Sonneman, 1956; Guynes, 1959; Weber, 1984; and unpublished 1:12,000-scale mapping by R. H. Campbell and B. A. Blackerby, 1962-1976). Lithologically recognized subunits (flows and breccias) are interlayered at various stratigraphic levels in the upper part of the zone, and do not form a consistent stratigraphic sequence; however pillow basalt, pillow breccia, and volcanic sand predominate in the lower part of the zone. Subunits include:

Tcobf **Conejo Volcanics, basaltic lower zone, basalt and andesitic basalt, basalt flows**—Basalt, andesitic basalt and basaltic andesite flows (Blackerby, 1965; Yerkes and Campbell, 1979, 1980; Campbell and others, 1996; Weber, 1984).

Tcobb **Conejo Volcanics, basaltic lower zone, basalt and andesitic basalt, basaltic breccia**—Basalt, andesitic basalt and basaltic andesite breccias; can include some pillow breccia; in part, mapped as Serrano member of Conejo Volcanics by Sonneman (1956) and Guynes (1959). (Sonneman, 1956; Guynes, 1959; Blackerby, 1965; Yerkes and Campbell, 1980; Weber, 1984; Campbell and others, 1996).

Tcop **Conejo Volcanics, basaltic lower zone, pillow basalt**—Basalt pillow lavas, pillow breccias and probable aquagene tuffs; included in Seminole Member mapped by Blackerby, 1965, and Serrano Member mapped by Sonneman, 1956, and by Guynes, 1959. (Sonneman, 1956; Guynes, 1959; Blackerby, 1965; Yerkes and Campbell, 1980; Campbell and others, 1996).

Tcobz **Conejo Volcanics, basaltic lower zone, basaltic sand**—Black basaltic sand and siltstone; included in Seminole Member of Blackerby, 1965. (Blackerby, 1965; Yerkes and Campbell, 1980; Campbell and others, 1996).

In the upper plate of Malibu Bowl Detachment Fault, three stratigraphically distinct tongues of volcanic rocks are interbedded with members of the Calabasas Formation:

Tcom **Conejo Volcanics, Malibu Bowl Tongue**—Andesitic and basaltic flows and flow breccias; underlies and tongues eastward into the Newell Sandstone Member of the Calabasas Formation and overlies the Dry Canyon Sandstone Member of the Calabasas Formation; as much as 143 m thick (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980).

Tcos **Conejo Volcanics, Solstice Canyon Tongue**—Basaltic and andesitic flows, breccias, and tuffs; local water-laid volcanic sandstone; underlies and intertongues eastward into the upper part of the Dry Canyon Sandstone Member of the Calabasas Formation, overlies Latigo Canyon Breccia Member of the Calabasas Formation; as much as 143 m thick (Campbell and others, 1970; Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Campbell and others, 1996).

Tcor **Conejo Volcanics, Ramera Canyon Tongue**—Basaltic and andesitic breccias, tuff-breccias, and flows(?); minor volcanic sandstone; underlies, and upper part intertongues with lower part of Escondido Canyon Shale Member of the Calabasas Formation; underlain in some areas by shallow marine strata of the Topanga Canyon Formation which is cut out locally by the Malibu Bowl Detachment Fault; as much as 518 m thick. (Campbell and others, 1970; Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Campbell and others, 1996).

Ti **Intrusive rocks, undivided (middle Miocene)**—Dikes, sills and irregularly shaped intrusive bodies of diabase, basalt, and andesite; commonly pervasively altered and easily eroded, undercutting slopes and, therefore, commonly spatially associated with toes of landslides; sills are larger and more abundant in the Topanga Canyon Formation at shallow stratigraphic depths below the base of the Conejo Volcanics; intrusive along the Malibu Bowl Detachment Fault only where Topanga Canyon Formation and younger strata are carried in the upper plate; (widespread in central and western Santa Monica Mountains; Yerkes and Campbell, 1980; Campbell and others, 1996; Yerkes and Campbell, 1994. In the central and western Santa Monica Mountains these are related to the Conejo Volcanics; however, in the eastern Santa Monica Mountains and elsewhere they may be related to other volcanic centers of roughly the same age (for example, small dikes mapped by Saul (1976) in the Mount Wilson 7.5' quadrangle).

Tid **Intrusive rocks, dacite (middle Miocene)**—Dacite dikes, irregular intrusive bodies in older Conejo rocks, and a plug intrusive into Topanga Canyon Formation; (Dibblee and Ehrenspeck, 1993, p. 89).

Tia **Intrusive rocks, andesitic (middle Miocene)**—Andesitic dikes, sills and irregular intrusive bodies, chiefly sills in Topanga Canyon and Vaqueros Formations, and dikes in older rocks.

Tib **Intrusive rocks, basaltic (middle Miocene)**—Basaltic, diabasic, and gabbroic dikes, sills and irregular intrusive bodies, chiefly sills in Topanga Canyon Formation and following detachment faults, and dikes in older rocks.

Tim **Mixed rocks (middle Miocene and early or early middle Miocene)**—Very fine- to fine-grained basalt, pervasively intrusive into black siltstone and very fine-grained sandstone of the Topanga Canyon Formation on a spacing too intimate to map separately at 1:12,000-scale; (Campbell, unpublished mapping, 1967-1976).

Ttc **Topanga Canyon Formation (middle and early Miocene)**—Marine sandstone, commonly arkosic, with interbedded siltstone, pebbly sandstone and pebble-cobble conglomerate; generally well indurated; recognized only in the central and western Santa Monica Mountains, where it is overlain unconformably by the Conejo Volcanics, and conformably overlies lithologically similar older Miocene and Oligocene strata of the Vaqueros Formation;

elsewhere, correlative strata are included in the undivided Topanga Group, **Tt**. Yerkes and Campbell (1979) formalized the name “Topanga Canyon Formation” and described as members lithologic facies that indicate an eastward shoaling of depositional environments from deeper shelf on the west to shoreface, estuarine, and fluvial deposits, wedging out just east of Santa Ynez Canyon. (Note that the deposition precedes post-volcanic tectonic rotation, so in early middle Miocene time the direction of shoaling was nearly north). North of Castro Peak, where the formation is undivided (**Ttc**), it is as much as 1,070 m thick. West of Santa Ynez Canyon to Malibu Canyon three members are recognized: the Cold Creek (**Ttcc**), Fernwood (**Ttcf**), and Saddle Peak (**Ttcs**) Members (Yerkes and Campbell, 1960). The Fernwood Member represents an estuarine and fluvial depositional environment, and separates shelf marine strata of the underlying Saddle Peak and overlying Cold Creek Members, both of which pinch out west of Topanga Canyon. The Fernwood Member wedges out westward and the two nearshore marine members coalesce just east of Malibu Canyon; therefore, the Formation is undivided from Malibu Canyon west to Zuma Canyon. Interbeds of siltstone and mudstone, suggestive of deepening offshore shelf depositional environments, become progressively thicker westward, and siltstone strata of the Encinal Canyon Member (**Ttce**) predominate west of Zuma Canyon. In and west of Arroyo Sequit some thick sandstone beds become prominent in the upper part of the Topanga Canyon Formation, and are here called the Big Sycamore Member (**Ttcb**).

Ttcc **Topanga Canyon Formation, Cold Creek Member**—Marine sandstone, siltstone, and minor pebbly sandstone; sandstone commonly medium grained, moderately to well sorted arkosic arenite, in laminated and graded beds as much as two meters thick, and locally biotitic. About 707 m thick in the northeast corner of the Malibu Beach 7.5’ quadrangle. Locally abundant molluscan fauna referred to "Temblor Stage" of Weaver and others (1944), including the locality for the “Topanga Canyon fauna” (about 50 molluscan species) of Arnold (1907a); named as a member of the Topanga Canyon Formation by Yerkes and Campbell (1979). Conformably overlies the Fernwood member of the Topanga Canyon formation; overlain, in most places conformably, by Conejo Volcanics. In a few localities in upper Topanga Canyon the Conejo is missing and the Cold Creek Member is accordantly overlain by the Calabasas Formation. Foraminifera from siltstone in upper part assigned to Relizian BFZ. (Yerkes and Campbell, 1980; Campbell, unpublished 1:12,000-scale mapping, 1965-1972).

Ttcf **Topanga Canyon Formation, Fernwood Member**—Paralic, fluvial, estuarine, and marine sandstone, pebbly sandstone, and mudstone, with minor tuff and limestone; interbedded with grayish-red or olive-gray mudstone and, locally, minor vitric rhyolite tuff and algal(?) limestone; fluvial sandstone forms thick lenticular ledge-forming beds and is complexly channeled and crossbedded; locally abundant closely spaced borings normal to sandstone bedding (ophiomorpha?), and rare fragments of bone occur; the shallow-water gastropod Melongena, known only from the provincial middle Miocene, occurs in sandstone on a ridge west of Topanga Canyon (in the Fernwood area) (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980). The Fernwood is overlain conformably by and intertongues into the Cold Creek Member of the Topanga Canyon Formation. The Fernwood overlies the Saddle Peak Member conformably and may intertongue with it. In several parts of the Topanga Canyon drainage area Fernwood strata are cut off down dip by Sespe Formation redbeds along the

Malibu Bowl Detachment Fault or by basalt and diabase intrusive into the fault. Fritsche (1993) and Flack (1993) propose that the Fernwood member should be assigned to the Sespe Formation. However, the Fernwood has nowhere been observed to be in direct depositional contact with Sespe strata (even though short segments of approximately located contact are shown on the map, there is no outcrop exposure of unfaulted contact relationships). Nor does the Fernwood contain any red sandstone, which is characteristic of (though not always present in) the Sespe Formation. Therefore, the usage of the source maps is retained. (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Yerkes and Campbell, 1994).

Ttcs **Topanga Canyon Formation, Saddle Peak Member**—Thick-bedded to massive, medium-to coarse grained marine sandstone, pebbly sandstone, and hackly fracturing sandy siltstone, over a 1/2-m-thick basal pebble conglomerate; conformably overlain by the Fernwood Member of the Topanga Canyon Formation; conformably overlies the Piuma Member of the Sespe Formation or its' marine correlative Vaqueros Formation; in places faulted against Sespe and older rocks, or strata of the Calabasas Formation, chiefly along the Malibu Bowl Detachment Fault. A resistant sandstone near the base of the Saddle Peak Member contains an abundant "Temblor" megafauna that includes the gastropod *Antillophos dumbleanus* (Anderson), that is apparently restricted to the middle Miocene; immediately above this bed is a 10-cm thick layer of well-preserved, in part articulated valves of the giant pectinid *Vertipecten nevadanus* (Conrad) (also called *V. bowersi*); the entire fauna is referred to the middle Miocene "Temblor" provincial Stage. Fritsche (1993) has proposed that the Saddle Peak Member be included with the Vaqueros Formation because some elements of the fauna are long ranging and are also found in the Vaqueros, and because closely similar lithofacies are found in both units. However, detailed mapping can carry continuous and overlapping stratigraphic horizons in most areas where the Saddle Peak Member is in contact with underlying Vaqueros, and the two units are mappable separately. Therefore, the usage of the source maps is retained. The unit is about 220 m thick along Piuma Road on the west shoulder of Saddle Peak. (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980).

Ttcb **Topanga Canyon Formation, Big Sycamore Member**—Alternating gray sandstone and dark gray siltstone or silty mudstone, commonly platy to shaly; chiefly mudstone with interbedded thin- to thick-bedded lenticular sandstone in sets that locally coalesce to massive beds; sandstone grain size variable, with local rip-up clasts of shale, and pebbly sandstone with polished, rounded chert pebbles; mudstone interbeds commonly thin-bedded to shaly. A rare occurrence of detrital glaucophane in sandstone is the earliest known north of the Malibu Coast Fault. Sonneman (1954) estimated a total thickness of 2,400 ft. (732 m) to 3,500 ft. (1,066 m). Mapped as the "Upper Member of the Sycamore Formation" by Sonneman (1956); mapped as individual sandstone beds in the "Undivided Topanga Canyon Formation" by Dibblee and Ehrenspeck (1990); here called "Big Sycamore Member of the Topanga Canyon Formation" to follow rules of the North American Code. Fossils include: locally common *Vertipectin Nevandus* at Point Mugu; rare *Turritella Temblorensis* (Sonneman, 1954); and Relizian foraminifera (Sonneman, 1954).

Ttce **Topanga Canyon Formation, Encinal Member**—Chiefly dark gray siltstone or silty mudstone, commonly platy to shaly, but at many localities bedding fissility is obscured by a dominant conchoidal fracture, possibly indicating bioturbation; lenticular dolomitic concretions locally abundant, particularly along locally restricted stratigraphic zones as thick as 60 cm; rare medium-and fine-grained sandstone beds in the Encinal Canyon area (western Point Dume 7.5' quadrangle) increase in abundance somewhat westward in the Triunfo Pass 7.5' quadrangle. The siltstone rests conformably on sandstone of the underlying San Nicholas Member of the Vaqueros Formation, but there is apparent discordance in some places where lack of exposure prevents clear discrimination. The Encinal Canyon Member intertongues with and is overlapped conformably by the Big Sycamore Member of the Topanga Canyon Formation, and unconformably overlain by Conejo Volcanics (see discussion of base of Conejo, above). Poorly preserved foraminifera in two collections from the Encinal Canyon Road exposures reported by Yerkes and Campbell (1979) are assigned to the Relizian(?) stage and Saucesian or Relizian stages of Kleinpell (1938), respectively. Further west, in the Triunfo Pass and Point Mugu quadrangles Sonneman (1956) reports that the "Lower Member of the Sycamore Formation", which is contiguous with the Encinal Canyon Member of the Topanga Canyon Formation (Yerkes and Campbell, 1980), also contained foraminifera assignable to the Relizian Stage. A subsequent collection reported by Flack (1993) is also assigned a late Saucesian to early Relizian age. Flack (1993, p. 46) considers the Encinal Member, as well as the entire Topanga Canyon Formation, to be late early Miocene rather than early middle Miocene. (Campbell and others, 1996; Campbell, unpublished 1:12,000-scale mapping, 1965-1975; Sonneman, 1956; Dibblee and Ehrenspeck, 1990).

Western Los Angeles Basin-Continental Borderland

Tr **Trancas Formation, undivided (middle and early Miocene)**—Marine mudstone, silty shale, claystone, sandstone, and locally prominent sedimentary breccia on Lechusa Point and Point Dume; the breccias are distinctive for their abundant detritus of the Mesozoic Catalina Schist, including glaucophane schist (San Onofre breccia of Woodford and Bailey, 1928). The Trancas has been much deformed in the zone south of the Malibu Coast Fault, and no complete section is known. The Sovereign Oil Company Malibu 1 exploratory well on Point Dume drilled through 290 m of marine sandstone, mudstone, claystone, and sedimentary breccia (San Onofre Breccia) between the base of the Monterey Shale and the underlying Zuma Volcanics, assigned to the Trancas formation by Yerkes and Campbell (1979); (Point Dume and Triunfo Pass 7.5' quadrangles; Campbell and others, 1996; Campbell, 1965-1975, unpublished 1:12,000-scale mapping). The siltstones locally contain abundant foraminiferal assemblages assigned to the Saucesian (lower Miocene) and Relizian or Luisian (middle Miocene) stages of Kleinpell (1938). **Tra**—quartz-bearing calcarenites in the western part of the Point Dume 7.5' quadrangle and eastern part of the Triunfo Pass 7.5' quadrangle are distinctive for the pervasive intergranular disruption that causes original bedding to be completely masked; further west, at Sequit Point, the sandstones are seen to be coarse-grained, cross-laminated calcarenites, composed chiefly of barnacle plates and oyster fragments, with significant areas intruded by sandstone of similar composition but in which the original fabric is no longer visible (inferred

to be a result of liquefaction). An exposure of San Onofre Breccia overlying Zuma Volcanics on the tip of Point Dume, south of the Point fault, is assumed to represent the base of the Trancas Formation in that area. The Trancas may intertongue with both the Zuma Volcanics and the lower part of the Monterey Shale, but is locally unconformably overlain by upper (late Miocene) beds of the Monterey Shale.

Tz **Zuma Volcanics (middle and early Miocene)**—Basaltic, andesitic and dacitic flows, flow breccias, pillow lavas, aquagene tuffs, mudflow breccias, volcanic sand and interbedded mudstone, siltstone, sandstone, minor breccia-conglomerate; all probably deposited in a marine environment; no igneous rocks south of the Malibu Coast Fault are recognizably intrusive into the associated sedimentary rocks; sedimentary interbeds carry foraminifera referred to the Relizian or Luisian Stages (middle Miocene) of Kleinpell (1938). Weigand and Savage (1993), from a study of major element analyses, showed that most of the analyzed samples of Zuma Volcanics fall in the dacite field of the classification of LeBas and others (1986). Plagioclase phenocrysts from basalt near the tip of Point Dume have been dated at 14.6 ± 1 my (Berry and others, 1976). Base not exposed, but an equivalent section in the exploratory well, Sovereign Malibu 1 on Point Dume, is about 430 m (stratigraphic) thick above probable metamorphic basement (Catalina Schist). Although the Zuma and Conejo Volcanics fall within the same range of ages, the overlying and underlying sedimentary strata, and the basement rocks, are significantly different, suggesting that they could be related to different extrusive centers. (Campbell and others, 1970, 1996; Yerkes and Campbell, 1980; and Campbell, unpublished 1:12,000-scale mapping, 1967-1971).

Soledad Basin and San Andreas Fault Zone

Tvz **Vasquez Formation, undivided (early Miocene to Oligocene?)**—Yellowish and reddish sandstone, conglomerate, and interbedded andesite-basalt, lying on pre-Tertiary crystalline basement rocks and unconformably below strata of Tick Canyon Formation; total thickness as much as 3,810 m (Jahns and Muehlberger, 1954). Includes numerous beds and lenses of megabreccia, many monolithologic. Named by Sharp (1936); further described by Jahns (1939). (Dibblee, 1996a,b).

Tvza **Vasquez Formation, andesitic volcanic rocks (early Miocene? to late Oligocene)**—Dark-gray to dark reddish-brown andesite and basaltic andesite, hard, very fine-grained matrix with fine- to medium euhedral phenocrysts of plagioclase feldspar. Occasional flow banding, conglomeratic layering, and some silica-filled amygdules. Outcrops locally exhibit sub-parallel sheet jointing.

Tvzb **Vasquez Formation, basaltic volcanic rocks (early Miocene? to late Oligocene)**—Dark-gray, basaltic to andesitic volcanic rocks. Unit contains small phenocrysts of augite and olivine. Outcrop exposures are highly jointed and resistant, with weathered surfaces dark-gray to dark-brown.

Tvzc **Vasquez Formation, non-marine conglomerate (early Miocene? to late Oligocene)**—Pebble- to cobble fluvial conglomerate and red clayey siltstone. Unit consists of sub-rounded to

rounded clasts of gray, tan, pink, and lavender volcanic rocks. Also contains quartz monzonitic to granodioritic clasts.

Tvzs **Vasquez Formation, sedimentary rocks (early Miocene? to late Oligocene)**—Pebble- to cobble fluvial conglomerate and red clayey siltstone. Unit consists of sub-rounded to rounded clasts of gray, tan, pink, and lavender volcanic rocks. Also contains quartz monzonitic to granodioritic clasts.

Topatopa Mountains and eastern Santa Ynez Range

Trn **Rincon Formation (early Miocene and late Oligocene)**—Marine shale and mudstone with dolomitic and limonitic concretions as much as 0.65 m in diameter (Fillmore 7.5’ quadrangle); foraminiferal faunas referred to the Zemorrian and Saucesian Stages (early Miocene) of Kleinpell (1938); thickness about 275 m. Overlain, apparently accordantly, by shale and mudstone assigned to the lower part of the Modelo formation (which, in this area, is designated middle and upper Miocene), and conformably overlies Vaqueros Formation strata. The type section for the Rincon Formation is approximately 30 mi. to the west in the vicinity of Rincon Point where the name, Rincon Shale, was suggested by Kerr (1931) (south flank of Santa Ynez Mountains, Fillmore and Piru 7.5’ quadrangles; Eschner, 1969). Fritsche (1993) proposed that similar rocks within a similar age-range in the western Santa Monica Mountains (the Encinal Member of the Topanga Canyon Formation and the Danielson Member of the Vaqueros Formation) should be termed "tongues" of the Rincon Formation; however, we have retained the nomenclature of the source maps

Western Santa Monica Mountains, Oak Ridge and eastern Ventura Basin

Tv **Vaqueros Formation, undivided (early Miocene and Oligocene)**—A heterogeneous sequence of thick- and medium-bedded sandstone and interbedded siltstone and mudstone; sandstone ranges from coarse- to very fine-grained, chiefly biotitic arkosic arenites and wackes; siltstone and mudstone interbeds commonly dark gray, but can be greenish or reddish in color; commonly carries *Turritella inezana* and other elements of the "Vaqueros fauna". Although the name was first used in central California (Hamlin, 1904) and subsequently extended on the basis of faunal elements, it has long been used in coastal Southern California, and is used consistently throughout intervening areas, to refer to a well-recognized and widespread, predominantly marine sequence that contains a distinctive molluscan fauna (Loel and Corey, 1932). Since Addicott (1972) noted that the range of the Temblor fauna included the range of the Vaqueros fauna in the Temblor Range type area, some authors (Fritsche, 1993; Dibblee, 1989a) have proposed abandoning the name, Vaqueros, and combining the pre-Conejo post-Sespe strata into a single unit. However, in nearly all the problematical areas there are sufficient continuous or overlapping beds, as well as differences in fauna, to provide a realistic basis for mapping separate formations. In the Santa Monica Mountains a complete section in the vicinity of Castro Peak, where the Vaqueros accordantly overlies the nonmarine Sespe formation, is as much as 760 m thick; east of Malibu Canyon however, shoreface facies intertongue with nonmarine strata of the Sespe Formation, and Vaqueros strata are not present in and east of Topanga Canyon. Along the north side of Simi Valley, Vaqueros strata about 600 m thick lie

accordantly above Sespe redbeds and are overlain by Conejo Volcanics; the Vaqueros wedges-out to the east in the Simi Valley West 7.5' quadrangle. In the Simi Valley area, Squires and Filewicz (1983, Fig. 2) show the Vaqueros as approximately 310 m in thickness, intertonguing with and overlying the Sespe Formation; it pinches out eastward beneath the unconformably overlying Conejo Volcanics. North of Fillmore, the easternmost Vaqueros is about 183 m thick. (Cemen, 1977; Eschner, 1969; Bailey, 1951). Oborne (1993) has described the several interbedded lithofacies that are present to the west of Topanga Canyon and interprets them to represent deposition during a rapid marine transgression from west to east over nonmarine strata of the Sespe. This compilation retains the usage and nomenclature of Yerkes and Campbell, 2005. (western Santa Monica Mountains, western Topatopa Mountains, and north side of Simi Valley; Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Campbell and others, 1996; Eschner, 1969; Bailey, 1951; Cemen, 1977; Squires, 1983a; Sonneman, 1956; Durrell, 1954). Includes:

Tvn **Vaqueros Formation, San Nicholas Member**—Very thick bedded to massive cliff- and ledge-forming marine sandstone, generally very light gray to pale bluish gray; rare interbeds and partings of siltstone and shale, commonly dark gray. Sandstone, very fine- to very coarse-grained arenite, locally pebbly; thick beds show internal cross lamination, parallel, lamination, and disturbed (burrowed?), laminations; local common barnacle detritus. Generally conformably underlain by the Danielson Member of the Vaqueros Formation; however, locally thinned where it rests on older rocks beneath the Zuma Detachment Fault, as in Encinal Canyon. Conformably overlain by the Encinal Member of the Topanga Canyon Formation. Mapped as "Nicholas Formation" by Sonneman (1956), named for exposures in the vicinity of San Nicholas Canyon (Triunfo Pass 7.5' quadrangle); formalized as a member of the Vaqueros Formation by Yerkes and Campbell (1979). (Campbell and others, 1996; Campbell, unpublished 1:12,000-scale mapping, 1967-1975).

Tvd **Vaqueros Formation, Danielson Member**—Grayish black, very fine-grained, marine sandy siltstone or mudstone, in medium and thin beds, generally with indistinct parallel lamination; fractures commonly conchoidal or irregularly subparallel to bedding, but locally platy or shaly. In San Nicholas Canyon, several prominent interbeds, 1/3 to 1 m thick, of calcareous very fine-grained sandstone and sandy mudstone contain fossil remains of *Turritella inezana* Conrad in such numbers as to locally form biostromes (Yerkes and Campbell, 1979, p. E12). Mapped as "Danielson Formation" by Sonneman (1956), named for exposures on the Danielson Ranch in Big Sycamore Canyon (Triunfo Pass 7.5' quadrangle); formalized as a member of the Vaqueros Formation by Yerkes and Campbell (1979). (Sonneman, 1956; Campbell and others, 1996; Campbell, unpublished 1:12,000-scale mapping, 1967-1975).

Western Santa Monica Mountains, Oak Ridge and eastern Ventura Basin

Ts **Sespe Formation, undivided (early Miocene, Oligocene, and late Eocene)**—A nonmarine "redbed" sequence of sandstone, pebbly sandstone, varicolored mudstone, and pebble-cobble conglomerate; sandstone beds commonly very thick to massive, with strong internal cross lamination; and rare thin interbeds varicolored reddish, greenish and grayish mudstone. The

sandstone beds are characteristically red in color, chiefly as a result of intergranular hematized biotite; several sections include beds that lack the characteristic red color. The only complete section of the Sespe exposed in the Santa Monica Mountains is in the Solstice Canyon-Castro Peak area, where about 1000 m of the nonmarine strata are in depositional contact on (and accordant with) the underlying marine Llajas Formation, and accordantly beneath the overlying marine Vaqueros Formation. Elsewhere in the Santa Monica Mountains, both to the east and to the west, the Sespe is in fault contact with underlying older strata, chiefly along the Zuma Detachment Fault. At the west end of the Simi Hills about 1365 m of Sespe strata lie accordantly above the marine Llajas and unconformably below Conejo Volcanics. Along the north side of Simi Valley, Sespe exposures total as much as 1656 m in thickness in the west (Simi Valley West 7.5' quadrangle), but wedges out to the east, north of Santa Susana Pass (Simi Valley East 7.5' quadrangle). Along the north flank of Oak Ridge the Sespe can be as much as 2135 m thick, based in part on drill-hole data. In the western Topatopa Mountains, north of Fillmore, the Sespe is about 430 m thick between the underlying marine Coldwater Formation and overlying marine strata assigned to the Vaqueros Formation (Fillmore 7.5' quadrangle). The name, Sespe Formation, was introduced by Watts (1897) and further described by Bailey (1947) for exposures in the vicinity of Sespe Creek, north of Fillmore, and has been extended over large parts of coastal southern California by various workers. Generally, it has been applied to a thick nonmarine sandstone, conglomeratic sandstone and siltstone sequence that is underlain by marine Eocene strata and overlain by marine Miocene beds.

Tsp **Sespe Formation, Piuma Member (early Miocene)**—In contrast to the thicker bedded, more coarsely grained sandstone and conglomerate of the undivided Sespe Formation below, the Piuma Member is distinguished by thinner individual beds, sandstone of generally finer grain size, absence of pebble and cobble conglomerate, and greater abundance of interbedded lacustrine or lagoonal siltstone. The member name was formalized by Yerkes and Campbell (1979) for the upper of two tongues of the Sespe that can be easily distinguished where strata of the marine Vaqueros Formation separate them; the Vaqueros wedges out eastward, but the contact between the Piuma Member and the undivided Sespe below can be carried some distance eastward beyond the Vaqueros wedge-out. (Yerkes and Campbell, 1980).

Topatopa Mountains and eastern Santa Ynez Range

Tcw **Coldwater Formation (late Eocene)**—Marine arkosic sandstone and shale, with lenses of pebble conglomerate and oyster reefs; thickness about 390 m. Earliest use of "Coldwater Sandstone Member" by Kew (1924); referred to "Coldwater Formation" by Bailey (1947). (Eschner, 1969).

Tcz **Cozy Dell Formation (late to middle Eocene)**—Well-bedded brown clay shale and mudstone; thickness as much as 600 m. Earliest use of "Cozy Dell Shale " member of the Tejon Formation by Kerr and Schenk (1928); described as "Cozy Dell Shale" by Dibblee (1950). (Eschner, 1969).

Tma **Matilija Formation, undivided (middle to early Eocene)**—Marine sandstone, arkosic, very well indurated, and interbedded mudstone and siltstone. Conformable beneath Cozy Dell Formation; base not exposed in the map area; total thickness exceeds 1 km. Molluscan fossils are of the Tejon Stage (late Eocene); however, interbedded shale contains foraminifera referred to the Ulatisian and Narizian (early to middle Eocene) Stages of Mallory (1959). "Matilija sandstone" member of the Tejon Formation defined by Kerr and Schenk (1928), described as Matilija Sandstone by Dibblee (1950). (Eschner, 1969). Includes:

Tmasl **Matilija Formation, siltstone and shale**—Micaceous shale with thin sandstone interbeds; Foraminifera referred to the Ulatisian and Narizian (middle to early Eocene) Stages of Mallory (1959). (Eschner, 1969).

Santa Susana Mountains, Simi Hills and Santa Monica Mountains

Tl **Llajas Formation (middle to early Eocene)**—Shallow marine, light-gray to yellowish-gray, very fine- to medium-grained sandstone, laminated siltstone and local mollusk coquina beds; interfingers with alluvial conglomerate (Tlc) at the base; sandstone is laminated to bioturbated; moderately indurated (Irvine, 1990, 1991; Squires, 1983b); section is about 1,800 ft. (550 m) thick. Locally contains fossil mollusks assigned to the "Domengine Stage" (Weaver and others, 1944); Figure 3 of Squires (1983b) suggests the basal portion corresponds to the upper "Capay Stage". As summarized by Squires (1983b), the Llajas section in the Simi Valley area was originally assigned to the "Tejon" or "Meganos" Formations (e.g. Kew, 1919, 1924); subsequently assigned informally to the Llajas Formation by Schenck (1931) and McMasters (1933); more formally named by Cushman and McMasters (1936) for surface outcrops at the type section on the northwest side of the north branch of Llajas Canyon (now known as Chivo Canyon and formerly known as "Oil Canyon"), and from corehole data obtained from the nearby Tapo No. 42 oil well, all located on the northeast side of Simi Valley) (Simi Valley East, Oat Mountain, Thousand Oaks 7.5' quadrangles, and correlative strata in the Point Dume, Malibu Beach, and Topanga 7.5' quadrangles). Includes:

Tlc **Llajas Formation, basal conglomerate**—Alluvial to shallow marine, light-brown to reddish-brown conglomerate interbedded with subordinate, poorly sorted, generally massive sandstone (Irvine, 1990); conglomerate is typically unstratified, ungraded, clast supported, and poorly sorted; clasts are typically well rounded, cobble size, and composed dominantly of quartzite with lesser amounts of granitic, volcanic and metamorphic rocks (Squires, 1983b). Squires (1983b) interprets this facies as a coastal alluvial fan or fan delta deposit. This unit defines the base of Llajas strata relative to the underlying Santa Susana Formation in the area northeast of Simi Valley (Evans and Miller, 1978).

San Gabriel Mountains

Tj **Juncal Formation (late early Eocene)**—Marine, brown amalgamated sandstone beds with interbedded conglomeratic sandstone, conglomerate and siltstone exposed in Elsmere Canyon (San Fernando 7.5' quadrangle); moderately to well cemented; clasts include exotic purple volcanic porphyry and local large siltstone rip-up clasts, and range up to boulder size. The coarse-

grained units are interpreted as turbidity current deposits in a middle- to upper-fan submarine fan depositional environment (Squires, 2008). The Elsmere Canyon section has a measured thickness of about 520 m (Squires, 2008) and it locally contains fossil mollusks originally assigned to the "Domengine Stage" of late early to early middle Eocene age (Weaver and others, 1944); however, detailed studies by Squires (2008) suggest the section at Elsmere Canyon represents the transition from the "Domengine Stage" to the underlying "Capay" Stage, at an age of about 50.5 Ma. The Eocene strata at Elsmere Canyon were first assigned to the "Domengine formation" by Brown and Kew (1932) and this usage was followed by early workers in the area (e.g. Oakeshott, 1950, 1958), and this usage was followed on Version 1.0 of the Los Angeles 30'x60' geologic map (Yerkes and Campbell, 1995). The Elsmere section was left unnamed by Winterer and Durham (1962), Kern (1973), and Dibblee (1991). Some subsequent workers assigned the name "Llajas Formation" to this section (e.g. Seedorf, 1983 and Yeats and others, 1994). Squires (2008) re-evaluated the past nomenclature and conducted additional field studies, and concluded the Elsmere Eocene section is more consistent lithologically with exposures of Juncal Formation mapped to the northwest in the Piru Creek area (Squires, 1987) rather than the type Llajas section, and the Piru and Elsmere sections may have originally been contiguous (Yeats and others, 1994).

The term "Martinez Formation" was previously retained on Version 1.0 of the Los Angeles 30x60' sheet for coarse-grained marine greenish-black to light olive-gray sandstone, with thin interbeds of black shale, and lenticular beds of well-cemented conglomerate of Eocene or Paleocene age mapped as fault-bounded slivers along the San Gabriel Fault between Bear Divide and Tujunga Canyon on the Sunland and San Fernando 7.5' quadrangles (Oakeshott, 1958; Yerkes and Campbell, 2005); clasts reportedly include exotic volcanic porphyry. The term "Martinez Formation" was imported from a type locality in the San Francisco Bay area; the term "Martinez" now generally refers to a Paleocene molluscan stage. Assignment of this section to the "Martinez Formation" was reportedly based on lithologic similarity with "Martinez" strata mapped in the Tejon quadrangle (Oakeshott, 1958) and on the discovery of the age-diagnostic fossil *Turritella pachecoënsis* (Clements and Oakeshott, 1935); however, use of the term "Martinez" has generally been abandoned as a lithologic formation name in southern California. Squires (pers. comm. 2014) notes that the reported specimens of fossil *Turritella* cannot be located for review and additional specimens could not be found during recent field studies; based on field observations of the stratigraphy and presence of exotic volcanic porphyry clasts, Squires suggests that the fault-bounded slivers may actually be part of the Juncal Formation; the fault-bounded slivers are therefore queried as Juncal Formation herein.

Santa Susana Mountains, Simi Hills and Santa Monica Mountains

Tss **Santa Susana Formation (early Eocene to late Paleocene)**—Marine clay shale and conchoidally fractured mudstone and siltstone with interbeds of fine- to medium-grained sandstone and lenses of pebble-cobble conglomerate; gray limestone concretions common in shale; locally contains foraminifera; locally abundant mollusks diagnostic of the "Meganos" and "Martinez" Stages (Saul, 1983); thickness as much as 1,000 m in the Simi Hills; unit thickness varies laterally and rapid lateral facies changes are common across map area. Named by Nelson (1925) for exposures in the Simi Hills near the town of Santa Susana. As

summarized by Parker (1983, 1985), lower Tertiary strata in the Simi Hills were originally correlated and assigned to the "Martinez and/or Meganos Formations" by early workers, including Waring (1914, 1917), Kew (1919, 1924), and Clark (1921). Nelson (1925) raised the "Martinez Formation" to group status and subdivided it into the Simi Conglomerate, Las Virgenes Sandstone, and the Martinez marine member, overlain by the Santa Susana Formation. Most literature published to date follows some form of Nelson's terminology, but the placement of contacts varies considerably among different authors. Parker (1983, 1985) modified Nelson's Santa Susana Formation to include the underlying Martinez marine member, thereby encompassing all strata above the Simi Conglomerate and Las Virgenes Sandstone and below the Llajas Formation in the Simi Hills and northeastern Simi Valley. Parker and other authors abandoned "Martinez Group" and "Martinez marine member" because "Martinez" is a molluscan Stage name, imported from a central California type locality, and no longer considered appropriate to use as a formation name for this interval. Colburn and others (1988) and Colburn and Novak (1989) extended Parker's nomenclature to correlative rocks in the Santa Monica Mountains and included beds mapped as Coal Canyon Formation by Yerkes and Campbell (1979, 2005) in the Santa Susana Formation. Distribution of lower Tertiary strata in the Simi Valley area on this map is based on Squires (1983a), which includes Parker's nomenclature and contacts. Parker described the lower Tertiary units in terms of western and eastern facies based on the location of the stratigraphic sections relative to the "Runkle Canyon fault" (Squires, 1983a). The western facies of the Santa Susana Formation in the Simi Valley area (Simi Valley East, Calabasas and Thousand Oaks 7.5'quadrangles) overlies the Las Virgenes Sandstone with a gradational to sharp contact and is disconformably overlain by the Llajas Formation. It generally consists of a lower unit of densely bioturbated, fossiliferous, fine- to medium-grained sandstone and an upper unit dominated by poorly fossiliferous fractured mudstone and siltstone interbedded with subordinate sandstone and minor conglomerate. The lower unit represents transition zone and offshore to shelf deposits and the upper unit represents deposition within a slope environment. The eastern facies overlies the Simi Conglomerate with a gradational or sharp contact and is overlain disconformably by the Llajas Formation. The eastern facies is more variable, but generally consists of fractured mudstone and siltstone similar to the western facies with discontinuous interbeds of sandstone and conglomerate. East of Meier Canyon, mudstone and siltstone are present in the lower half and sandstone and conglomerate present in the upper half. Sandstone occurs as discontinuous lenses in conglomerate and in beds up to 20 meters thick. Near Runkle Canyon, sandstone occurs as thin interbeds within the mudstone and siltstone and in tongues up to 150 m with locally abundant megafossils occurring in layers within concretionary beds. Northeast of Simi Valley in Poison Oak Canyon, beds are dominantly mudstone interbedded with minor sandstone above two tongues of Simi Conglomerate. These beds represent inner fan deposits. Interbedded sandstone and conglomerate near Meier Canyon represent the coarse portion of an inner fan and slope deposits. The uppermost portion of the Santa Susana Formation in both the western and eastern facies consists of sandstone with megafossils and microfauna indicative of a shelf environment and may record a basin filling and shoaling event prior to the deposition of the nonmarine basal Llajas conglomerate., In the Santa Monica Mountains, Santa Susana strata

include marine sandstone, pebble conglomerate, siltstone and algal limestone. Sandstone is very fine to medium grained, poorly to well sorted, consisting of subrounded quartz and feldspar grains in a sparse clay matrix, locally biotitic; locally contains abundant mollusks; beds commonly are thick and locally have graded upper parts and sharp upper contacts. Siltstone and silty claystone are present locally in the upper part of the formation; closely jointed, conchoidal fracture, and containing abundant biotite; local partings of fine-grained silty biotitic sandstone, and calcareous beds or concretions as thick as 15 cm and as long as 1 m. Pebble-cobble conglomerate forms resistant steep slopes in Carbon and Topanga Canyons; in beds as much as 7 m thick with scattered pebbles, boulders, slabs, and interbeds of mudstone and medium-to coarse-grained sandstone. The Yerkes and Campbell (2005) map shows the Coal Canyon Formation to be about 335 m thick in Solstice Canyon, the only complete section exposed in the Santa Monica Mountains. The thickness summed from incomplete sections in the Carbon Canyon-Topanga Canyon area is as much as 450 m. Commonly carries a molluscan fauna that includes the Martinez-Stage gastropods *Turitella pachecoensis* and *Mesalia martinezensis* (Gabb, 1869). Colburn and others (1988) and Colburn and Novak (1989) prepared five stratigraphic columns and detailed geologic maps of the section localities along the axis of the Santa Monica Mountains from Solstice Canyon in the west to Runyon Canyon near Hollywood and correlated Simi Conglomerate, Las Virgenes Sandstone, and Santa Susana Formation strata. The Las Virgenes Sandstone and Simi Conglomerate are not separately delineated on the current version of the Los Angeles compilation map in the central and eastern Santa Monica Mountains (Malibu Beach, Topanga, Beverly Hills, and Hollywood 7.5’ quadrangles) and Simi Conglomerate and Las Virgenes Sandstone strata mapped by Colburn and Novak (1989) are included in Santa Susana Formation in these areas. Yerkes and Campbell (1979) mapped the Simi Conglomerate in Solstice Canyon (Point Dume 7.5’ quadrangle), but did not recognize the Las Virgenes Sandstone in the Solstice Canyon section, and included most of that interval in the Simi Conglomerate. In the Santa Monica Mountains, the Santa Susana Formation overlies and interfingers with the nonmarine Las Virgenes Sandstone (included in Simi Conglomerate on this map) or overlies the late Cretaceous Tuna Canyon Formation; the relations are generally accordant but locally unconformable. In Solstice Canyon, the Santa Susana Formation is overlain disconformably(?) by marine strata of Eocene age. (Squires, 1983a; Yerkes and Campbell, 1980; Campbell and others, 1996). Includes:

Tssl **Santa Susana Formation, limestone**—Algal limestone occurs as scattered lenses and pods in siltstone sequences east of Topanga Canyon, most prominently in the eastern wall of Santa Ynez Canyon.

Santa Susana Mountains, Simi Hills and Santa Monica Mountains

Tlv **Las Virgenes Sandstone (early(?) Paleocene)**—Nonmarine to marine light-gray to yellowish orange, predominantly medium- to coarse-grained weakly to moderately indurated sandstone with green interbedded mudstone and red-bed mudstone, and minor pebble conglomerate; megafossils and burrows are present in the upper part of the section at Bus Canyon; thin sequence, locally as thick as 195 m near Bus Canyon in the Simi Hills, but thins westward to zero; originated as sandy, braided alluvial and meandering stream deposits on a coastal plain;

upper part represents nearshore marine deposits (Parker, 1983); conformably overlies Simi Conglomerate and is overlain by and interfingers with the Santa Susana Formation. Named by Nelson (1925) for exposures near Las Virgenes Canyon in the Simi Hills. Colburn and others (1988) and Colburn and Novak (1989) correlated Las Virgenes Sandstone from the Simi Hills to five localities in the Santa Monica Mountains. These strata are included in the Santa Susana Formation on the current Los Angeles compilation map in the central and eastern Santa Monica Mountains (Malibu Beach, Topanga, Beverly Hills, and Hollywood 7.5' quadrangles). Yerkes and Campbell (1979, 2005) did not recognize the Las Virgenes Sandstone in the Solstice Canyon section (Point Dume 7.5' quadrangle), and included most of that interval in the Simi Conglomerate, including distinctive pisolite-bearing beds that Colburn assigned to the Las Virgenes Sandstone. Pisolite-bearing red beds are also mapped in the Bus Canyon section in the Simi Hills by Parker (1985), but he included the beds in the Simi Conglomerate. (Squires, 1983a).

Tsi **Simi Conglomerate, undivided (Paleocene)**—Thin, predominantly nonmarine cobble-boulder conglomerate mapped at the base of the Tertiary sequence in the Simi Hills, the Santa Monica Mountains, and northeast of Simi Valley. The conglomerate is poorly bedded, weakly to moderately indurated and contains abundant well-rounded, polished cobbles and boulders of quartzite, granitic, rhyolitic, and gneissic rocks in conglomeratic, coarse-grained sandstone. Distribution of lower Tertiary strata in the Simi Valley area shown on this map is based on Squires (1983a), which includes Parker's (1983, 1985) nomenclature and contacts. Parker described the lower Tertiary units in terms of western and eastern facies based on the location of the stratigraphic sections relative to the "Runkle Canyon fault" (Squires, 1983a). According to Parker, Simi Conglomerate west of the Runkle Canyon fault (Squires, 1983a) represents alluvial fan and braided river deposits and Simi Conglomerate east of the Runkle Canyon fault in Runkle and Meier Canyons and northeast of the Simi Valley represents channel and inner fan facies of a deep-sea fan, based on observed sedimentary structures and microfaunal studies summarized by Parker (1983, 1985). The marine conglomerate included by Parker in the Simi Conglomerate is considered by other authors to be part of the Santa Susana Formation or an unnamed Paleocene marine unit (Hanson, 1981).Yerkes and Campbell (1979) tentatively correlated beds described in the Simi Hills by Nelson (1925) as the Simi Conglomerate with lithologically similar beds in the Solstice Canyon area of the Santa Monica Mountains, and the correlation is supported in subsequent detailed petrographic work by Colburn and Novak (1989). In Solstice Canyon (eastern Point Dume 7.5' quadrangle) the conglomerate includes a 1-m-thick bed of brick-red pisolitic clayey sandstone, which Colburn and Novak (1989) include in the Las Virgenes Sandstone. Simi Conglomerate beds mapped by Colburn and Novak (1989) in the central and eastern Santa Monica Mountains (Malibu Beach, Topanga, Beverly Hills, and Hollywood 7.5' quadrangles) are included in the Santa Susana Formation on the current Los Angeles compilation map. Correlative strata in the Santa Susana Mountains, mapped as "Martinez Formation" by Evans and Miller (1978), are here included with the Simi Conglomerate. Evans and Miller (1978) recognized three local lithologic members.

Tsic **Simi Conglomerate, conglomeratic member**—Massive, yellowish brown pebble to cobble conglomerate with numerous brownish sandstone lenses as much as 1 m thick and continuous

for a few tens of meters along strike. Locally contains molluscan fauna referred to the Martinez Stage (Paleocene) (Evans and Miller, 1978).

Tsis **Simi Conglomerate, shale member**—Light olive gray micaceous siltstone, silty shale, and shale with local thin interbeds of brown, medium- to coarse-grained sandstone. Dark gray limestone occurs in the shale as thin, discontinuous beds as well as small pods and lenses (Evans and Miller, 1978).

Tsia **Simi Conglomerate, sandstone member**—Massive, gray to brownish, coarse- to very coarse-grained sandstone, cemented by silica and hydrous iron oxides, with thin interbeds of micaceous siltstone and lenses of boulder, cobble and pebble conglomerate; locally strongly cemented by calcite (Evans and Miller, 1978).

Santa Susana Mountains, Simi Hills and central and western Santa Monica Mountains

Kc **Chatsworth Formation (late Cretaceous)**—Dominantly turbidite sandstone, massive, thick-bedded, medium- to coarse-grained, well-cemented; conglomeratic sandstone with rounded, polished clasts of quartzite, porphyry and granitic rocks; with minor siltstone and conglomerate. Molluscan faunas include the ammonite *Metaplacenticeras californicum* and the gastropod *Tuttitella pescaderosensis*, referred to the Campanian or Maestrictian (late Cretaceous) Stages (Popenoe, 1973; Saul and Alderson, 1981); benthic foramifera from mudstones in the lower-middle part of the sequence are referred to the late Campanian. Exposed thickness exceeds 1830 m; base not exposed nor drilled; overlain with slight unconformity by Paleocene strata along north side of the Simi Hills, elsewhere, as along the south flank of the Simi Hills, unconformably overlain by Miocene beds. The name, Chatsworth Formation was introduced and defined by Colburn and others (1981) for rocks in the eastern Simi Hills near Chatsworth, that were previously mapped as “Chico Formation” or as unnamed “Upper Cretaceous Rocks” (“Chico” is a molluscan Stage name imported from central California). (Weber, 1984).

Central and western Santa Monica Mountains

Kt **Tuna Canyon Formation, undivided (late Cretaceous)**—Marine sandstone, siltstone and conglomerate. Sandstone, thick-bedded to very thick-bedded, laminated and graded arkosic wacke (turbidite); locally containing abundant fragments of black slate(?); convolute lamination in some beds, load casts, low-angle cross-lamination, or concentrations of carbonized plant fragments or mica. Fossiliferous sandstone and siltstone are present locally as interbeds or thick lenses; in Las Flores Canyon, contains several beds of olive-gray siltstone that locally contain foramifera. The Tuna Canyon Formation is nowhere completely exposed in the Santa Monica Mountains; the maximum exposed thickness, in the Pena Canyon-Tuna Canyon area, is nearly 800 m. East of Santa Ynez Canyon rests on nonmarine red conglomerate (Trabuco Formation, late Cretaceous) and the Santa Monica Slate (late Jurassic). The formation is overlain disconformably (?) by the Simi Conglomerate in Solstice Canyon, and elsewhere by a basal conglomerate of the Coal Canyon Formation (Paleocene). In several places it contains the Campanian ammonite *Metaplacenticeras sp.*; foramifera faunas are referred to zones D-2, E, and F-1 (Maestrictian or Campanian - late Cretaceous) of Goudkoff (1945). Named by Yerkes

and Campbell (1979) to replace the name “Chico”, which was imported from central California and used on earlier maps in the Santa Monica Mountains. (central and eastern Santa Monica Mountains; Campbell and others, 1996; Yerkes and Campbell, 1980; Alderson, 1988; Hoots, 1931). East of Santa Ynez Canyon the formation was subdivided by Alderson (1988) into four informal members:

Kte **Tuna Canyon Formation, informal member 'e'**—Greenish-gray shale with interbedded coarse-grained sandstone in the upper part.

Ktd **Tuna Canyon Formation, informal member 'd'**—Fine-grained, thick-bedded, fossiliferous sandstone.

Ktc **Tuna Canyon Formation, informal member 'c'**—Pebble-cobble conglomerate and minor sandstone.

Ktb **Tuna Canyon Formation, informal member 'b'**—sandstone with minor conglomerate and black shale, carrying Turonian and Coniacian ammonites.

Ktr **Trabuco Formation (late Cretaceous)**—Conglomerate with well-rounded, polished pebbles, cobbles and boulders of varicolored quartzite, porphyry, granite, basalt, and with angular chips of black slate in a matrix of soft, clayey, coarse-grained to pebbly grit. Thickness estimated at 225 m; unconformably overlies Santa Monica Slate. Name applied by Durrell (1954) for rocks of similar composition and stratigraphic position in the type area in the Santa Ana Mountains, where it was named by Packard (1916); correlation reiterated by Colburn (1973). (Yerkes and Campbell, 1980; Hoots, 1931).

Kgr **Granitic rocks (late Cretaceous)**—Includes a variety of plutonic igneous rocks ranging from quartz monzonite and granodiorite to tonalite, quartz diorite, and diorite; chiefly quartz diorite: intrudes Santa Monica Slate in the eastern Santa Monica Mountains (Durrell, 1954).

San Gabriel and Verdugo Mountains

Kgl **Granitic rocks, leucocratic granodiorite (late Cretaceous)**—Light gray to buff, fine- to medium- grained granodiorite; intrudes all other crystalline rocks in area south of south branch of the San Gabriel Fault (Smith, 1982).

Kgd **Granodiorite (Cretaceous)**—Light-gray to dark-gray, medium-grained granodiorite. Unit includes well-foliated, gneissic mafic enclaves. In thin section, samples have some hornblende, apatite, euhedral zircons, and biotite although much is altered to chlorite. Some myrmekitic texture observed in plagioclase feldspars. Exposed in northeast Pacifico Mountain quadrangle. Mapped as qd by Barrows and others (1985) and Dibblee (1997); described by Olson and Hernandez (2013) on map of adjacent Palmdale quadrangle.

Kto **Tonalite (late Cretaceous)**—Mapped by Jahns and Muehlberger (1954) as “granite and other quartz-bearing plutonic rocks”; these rocks are compositionally tonalite (D. M. Morton, oral communication, 2003) in the IUGA classification (Streckheisen, 1973).

Ktoqd **Tonalite and quartz diorite (late Cretaceous)**—Mapped by Morton (1973) as predominantly quartz diorite, grading to granodiorite, quartz monzonite and diorite; compositionally mostly

tonalite (D. M. Morton, oral communication, 2003) in the IUGA classification (Streckheisen, 1973).

Ktowd **Tonalite (Wilson Diorite of Miller, 1934) (late Cretaceous)**—Designated granodiorite and quartz diorite on source maps; identified as mostly tonalite (D. M. Morton, oral communication, 2003) in the IUGA classification (Streckheisen, 1973).

Kgrd **Granodiorite**—Gray medium to coarse grained granodiorite with quartz diorite and granite. Described as Granodiorite by Oakeshott (1958). Includes rocks mapped as the Mt Josephine Granodiorite by Carter (1980). Mostly massive, but commonly gneissoid near contacts with older rocks; locally carries large inclusions and pendants of gneiss and Placerita metasediments. (Oakeshott, 1958, Carter, 1980).

Kp **Pelona Schist (Late Cretaceous to Paleocene?)**—Greenish-gray chlorite-albite, actinolite-albite, quartz-albite, and albite-talc schists, locally interbedded with metavolcanics and brown to black quartzites; a thick, isoclinally(?) folded sequence. The protolith of the Pelona and its correlative Orocopia Schist was presumably deposited during the mid-Mesozoic, recrystallized during burial to depths of 25-35 km, and later thrust beneath western North America at rates > 4 mm/y on the Vincent thrust. Named by Hershey (1902a) for outcrops on the Sierra Pelona ridge. (Ehlig, 1981, p. 266; Jacobson, 1990; northern Mint Canyon 7.5' quadrangle, map after Jahns and Muehlberger, 1954).

Jeg **Echo granite (Jurassic)**—Coarse-grained, pinkish-orange granite and monzogranite; medium-grained, xenomorphic, inequigranular, and showing protoclastic granulation in thin section (Miller, 1946). Determined to be Jurassic in age by Barth (2008). Named by Miller (1934). (Smith, 1986).

Eastern Santa Monica Mountains

Jsm **Santa Monica Slate, undivided (late Jurassic)**—Black slate, sheared metasiltstone, and fine-grained metagraywacke; intensely jointed, isoclinally(?) folded; intruded by Cretaceous granitic pluton forming contact auriole zones of phyllite and spotted cordierite slate; rare pelecypod fragments indicate a late Jurassic age in part (Imlay, 1963). Named by Hoots (1931, p. 88) (Hoots, 1931). Includes:

Jsms **Santa Monica Slate, spotted slate**—Spotted with large crystals of cordierite; outer zone of contact aureole with nearby granitic intrusive rocks; grades to unspotted slate through a zone in which individual spots become progressively smaller outward (Hoots, 1931).

Jsmp **Santa Monica Slate, phyllite**—Chiefly mica schist and dark gray phyllite; forms inner zone of contact aureole with adjacent granitic intrusive (Hoots, 1931).

San Gabriel and Verdugo Mountains

Mzdbh **Biotite-hornblende diorite (Mesozoic?)**—Medium- to dark-gray, medium-grained biotite-hornblende monzodiorite; includes scattered small bodies of older brownish-gray coarse-grained weakly gneissic biotite quartz monzonite; intruded by leucocratic granodiorite (Smith, 1986).

Mzdhb **Hornblende-biotite diorite (Mesozoic?)**—Medium-gray, medium-grained hornblende- biotite diorite; intruded by coarse-grained hornblende diorite and younger leucocratic granodiorite (Smith, 1986).

Mzqdb **Biotite-quartz diorite (Mesozoic?)**—Medium- to dark gray, medium grained quartz diorite; slightly gneissic. Locally contains inclusions of coarse-grained quartz diorite a few m across, and small elongate bodies of marble, quartzite, and schist of Paleozoic (?) age (Smith, 1986).

Mzmg **Biotite Monzogranite (Mesozoic)**—Light gray fine to coarse grained generally non-porphyritic monzogranite. Locally includes granodiorite. Foliated to locally gneissic. Mapped by Smith (1986) as leucogranitic and metamorphic complex. (Smith, 1986; Powell and others 1983).

Mzmgp **Porphyritic Biotite Monzogranite (Mesozoic)**—Light gray fine to coarse grained generally non-porphyritic Monzogranite. Locally includes granodiorite. Foliated to locally gneissic. Mapped by Smith (1986) as leucogranitic and metamorphic complex. (Smith, 1986; Powell and others 1983).

Mzd **Biotite-Hornblende Quartz Diorite, Diorite, and Gabbro (Mesozoic)**—Dark gray fine to coarse grained diorite. Locally includes tonalite and granodiorite. Foliated. Mapped by Saul (1976) as diorite. (Saul, 1986; Powell and others 1983).

Mzhd **Hornblende Diorite (Mesozoic)**—Gray, medium- to coarse-grained hypidiomorphic granular diorite. (Smith, 1986).

Mza **Alaskite (Mesozoic?)**—Salmon-pinkish-gray, medium-grained, mildly gneissic syenogranite. Forms long thin klippe over a much larger mass of granitic rock (Smith, 1986).

Mzh **Hornblendite (Mesozoic)**—Melanocratic coarse-grained hornbledite (Powell and others, 1983).

Mzm **Mylonite (Mesozoic)**—Gray fine-grained to microcrystalline mylonite. Mapped by Smith (1986) as siliceous metasedimentary rock. (Powell and others, 1983; Smith 1986).

Mzdg **Diorite gneiss (early to middle Mesozoic)**—Dark-colored gneisses including metadiorites, massive hornblende diorite, and amphibolite and biotite schists (60-80% plagioclase, 5-15% quartz, 5% or less potassium feldspar, locally as much as 30% biotite and locally as much as 10% brown hornblende); intrudes the Placerita Formation and intruded by Cretaceous granitic rocks; (Oakeshott, 1958).

TRlgd **Mount Lowe intrusive suite, undivided (Triassic)**—A compositionally layered pluton exposed over a large area in the western San Gabriel Mountains and northeastern Soledad basin (studied and described by Ehlig, 1981); varies from hornblende diorite and quartz diorite near the base to albite-rich granite and syenite in the upper part; large phenocrysts of hornblende, orthoclase and garnet contribute to distinctive appearance (pebbles and cobbles are readily recognizable as clasts in younger gravel deposits); metamorphosed to lower amphibolite facies and upper amphibolite facies (grade apparently varies with proximity to Cretaceous intrusive rocks); average composition 60-90% feldspar, of which plagioclase (oligoclase to albite) is

most abundant and orthoclase occurs chiefly as phenocrysts, quartz ranges from a trace to as much as 25 %, averages about 10% (Ehlig, 1981). Initially named Mount Lowe Granodiorite by Miller (1926 abstract), subsequently termed Lowe Granodiorite by Miller (1934, 1946); renamed Mount Lowe intrusion by Barth and Ehlig (1988). The common usage of most source maps has been retained in this map compilation. A U-Pb age on zircon is reported as 220 ± 10 my (Silver, 1971), and a Rb-Sr whole rock age of 208 ± 14 my reported by Joseph and others (1982). Joseph and others (1982) also report a high (800-1,100 ppm) Sr content, a low initial ^{87}Sr-^{86}Sr ratio of 0.70456 ± 0.00003, and a high alkali content ($Na_2O = K_2O \sim 10$ wt.%). More recently, Barth and others (1990) report a U-Pb zircon age of 218 my. Subunits include:

TRlgb **Mount Lowe intrusive suite, biotite-orthoclase facies**—As much as 10 percent biotite in a nearly white granular plagioclase and subordinate (less than 25 percent) quartz matrix. Has orthoclase phenocrysts; hornblende phenocrysts prominent in other subunits are absent, although a few hornblende-bearing layers occur in the lower part of this subunit (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

TRlgdp **Mount Lowe intrusive suite, Porphyritic facies**—Orthoclase phenocrysts in granular matrix of plagioclase and subordinate quartz; garnet also occurs as small crystals concentrated in veinlets (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

TRlgdh **Mount Lowe intrusive suite, orthoclase-hornblende facies**—Light gray hornblende diorite (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

TRlgm **Metamorphosed Mount Lowe intrusive suite (Cretaceous and Triassic)**—Relatively uniform light-colored orthogneiss containing porphyroblasts (relict phenocrysts) of hornblende and, less commonly, potassium feldspar in a plagioclase and quartz matrix. Parent plutonic rock is (Triassic) Lowe Granodiorite and was metamorphosed during a Cretaceous orogenic event (Morton, 1973a, p. 9; and D. M. Morton, oral communication, 2003).

TRhdg **Hornblende diorite gabbro**—dark to very dark gray, medium-grained hornblende diorite gabbro. Massive to locally foliated. (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

MzPzsp **Serpentinite (Mesozoic or Paleozoic)**—Light to dark green, well foliated, sheared and slickensided serpentinite, altered peridotite (chiefly augite and olivine); slickensided fragments up to boulder size; boundaries intensely sheared and relations to adjacent rocks obscure (Barrows and others, 1975).

Pzgn **Gneiss complex (Paleozoic?)**—Feldspathic gneisses, including granitic to granodioritic augen gneisses, gneissic intrusive rocks of granitic to dioritic composition, amphibole-rich gneiss, and local interlayered schist, quartzite, amphibolite, and marble; according to Jahns and Muehlberger (1954), many of the gneisses are of hybrid origin, and some may be parts of the Placerita Formation that have been intimately injected by younger igneous material.

Pzp **Placerita Formation (Paleozoic)**—Metamorphosed sedimentary rocks, including marble, dolomite, feldspathic gneisses, graphitic marble, quartzite, calcic pyroxene hornfels and a variety of schists including feldspar-tremolite, graphite-tremolite, graphite-biotite-feldspar, and tremolite-talc; the various schists and gneisses occur as septa and pendants of all sizes in a

granodioritic host rock, along with diorite gneisses and migmatites. The best-preserved section may be as much as 600 m thick. Named by Miller (1934), for exposures in Placerita Canyon, the type locality. The age indicated by Oakeshott (1958) is pre-Cretaceous; however, Morton (oral communication, 2003) indicates the age is Paleozoic. (Central Sunland 7.5' quadrangle, Oakeshott, 1958; southern Mint Canyon 7.5' quadrangle, Saul and Wooton, 1983).

Pgn **Gneiss (Proterozoic?)**—Alternating discontinuous dark brown biotite-rich and light-colored quartz-feldspar-rich layers and lenses; layers generally about an inch thick; sheared, as expressed by an intricate structure of gneiss lenses with common local small microscopic tight flow-type folds. Described by Morton (1973) and by Crook and others (1987) as Cretaceous or older, but recently described by Morton (oral communication, 2003) as Precambrian. (Morton, 1973; Crook and others, 1987).

Anorthosite-gabbro complex of Oakeshott (1958) probably a result of differentiation of a single parent magma. Anorthosite and gabbro are pervasively shattered, sheared and brecciated. Barth and others (1995) indicate a general age of 1,200 Ma on the basis of dated zircons and thermobarometry, substantially older than 930 ± 90 Ma and 810 ± 80 Ma lead-alpha zircon ages determined by Neuerburg and Gottfried (1954).Unit is composed of sub-units mapped and described by Carter (1980) including:

Pan **Anorthosite-gabbro complex, anorthosite (Proterozoic)**—Composed of medium- to very coarse-grained plagioclase; light gray and white; contains more than 90 percent plagioclase (andesine) and less than 10 percent mafic minerals (mostly hypersthene); grain size ranges from less than 1 mm to more than 30 cm.

Pagb **Anorthosite-gabbro complex, anorthosite with gabbro (Proterozoic)**—Composed of anorthosite as above with layers or zones of gabbro or diorite.10 to 50% mafic minerals, mostly hornblende, white to gray, medium to coarse grained (Carter, 1980, 1982).

Psy **Anorthosite-gabbro complex, syenite (Proterozoic)**—Composed of plagioclase feldspar (andesine) with lesser potassium feldspar (Microcline-perthite). Has minute black specks of magnetite which may be altered from augite. Rock is generally tan, stained rusty tan to brown by limonite where weathered. (Jahns and Muehlberger, 1954; Oakeshott, 1958; Carter, 1980, 1982).

Pfgb **Anorthosite-gabbro complex, ferro-gabbro (Proterozoic)**—Composed mostly of ferro-magnesian minerals with lesser feldspars dark greenish brown. Contains sub-metallic molecules of iron ilmenite (magnetite-titanite). Intrusive into Pan and Psy. (Carter, 1980, 1982).

Plgb **Anorthosite-gabbro complex, leucogabbro (Proterozoic)**—Light gray compositionally layered gabbro, leucogabbro and anorthosite (Carter, 1980, 1982).

Pjgb **Anorthosite-gabbro complex, jotunitic gabbro (Proterozoic)**—Light gray compositionally layered gabbro with antiperthitic andesine. (Carter, 1980, 1982).

Pjgba **Anorthosite-gabbro complex, jotunite-norite-gabbro-diorite (Proterozoic)**—Composed of hornblende, chlorite, biotite, and actinolite (altered from pyroxene) and limonite-magnetite,

dark greenish brown, locally compositionally layered, contains inclusions of anorthosite (Carter, 1980, 1982).

Pggn **Anorthosite-gabbro complex, gabbroic to anorthositic gneiss (Proterozoic)**—Rocks of the anorthosite-syenite complex that were strongly deformed and in part recrystallized during emplacement of the Triassic Mt Lowe Intrusive suite (Carter, 1980, 1982).

Pgb **Anorthosite-gabbro complex, gabbro (Proterozoic)**—Gray, mottled with greenish or brownish black, and solid dark greenish and brownish black; mafic mineral content ranges from 35 percent to 65 percent of rock; compositionally ranging from gabbroic anorthosite to norite, diorite, pegmatitic hornblende gabbro, and olivine gabbro. Chiefly xenomorphic granular texture; alternating felsic and mafic bands, from a few inches to several feet in thickness are common, but generally discontinuous. Feldspar is mostly calcic andesine (labradorite in more mafic rocks), in many places partly altered to albite or albite-oligoclase. Pyroxenes (and subordinate amphiboles) commonly altered to chlorite, antigorite and biotite (Oakeshott, 1958). (Carter, 1980, 1982, Oakeshott, 1958).

Phbgb **Anorthosite-gabbro complex, hornblende bytownite gabbro (Proterozoic)**—Fine to medium grained foliated, layered, hornblende-chlorite gabbro with labradorite to bytwonite plagioclase. Some layers of anorthosite (Carter, 1980, 1982).

Pgbla **Anorthosite-gabbro complex, anorthosite inclusion-rich gabbro (Proterozoic)**—Strongly layered gabbro with numerous inclusions of anorthosite, some of which are up to 50 feet in length (Carter, 1980, 1982).

Pmgn **Mendenhall Gneiss (Proterozoic)**—Layered migmatitic felsic gneiss and mafic granulite, having rare interlayered augen gneiss and aluminous gneiss. Gneiss is characterized by large-scale foliation, fracturing, jointing, and blocky shattering. Dikes of anorthosite and associated rocks cut gneiss, and centimeter- to meter-scale fragments of gneiss are scattered through the anorthosite. Most distinctive rock is dark gneiss with tint imparted by blue quartz (Oakeshott, 1958). Named by Oakeshott (1958, p. 21), who designated type locality on Mendenhall Peak. Age of Mendenhall Gneiss is greater than 1,200 Ma age of anorthosite sequence (Silver and others, 1963; Barth and others, 1995).

SYMBOL EXPLANATION

Contact between map units - Solid where accurately located or approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Gradational contact between map units

Fault - Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Thrust Fault - Barbs on upper plate; solid where accurately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Detachment fault - Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Syncline - Solid where accurately located; long dash where approximately located; dotted where concealed

Anticline - Solid where accurately located; long dash where approximately located; dotted where concealed

Overturned anticline - Solid where accurately located

Dike - Solid where accurately located; long dash where approximately located; dotted where concealed

Tuff marker bed

Strike and dip of sedimentary beds. Number indicates dip angle in degrees:

- Horizontal bedding
- 35 — Inclined bedding
- Vertical bedding
- 75 — Overturned bedding
- 35 — Inclined bedding where top direction of beds is known
- 75 — Overturned bedding where top direction of beds is known
- 15 — Inclined crumpled bedding
- 35 — Approximate orientation of inclined bedding
- 60 — Inclined bedding as determined from aerial photographs

35 — Strike and dip of inclined cleavage. Number indicates dip angle in degrees

60 — Strike and dip of inclined igneous foliation. Number indicates dip angle in degrees

Strike and dip of metamorphic foliation. Number indicates dip angle in degrees:

- 35 — Inclined foliation
- Vertical foliation

30 — Strike and dip of inclined igneous joints. Number indicates dip angle in degrees

ATTACHMENT B

ANALYSIS OF POTENTIAL ECOLOGICAL EFFECTS OF FLOW DIVERSIONS ON WILLOW HABITAT

TECHNICAL MEMO

From: Eric Stein and Jenny Taylor – Southern California Coastal Water Research Project (SCCWRP)

To: Marc Blain, David Jaffe - Psomas

Re: Analysis of Potential Ecological Effects of Flow Diversions on Willow Habitat

Date: September 14, 2018

Background and Approach

The ecological effects of flow diversions were assessed based on modeled relationships between hydraulic changes and probability that the resultant physical conditions can support southern willow riparian habitat conditions conducive to occupancy by least Bell's vireo.

There are two general approaches that can be used to relate physical changes (e.g. changes in streambed elevation or substrate composition) to biological effects (e.g. ability to support vireo). The first involves creating a mechanistic model that predicts species occupancy through a series of equations that relate physical changes to specific life history needs of the species. For example, predicting the expected recruitment, growth, and scour of riparian habitat based on a time series of modeled patterns of velocity and scour. The second approach involves establishing statistical relationships between physical conditions and probability of a species occurring using a combination of output of hydraulic models and presence vs. absence data of vireo over time.

For this study we used the statistical approach to estimate the probability of occurrence of vireo under physical conditions associated with flow diversion scenarios. We chose this approach because 1) it is a more efficient approach for evaluating ecological effects in a relatively small area over relatively short periods of time; 2) it can be more directly related to available species observation data; 3) it produces a probability estimate that provides flexibility in setting management thresholds (i.e. managers can select a probability of effect that triggers a management decision); and 4) the hydraulic modeling does not provide a long-enough time series of output (due to the computational complexity of the model) to support a mechanistic approach.

The probability of effects on least Bell's vireo were assessed using the following steps. Data preparation was done in ArcGIS and analysis was completed in RStudio:

1. Physical properties in the study area were based on the hydraulic model output provided by Psomas. We focused on depth, extent and duration of inundation, velocity, and shear stress as the key output variables as these are the ones most likely to influence presence or absence of willow riparian habitat preferred by the least Bell's vireo. We focus primarily on the dry year model output as the greatest differences were observed under dry conditions, and therefore, any effects, if they occur, would be under dry conditions.

2. Initially, we planned to use vireo occurrence data as an indicator of suitable habitat. However, despite a thorough literature review, we were only able to find a few instances of vireo nesting and a few confirmed absences. Therefore, we decided to use willow presence as an indicator of suitable habitat, which has been documented extensively in the literature.

3. Vegetation coverage of the study area was digitized for a representative wet year (2010) and dry year (2014) using digital aerial imagery provided through the USDA National Agriculture Imagery Program (NAIP). NAIP provides seamless georectified images with four color bands (red, green, blue and near infrared) with known vintage. NAIP imagery is acquired at a one-meter ground sample distance with a horizontal accuracy that matches within six meters of photo-identifiable ground control points, which are used during image inspection. An unsupervised object classification was used to attribute riparian trees and shrubs vs. non-target habitats, and raster images were converted to polygons. Straggler trees and shrubs were manually deleted or produced the final shape files.

4. Water velocity, percent of time inundated, water depth, shear stress, and arrival time variables were used from the *dry* year hydraulic modeling. We focused on the dry year, because results of the hydraulic modeling comparing the historical with predicted flows differed most significantly for the dry year. These hydraulic parameters were selected because they are known to influence recruitment, growth, and survival of riparian habitat. These variables were provided to us in raster format, with approximately 18,000 pixels. We converted each pixel to a point and spatially joined the hydraulic variable values to the vegetation layer. This created a dataset that related the presence of willow with each of the hydraulic variables.

5. To begin to explore the relationship between each of the hydraulic variables and the occurrence of willow, we compared the distribution of each variable for areas where willows were present and areas where willows were absent using a two-sided t-test. Arrival time showed the least difference between groups (p>0.1) and because the distributions looked so similar, we did not include this variable in further analysis. The other four hydraulic variables did display a significant difference between the two groups and were all significant at the α=0.001 level: Depth, shear stress, velocity, and percent of year inundated. A correlation matrix (
6. Figure 1) was calculated for the remaining four hydraulic variables and shear stress was removed based on its significant correlation with velocity (r=0.79).

7. Data were split randomly into 25% testing data and 75% training data. Initially a multinomial regression was used to predict vegetation classes including coast live oak, riparian herbaceous, and willow. However, this model severely overpredicted willow occurrence. Because we are concerned with the potential reduction in willow habitat, we decided this model would not provide a reliable answer to that question. Logistic regression analysis (eq. 1) was the next model used to develop relationships between the three hydraulic properties and the presences or absence of willow habitat. We used a binomial logistic regression model because it allows for estimation of the probability of a binomial response (in this case presence vs. absence of willow habitat) based on one or more predictor variables (in this case hydraulic properties). The resulting plots allow for an estimation of the probability of vireo habitat occurrence based on a continuous range of hydraulic variables (e.g. inundation time, water velocity).

Eq. (1): $\text{logit}(\text{willow presence}) = \beta_0 + \beta_1(\text{depth}) + \beta_2(\text{velocity}) + \beta_3(\text{annual inundation})$

8. The validation of the model with the testing data showed an overall accuracy of 81.9%. The model was very good at predicting areas where willows were absent (specificity=89.9%) and much less effective at predicting areas where willows are present (sensitivity = 13.5%). From an ecological perspective, this makes sense because we can accurately predict areas where we know willows are unlikely to occur. In contrast, there are other areas that are unlikely to support willows, but where absence may be explained by a variety of factors beyond channel hydraulics (See Attachment A). This suggests that our predictions of willow occurrence will be much less accurate than our predictions of willow absence.

9. The dry year logistic regression model was used to predict willow occurrence with the modelled hydraulic output under the proposed water diversion scenario. Dry wear model output was used because the greatest differences in channel conditions were observed during the simulated dry year. The same method was used to prepare the data as described above for the training data: the velocity, percent inundation, and depth variables were converted to points and joined together.

Results

All hydraulic variables tested showed significant differences ($p < 0.001$) in willow occurrence between predicted future conditions and historic flow characteristics. However, given the small sample size of vegetation polygons and the high number of hydraulic observations (>18,000), we believe the significance estimates may be overestimated.

The basic logistic regression models are provided in Figure through 4 and show the probability of willow occurrence for depth, annual percentage inundation time, and velocity, respectively. The range on the x-axes are bounded by the values observed in the data and their associated probability estimates. We see an increase in probability of willow occurrence with increasing depth and percent annual inundation. These trends in depth and annual inundation percentage suggest that the some persistent inundation is important for suitable willow habitat, which agrees with the literature. Lastly, we see a steep decline in occurrence of willow habitat as the velocity increases. This suggests that willows will not be present in active channels where velocity is highest.

Our models predict a slight decrease in probability of occurrence of willow habitat in dry years with the proposed diversion compared to without the diversion. Changes in probability of occurrence vary spatially and are most pronounced near the outlet to the spillway and at the margins of the basin (Figure 5). In general, we see exaggeration of extreme values; increases in the probability of willow occurrence in areas where occurrence was high and decreases in the probability of willow occurrence where the occurrence was low. The most pronounced decrease predicted is a 13.8% decline in probability of occurrence in the lower basin, near the spillway, associated with a slight decrease in depth and duration of inundation. This is offset by a 6.6% increase in probability of occurrence at the margins of the basin, also associated with change in depth and duration of inundation.

It is important to note that difference in velocity in the reservoir is not a driver of impacts to habitat since the velocity is essentially zero for most of the ponded areas. The biggest influencing factor appears to be the duration of inundation which is driven by a combination of hydrologic events and the operational curve of the dam. Only in a statistically dry year with high flow events that occur late in the storm season (as opposed to the average) do we see durational impacts to ponding extents in the model. This change in duration of inundation also influences change in probability of willow

occurrence along the margins of the basin. However, as stated above, net changes in probability of willow occurrence are less than 10%. As previously noted, we see no effects in the main portion of the stream channel or during wet years. Finally, it is important to note, that this analysis only speaks to the probability that willow habitat will or will not occur, it does not speak to health or vigor of the community.

Caveats of Analysis

1. Pseudoreplication is an issue when observations are not random or independent. Our observations were based on the pixel size of the hydraulic modeling, as opposed to randomly selecting plots as our samples. Consequently, pseudoreplication may have introduced additional uncertainty into our results.

2. The hydraulic variables that went into this analysis were averaged values based on wet and dry years, therefore, they do not show the true extent of water inundation. We are not considering that some areas do get inundated in dry years, or that some areas do not get inundated in dry years. This likely is the reason the model had trouble finding differences between the areas that do have willows and those that do not.

3. The presence of vegetation is a function of the current year's precipitation, which we considered, but also the precipitation and resulting hydraulics of many years prior, which we did not consider.

4. The vegetation classification was completed because the original vegetation map which was part of the EIR was too coarse (it was used in the multinomial regression which ultimately over predicted willow). This vegetation classification was not ground-truthed, and it is likely that other types of trees and shrubs, such as coast live oak, were included in what we designated willow habitat.

5. Results of the statistical analysis are limited by the small area of analysis and low data density. A regional analysis would have provided the opportunity to develop the logistic regression model using a larger more robust data set, which would have improved confidence and resolution in the model.

Figures

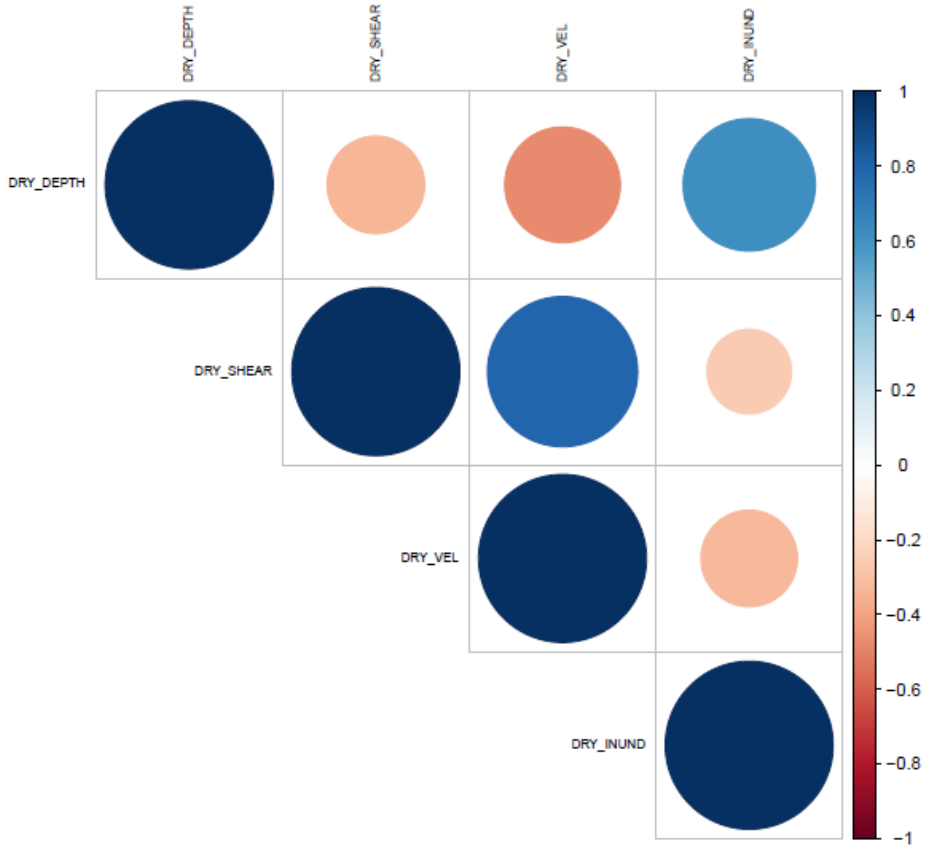


Figure 1: Dry year correlation plot of depth, shear stress, velocity, and annual inundation percentage. The correlation between shear and velocity was above 0.7.

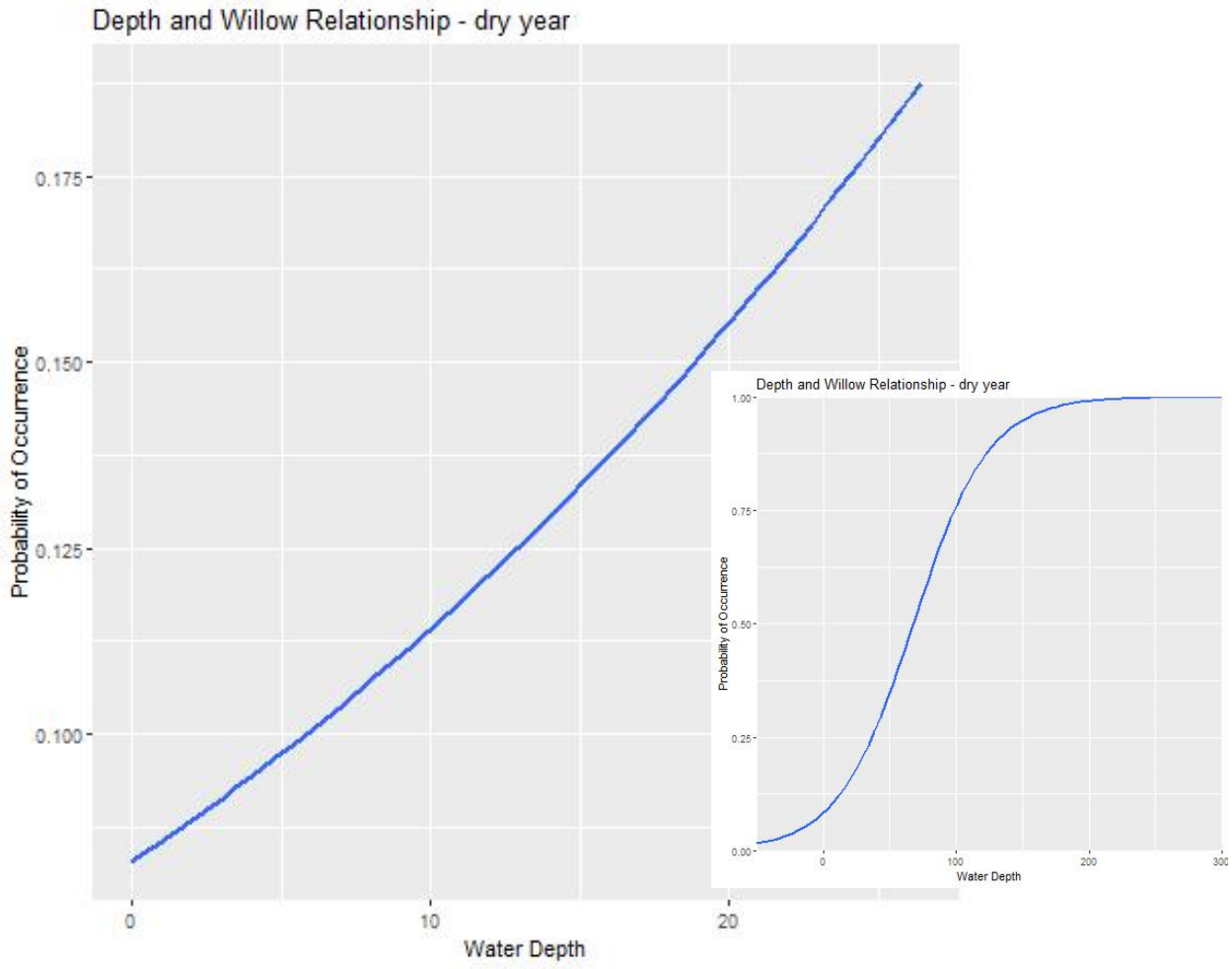


Figure 2: The relationship between water depth (ft) and the probability of occurrence of willow. Inset graph shows the full logistic regression. Larger graph focuses on the range of depth values in the dry year hydraulic data set and the associated estimates of probability of willow occurrence.

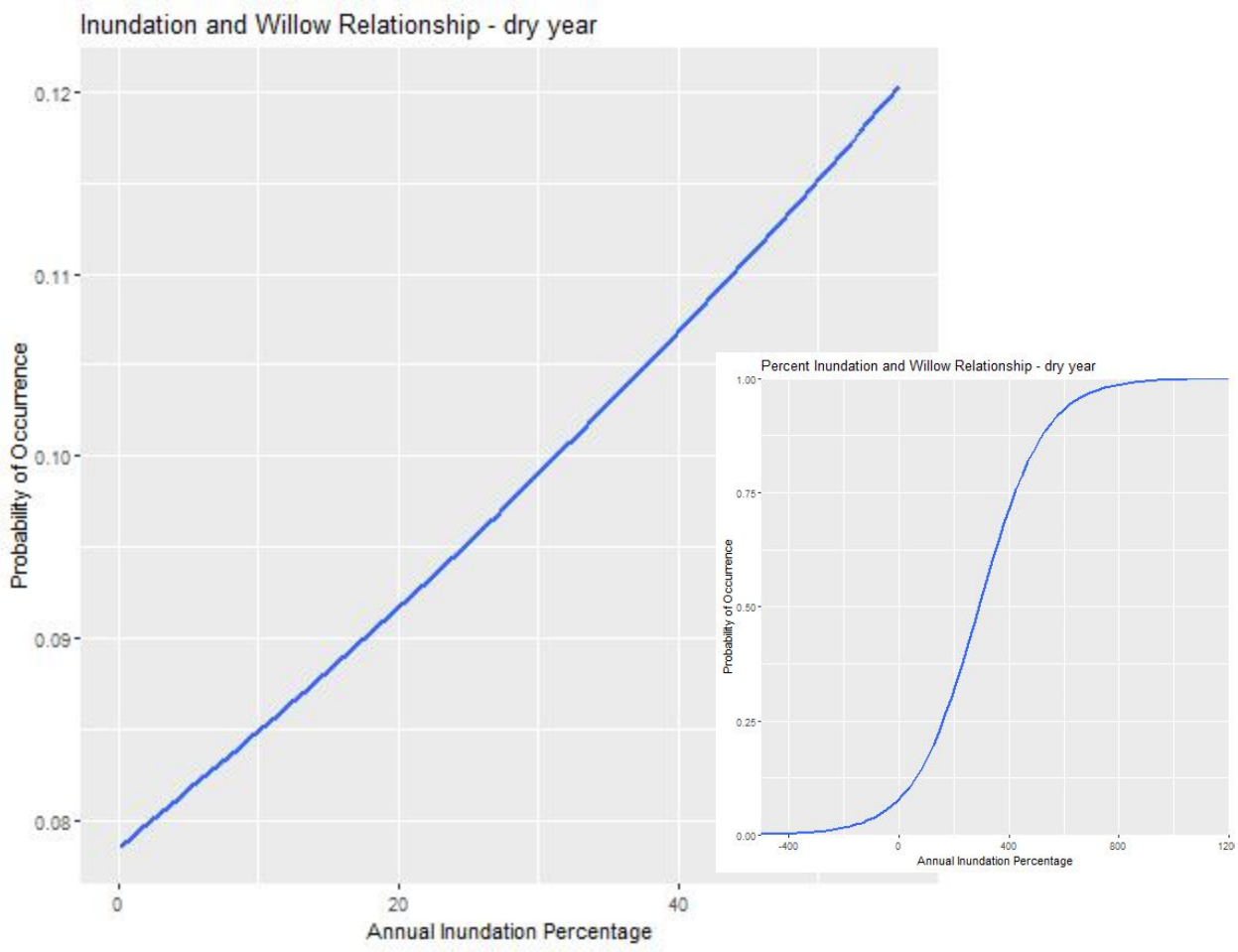


Figure 3: The relationship between average annual inundation percentage and the probability of occurrence of willow. Inset graph shows the full logistic regression. Larger graph focuses on the range of inundation values in the dry year hydraulic data set and the associated estimates of probability of willow occurrence.

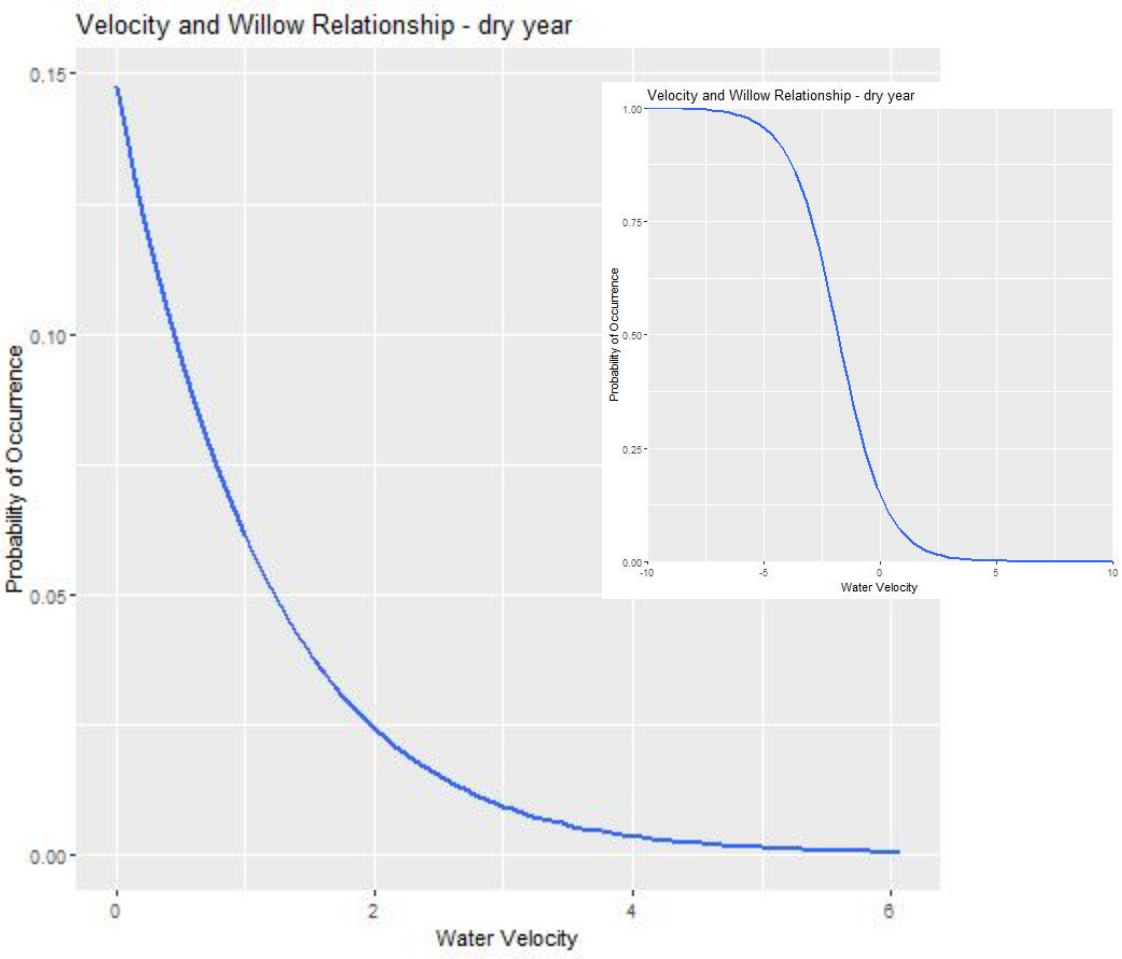


Figure 4: The relationship between water velocity (ft/s) and the probability of occurrence of willow. Inset graph shows the full logistic regression. Larger graph focuses on the velocity range in the dry year hydraulic data set and the associated estimates of probability of willow occurrence.

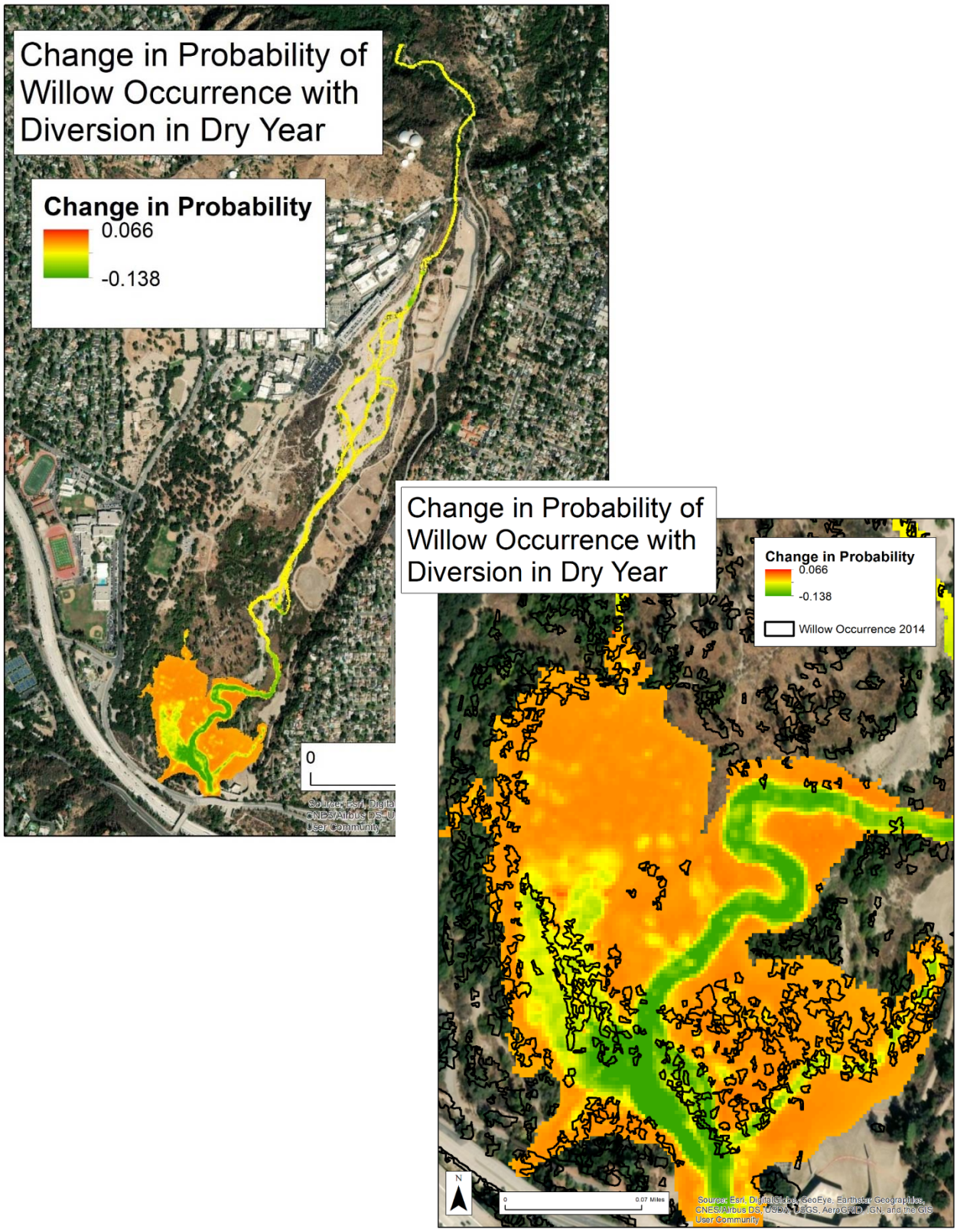


Figure 1: Change in probability of willow with the diversion in a dry year, compared to a dry year with no diversion. Green shows a decrease in probability, yellow is roughly no change, and red signifies an increase in probability. Note that green is a decrease of 13.8% and red is an increase of 6.6%. Lower graphic shows a zoomed in view of the lower basin.

Attachment A: Box plots showing differences in ranges of hydraulic variables in areas where willows were present (1) vs. absent (0)

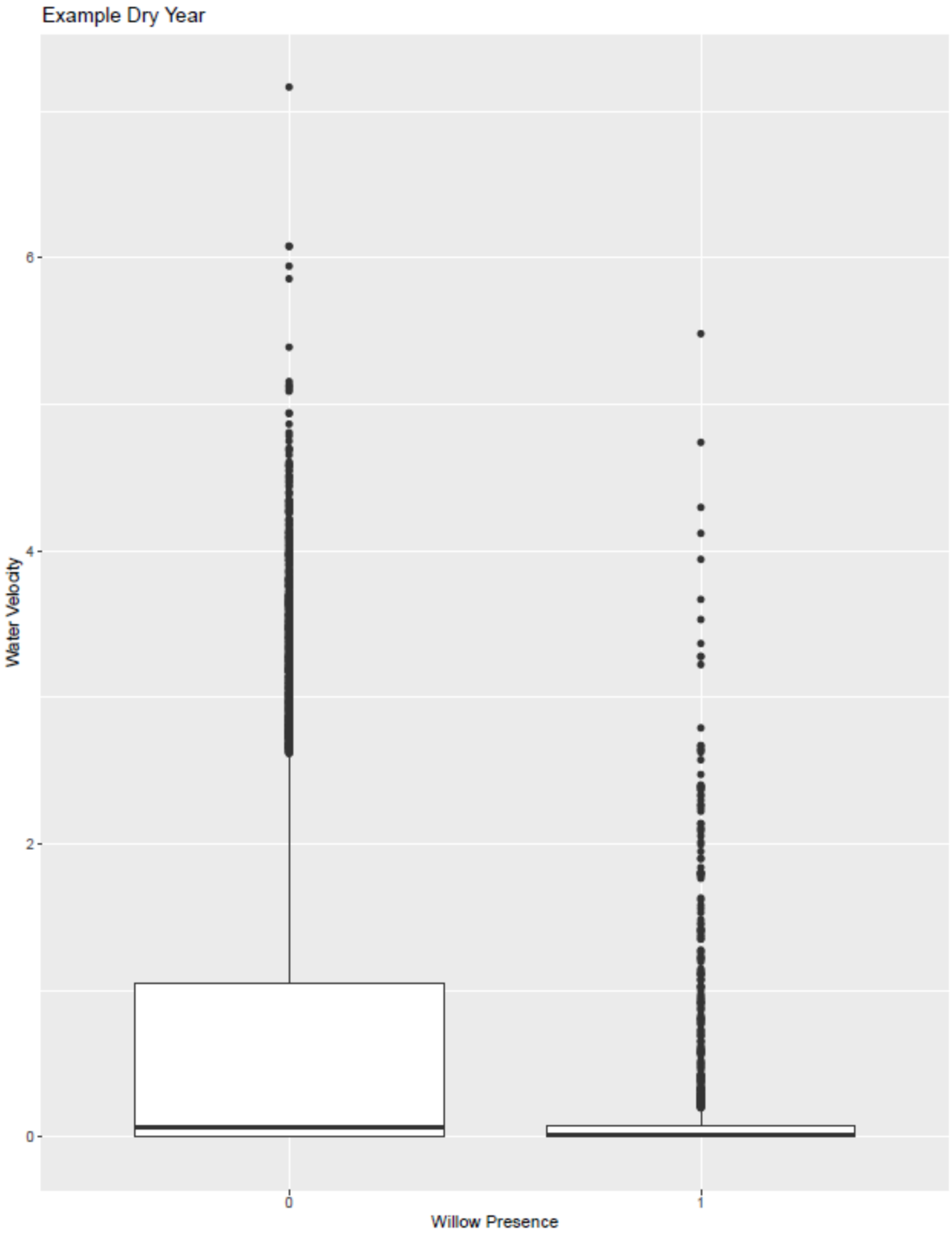


Figure A-1: Boxplot showing water velocity (ft/s) values for observations where willow shrub was and was not present.

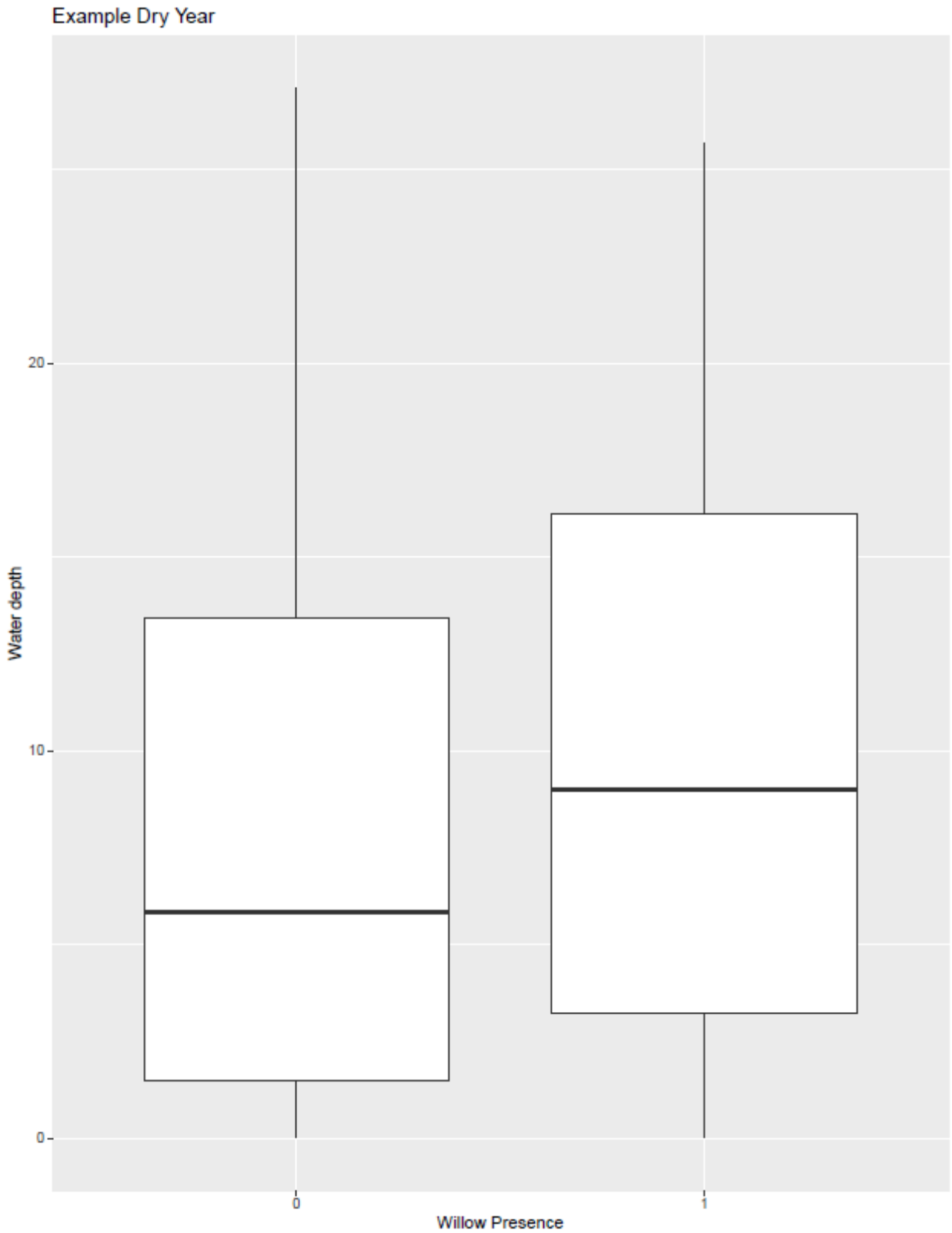


Figure A-2: Boxplot showing water depth (ft) values for observations where willow shrub was and was not present.

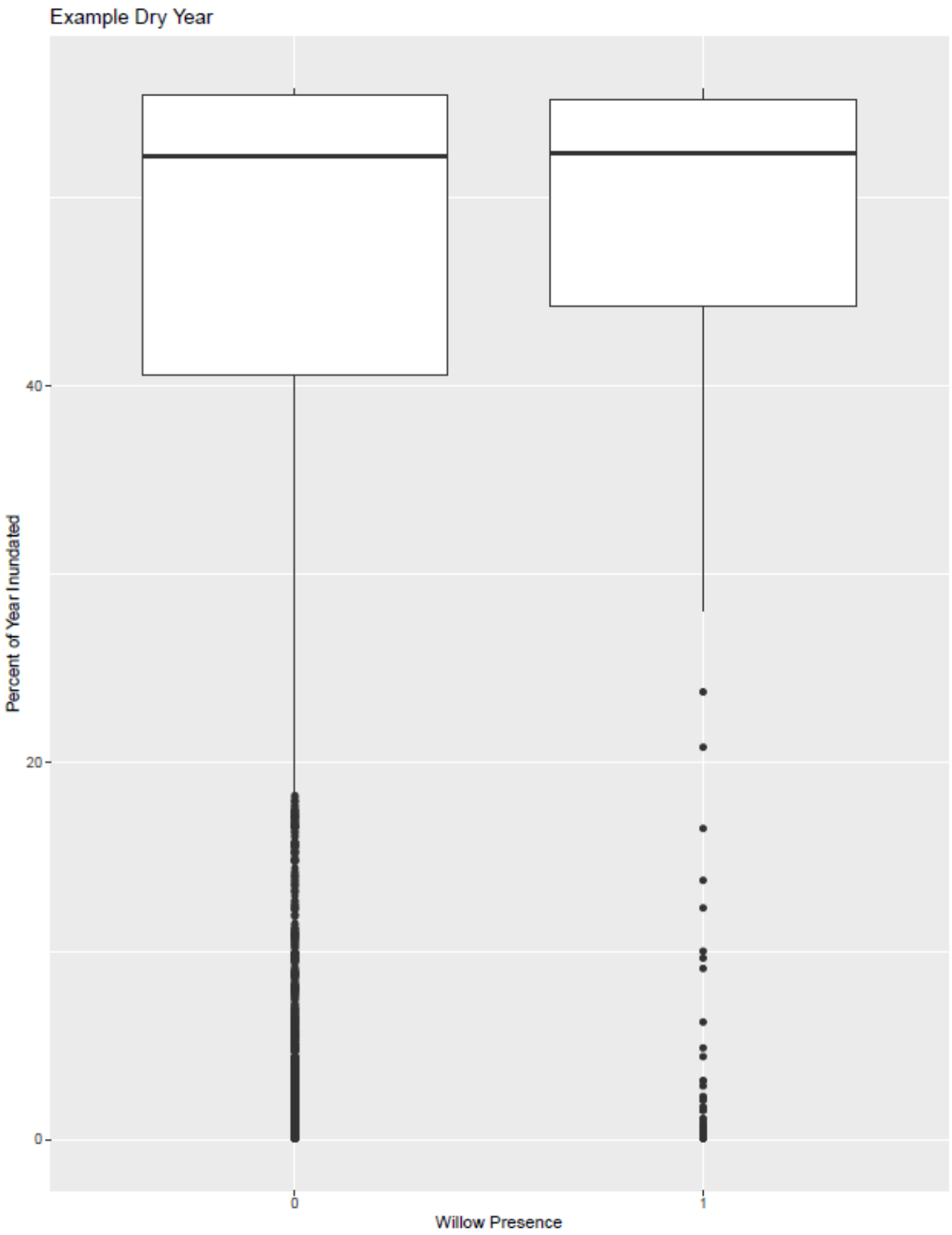


Figure A-3: Boxplot showing percentage of year with water inundation values for observations where willow shrub was and was not present.

Appendix E-1

Cultural Resources Technical Report for the Arroyo Seco Canyon Project Areas 2 and 3, June 2020

CULTURAL RESOURCES TECHNICAL REPORT FOR THE ARROYO SECO CANYON PROJECT AREAS 2 AND 3 PASADENA, CALIFORNIA

Prepared for:

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Acronyms and Abbreviations

APE	Area of Potential Effect
APN	Assessor Parcel Number
CCC	Civilian Conservation Corps
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CHRIS	California Historical Resources Information System
City	City of Pasadena
CRHR	California Register of Historical Resources
DPR	Department of Parks and Recreation
LACFCD	Los Angeles County Flood Control District
MWD	Metropolitan Water District
NAHC	Native American Heritage Commission
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
PRC	California Public Resources Code
Project	Arroyo Seco Canyon Project Areas 2 and 3
PWP	Pasadena Department of Water and Power
SCCIC	Southern California Coastal Information Center
SCE	Southern California Edison
SHPO	State Historic Preservation Officer
SLF	Sacred Land File
USFS	United States Forest Service
USGS	United States Geological Survey
WTP	Water treatment plant

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Executive Summary

Dudek was retained by the City of Pasadena (City) to complete a cultural resources technical report for the Arroyo Seco Canyon Project Areas 2 and 3 (Project) in the City of Pasadena, California. This report includes the results of a California Historical Resources Information System (CHRIS) records search; coordination with the Native American Heritage Commission (NAHC) and tribal contacts; pedestrian survey of the Project site by a qualified architectural historian; building development and archival research; development of an appropriate historic context for the Project site; and recordation and evaluation of built environment resources over 45 years old for historical significance and integrity in consideration of National Register of Historic Places (NRHP), California Register of Historical Resources (CRHR), and City of Pasadena designation criteria and integrity requirements. This report was prepared in conformance with California Environmental Quality Act (CEQA) Guidelines Section 15064.5 for historical resources and all applicable local guidelines and regulations.

Dudek conducted a CHRIS records search at the South Central Coastal Information Center (SCCIC) on October 3, 2019. The records search results indicate that 14 previously recorded cultural resources exist within the surrounding 0.5-mile search radius. However, only one resource, the Hahamongna Watershed Park and associated recreational facilities (P-19-189942), overlaps the Project site. This resource was previously found ineligible for the CRHR and is not considered an historical resource under CEQA.

Dudek contacted the NAHC on September 16, 2019, and requested a review of the Sacred Lands File (SLF). The NAHC replied via email on October 7, 2019 stating that the result of the SLF search was positive. Moreover, the NAHC recommended contacting the Gabrieleno Band of Mission Indians – Kizh Nation for more information. The NAHC also provide contact information for an additional four Native American individuals and/or tribal organizations who may have direct knowledge of cultural resources in or near the Project site; however, the additional four Native American individuals and/or tribal organizations have not, as of the preparation of this technical report, contacted the City requesting that the lead agency (City) provide notification to the tribe of projects in the tribe's area of traditional and cultural affiliation. No additional tribal outreach was conducted by Dudek; however, in compliance with Assembly Bill (AB) 52, the City has contacted tribal representatives that have requested to be notified of projects in Pasadena. Details of the SLF request and results including the tribal outreach process are presented in Section 2.2 and provided in Appendix C. The proposed Project is subject to compliance with Assembly Bill (AB) 52. Native American consultation pursuant to AB 52 is on-going.

The following resources within the Project Area of Potential Effect (APE) were identified as historical resources under CEQA and historic properties under Section 106 of the National Historic Preservation Act (NHPA):

- John L. Behner Water Treatment Plant (3S/3CS/5S3)
- Bridge No. 2 (3S/3CS/5S3)
- Bridge No. 3 (3S/3CS/5S3)

Additionally, five (5) stone wall features were identified within the APE that are considered character-defining features of the larger Arroyo Seco, and should be avoided/protected as part of the proposed Arroyo Seco Canyon Project in accordance with the Arroyo Seco Design Guidelines (City of Pasadena 2003a).

The remaining built environment identified within the APE, including the Screen Building Complex, Bridge No. 1, and the PWP/LACFCD flood control and water conservation infrastructure, do not appear eligible for NRHP, CRHR, or City designation due to a lack of significant historical associations and architectural merit. Therefore, these properties are not considered historical resources under CEQA or historic properties under Section 106 of the NHPA.

Implementation of MM-CUL-1 through -5 (Section 6.3), will reduce impacts to the John L. Behner WTP, Bridge No. 2, and the Arroyo Seco stone wall features to a less than significant level. However, impacts will remain significant and unavoidable for Bridge No. 3 since the structural overlay bridge installed in 2017 is not in conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties in consideration of its proposed permanency. The overlay structure, characterized by a steel deck supported by steel I-beam girders, poured-in-place concrete ramps, and tubular metal railings, does not conform to the Secretary of the Interior's Standards for Rehabilitation of a 1930s timber bridge built by the CCC. As a potentially permanent design feature (or at least into the foreseeable future), the continued presence of the overlay structure on Bridge No. 3 is considered a significant impact to historical resources, as the overlay detracts from nearly all of its important character-defining features and introduces incompatible, highly visible, modern materials.

Because there are no plans for the future reconstruction/replacement of Bridge No. 3 at this time, it is anticipated that the existing bridge may continue to deteriorate. Therefore, this Draft EIR anticipates the environmental impacts of the continued use of the temporary bridge structure over Bridge No. 3, and the continued deterioration of the existing Bridge No. 3, into the foreseeable future. Whether and when reconstruction/replacement of Bridge No. 3 will be undertaken is unknown, and it is unknown whether the new bridge would be constructed in such a manner that would allow for its preservation as a historical resource. Therefore, impacts to historical resources under CEQA are considered significant and unavoidable, even with implementation of archival documentation mitigation (MM-CUL-2).

Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on historic properties, assess the effects, and seek ways to avoid, minimize, or mitigate any adverse effects on such properties (36 CFR 800.1[a]). In consideration of the discussion above for Bridge No. 3, the proposed project would result in adverse effects to historic properties that cannot be mitigated in a way that would eliminate or reduce effects.

1 Introduction

Dudek was retained by the City of Pasadena to complete a Cultural Resources Technical Report to support the required California Environmental Quality Act (CEQA) Section 15064.5 for historical resources and Section 106 of the National Historic Preservation Act (NHPA) documentation for the Arroyo Seco Canyon Project (Project) in the City of Pasadena, California. This report includes the results of a California Historical Resources Information System (CHRIS) records search; coordination with the California Native American Heritage Commission (NAHC) and tribal contacts; pedestrian survey of the Project site by a qualified architectural historian and archaeologist; building development and archival research; development of an appropriate historic context for the Project site; and recordation and evaluation of five (5) properties over 45 years old for historical significance and integrity in consideration of National Register of Historic Places (NRHP), California Register of Historical Resources (CRHR), and City of Pasadena designation criteria and integrity requirements.

This report and associated property significance evaluations was prepared by Dudek Architectural Historians Kate G. Kaiser, MSHP; Kara R. Dotter, MSHP; and Nicole Frank, MSHP. Dudek Archaeologist Adriane Dorrler, BA, completed the CHRIS records search, the NAHC Sacred Lands File (SLF) request, and coordinated Native American outreach, in addition to contributing to the report. This report was reviewed for quality assurance/quality control by Dudek Principal Architectural Historian Samantha Murray, MA, Dudek Senior Archaeologist Heather McDaniel McDevitt, MA, RPA and Dudek Lead Archaeologist Linda Kry, BA. Resumes for all key personnel are provided in Appendix A. Ms. Murray meets the Secretary of the Interior's Professional Qualification Standards (36 CFR 61) for both an Architectural History and Archaeological Principal Investigator.

1.1 Project Location and Description

Project Location

The Project site is located in the City of Pasadena within the Arroyo Seco Canyon at 3420 and 3500 Arroyo Seco Road, City of Pasadena. The Project site is located within Township 1 and 2 North, Range 12 West, of the Pasadena, California 7.5-minute USGS quadrangle. The Project site encompasses portions of two separate parcels, specifically Assessor Parcel Numbers (APNs) 5830-001-906 and 5823-015-902. The Project site can be accessed via Interstate (I) 210 by exiting Windsor Avenue and traveling northward for approximately 0.8-mile to the intersection of Windsor Avenue and Ventura Street. From this intersection, the City's open area (i.e., former Jet Propulsion Laboratory [JPL] East Parking Lot) is located approximately 0.3-mile north along Explorer Road, which constitutes the southern boundary of Area 3.

The proposed Project consists of two primary areas, as shown on Figure 1, Project Location Map, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements. These areas are connected by the Arroyo Seco Road[1] (i.e. Gabrielino Trail/Access Road), which serves as a recreational trail and the access road for City of Pasadena and U.S. Forest Service (USFS) vehicles heading into the Arroyo Seco Canyon. As shown on Figure 1, the proposed Project would involve construction activity and facility improvements in both areas, as well as construction truck traffic along portions of the Gabrielino Trail/Access Road. The former Travelling Screen and

[1] Formerly North Arroyo Boulevard

Chlorine Building (Screen Building) adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging.

The Arroyo Seco is a creek that begins in the San Gabriel Mountains and passes through three distinct recreational areas within the City: (1) Upper Arroyo Seco, containing the Hahamongna Watershed Park (HWP) and Devil's Gate Reservoir and Dam; (2) Central Arroyo Seco, extending south of the Devil's Gate Dam to the Colorado Street Bridge; and (3) Lower Arroyo Seco, from the Colorado Street Bridge to the southern boundary of the City. The Project proposes new facilities and improvements only in the Upper Arroyo Seco, as shown on Figure 1.

Project Summary

Pursuant to Section 15367 of the State CEQA Guidelines, the City of Pasadena (City) Department of Water and Power (PWP) is the Lead Agency for the Project, as it has the principal responsibility for carrying out the Project and has the authority for approving the Project and its accompanying environmental documentation. The following provides a breakdown of all major Project areas/components:

Area 2: Diversion and Intake Replacement

Figure 2 (Area 2 Existing Conditions), identifies the primary existing structures in Area 2, including the concrete diversion weir and intake structure, a fenced area with a screening building and access to sections of the conveyance system, the Gabrielino Trail/Access Road, and a historic bridge (Bridge No. 3) over the Arroyo Seco. The diversion weir directs water into the intake structure by obstructing the stream flow and creating a small pool of water that flows into the intake. The intake would be operated to divert the City's 25 cfs of water rights, while additional flows beyond 25 cfs would continue downstream. Due to sediment buildup trapped on the upstream side of the weir, the pooling capacity is reduced and the ability to collect water for spreading is limited. When water enters the intake, it is conveyed downstream through the conveyance system to the PWP's spreading basins. The existing intake/diversion system consists of an approximate 9-foot-high reinforced concrete training wall and intake structure with a trash rack on the east bank of the stream, and a reinforced concrete weir with stop logs in slots. Under current conditions, the weir crest is approximately 2 feet above the streambed on the downstream side.

Improvements in Area 2 include the demolition and removal of the existing concrete weir and portions of the intake structure and the construction of a new diversion structure that would be operated to divert up to 25 cfs of creek flows into the existing conveyance system. The intake structure would be remodeled with new concrete walls and top deck to accommodate a new screen configuration. An existing concrete slab that previously supported an equipment building located adjacent to the Gabrielino Trail/Access Road would be demolished. A new 106-square-foot (11 feet 4 inches by 9 feet 4 inches) intake service building would be constructed to house the electrical and hydraulic controls for the diversion structure. Electric power for the operation of the diversion structure and control equipment enclosure would be supplied by an existing power line at the screen building (southeast of the intake structure). The locations of the proposed facilities and improvements are shown on Figure 3 (Area 2 Conceptual Design Overview).

The proposed new diversion/intake structure would capture flows up to PWP's surface water rights. This would include all flows during small storm events and dry weather flows in the Arroyo Seco, and a portion of flows during large storm events. During larger storms when the water is too turbid with suspended sediments (e.g., flows generally above 100 cfs), the stream with its associated sediment load would bypass the diversion/intake structure and continue downstream to Devil's Gate Reservoir. Operation of the weir during high flows would be facilitated by

the adjustable height weir or crest gate. At low flows, the gate would start in the 'up' position and as flows increase, the gate would be lowered to maintain a constant water surface level in the diversion pool (a pool created behind the weir to allow for an appropriate water elevation to flow into the diversion intake). When the gate is fully lowered, flows would entirely bypass the diversion structure and carry all flows and sediment downstream.

Under existing conditions, the weir/diversion structure is a barrier to upstream fish passage due to the elevation drop downstream of the structure. The new diversion/intake structure would improve biological functions in the Arroyo Seco by allowing for fish (and other aquatic wildlife) passage in the event that fish populations are established in the future. The new diversion structure would be designed for the possibility that some future fish may pass downstream when the diversion is not operating (i.e., the gate is lowered to allow flows to continue downstream without diversion) or when the diversion is operating and flows are high enough to spill over the crest gate. A roughened channel would be constructed downstream of the new diversion structure and operable weir such that upstream passage for future fish populations may occur during periods when the diversion is not operating and flows are adequate to allow for passage. In the current condition, water passes through a trash rack to prevent debris from entering the conveyance system to the spreading basins. In addition to filtering such debris, the proposed new intake structure would include a fish screening feature to prevent future fish populations from passing into the intake and conveyance system.

Area 3: Spreading Basin Improvements

As shown in Figure 4 (Area 3 Existing Conditions), Area 3 is located approximately 0.3-mile downstream from Area 2 and includes two existing spreading basins that are known as Pasadena Ponds 1 and 2 (formerly used as sludge ponds for the Behner Treatment Plant) and Spreading Basins No. 1 through 4, the former JPL Parking Lot and adjacent Explorer Road, and the Arroyo Seco Road (i.e. Gabrielino Trail/Access Road), which would provide construction vehicle access to Area 2 of the Project site. Figure 4 identifies the primary structures and facilities in Area 3.

As shown in Figure 5, Area 3 Conceptual Design Overview, improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased diversion of creek flows for infiltration into the Raymond Basin. Various facilities would be demolished, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chainlink fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins.

Figure 5 (Area 3 Conceptual Design Overview), depicts the proposed spreading basin improvements. Creek flows from the existing conveyance system would outlet to the new sedimentation basin or to new spreading Basin E located over the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's open area (i.e., former JPL East Parking Lot, vacated in 2015 for the purpose of expanding the spreading basins). Each new basin would have an access ramp for maintenance. Rock boulders would be placed along the western edge of Explorer Road to separate the roadway from the adjacent basins. With the area's sloping terrain, depths of the basins would range from 3 feet to 7 feet. When spreading water, the water depth in the basins would be approximately 1 foot. All basins would include inlets/outlets with 24-inch interconnection pipelines. Spillways, pipelines, culverts, and valves would be provided to connect the basins to each other. Basin J would be the last newly constructed basin located entirely within the former JPL East Parking Lot, which would include interconnection pipelines into the existing Basin 3. Other basins downstream of Basin 3 are not a part of the proposed Project, although Basin 4 may be temporarily impacted during construction.

Gabrielino Trail and Bridge Crossings

As shown in Figure 6 (Gabrielino Trail and Bridge Crossings Map), the Gabrielino Trail (i.e., Arroyo Seco Road) runs generally parallel to the Arroyo Seco and along the eastern side of the former JPL East Parking Lot and serves as a recreation trail for hikers, bikers, and equestrian uses. It also serves as a maintenance access road that leads to the Behner Water Treatment Plant and into the Arroyo Seco Canyon area to provide access for PWP and the USFS. During construction activities, the Gabrielino Trail/Access Road would provide for vehicular access to and from Area 2, and sometimes Area 3 (Explorer Road will be its primary access road).

Along the Gabrielino Trail/Access Road, three bridges cross portions of the Arroyo Seco. Bridge Nos. 1, 2, and 3 are located between Areas 2 and 3, respectively. Bridge No. 1 is a culvert-style bridge with concrete slab deck over Millard Creek, approximately 0.13-mile north of the JPL Bridge. A July 2015 Bridge Condition Assessment found that the bridge abutments were being undermined due to scouring and that the Gabrielino Trail/Access Road had sloughed off in sections. A structural overlay bridge spanning the length of this bridge was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage. Bridge No. 2 is located approximately 130 feet north of Bridge No. 1 and is a reinforced concrete arch bridge with decorative cast-concrete railing. Bridge No. 2 was likely constructed to provide a formal entrance to the Upper Arroyo Seco and the ANF; Bridge No. 2 meets the required criteria to be listed as a historical resource in the California Register of Historic Resources (CRHR) and in the City of Pasadena as a landmark (BonTerra Psomas 2015).

Bridge No. 3 is located approximately 0.34-mile north of the JPL Bridge within Area 2 and was constructed with truss-bridge forms using wood timbers. It was constructed by the Civilian Conservation Corps (CCC) in 1939 and is associated with events that made a significant contribution to the history of the United States and California. Bridge No. 3 is eligible for inclusion in the NRHP and in the CRHR. The bridge was heavily damaged by the 2010/2011 storm events following the 2009 Station Fire. A structural overlay bridge spanning the entire length of Bridge No. 3 was constructed in 2017 to provide additional support for large/heavy vehicle travel and to protect the structure from further damage. A structural evaluation of Bridge No. 3 subsequent to the structural overlay, however, shows that the condition of Bridge No. 3 continues to deteriorate and is no longer safe for use (TJC 2018).. Structural repairs, including replacement of its timber members, will be required to restore its use.

Upon completion of the proposed Project, the City intends to keep the Bridge No. 3 overlay structure as-is, with the understanding that the reconstruction/replacement of Bridge No. 3 will eventually be required, although such replacement is not yet planned, if the City wishes to maintain the bridge. Although the temporary structural bridge overlay was constructed to allow transport of heavy equipment and materials during the ASCP construction, its continued presence provides for the safe passage of vehicles, pedestrians, and equestrians along the Gabrielino Trail/Access Road and to the USFS facilities. Additionally, the temporary structure allows access to large vehicles, including fire trucks, that were previously restricted due to the loading limitations of the original bridge even before it was damaged. The temporary structure spans the existing bridge abutments; therefore, its structural integrity is not impacted by the deteriorating structural integrity of Bridge No. 3. Since the temporary structure is constructed of steel elements and concrete, and will experience relatively light traffic, its expected service life is estimated to exceed 50 years. There may be safety risks associated with the continued deterioration of Bridge No. 3 if structural members fail and fall; in which case the City may decide to affirmatively deconstruct some or all of the bridge to protect public safety.

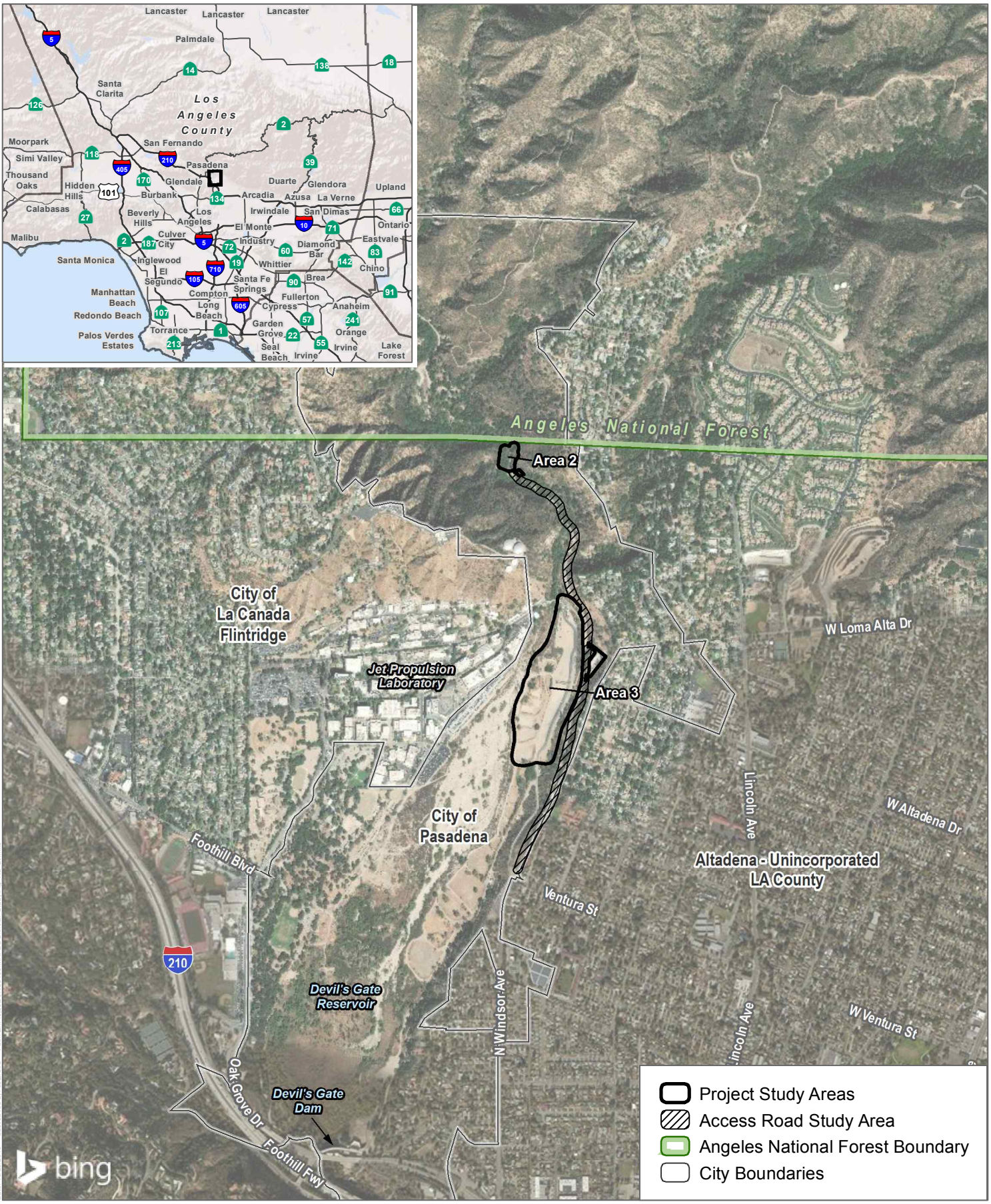
Because there are no plans for the future reconstruction/replacement of the Bridge No. 3 at this time, it is anticipated that the existing bridge may continue to deteriorate, and although not anticipated at this point, may even be removed to protect public safety. Therefore, this Draft EIR anticipates the environmental impacts of the continued use of the temporary bridge structure over Bridge No. 3, and the continued deterioration of the existing Bridge No. 3, into the foreseeable future (and perhaps even its eventual removal). Whether and when reconstruction/replacement of Bridge No. 3 will take place is unknown, and it is unknown whether the new bridge would be constructed in such a manner that would allow for its preservation as a historical resource.

Additionally, stone masonry walls (which are considered local historical resources that contribute to the character of the larger Arroyo Seco) line the east side of the Arroyo Seco at Bridge No. 2 and continue upstream to Bridge No. 3. The stone masonry walls would not be altered by Project activities, but will require protection.

Construction Staging Areas

As depicted on Figures 3 and 5, during construction activities, the former Travelling Screen and Chlorine Building (Screen Building) adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging.

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SOURCE: Bing 2019, Open Street Map 2019

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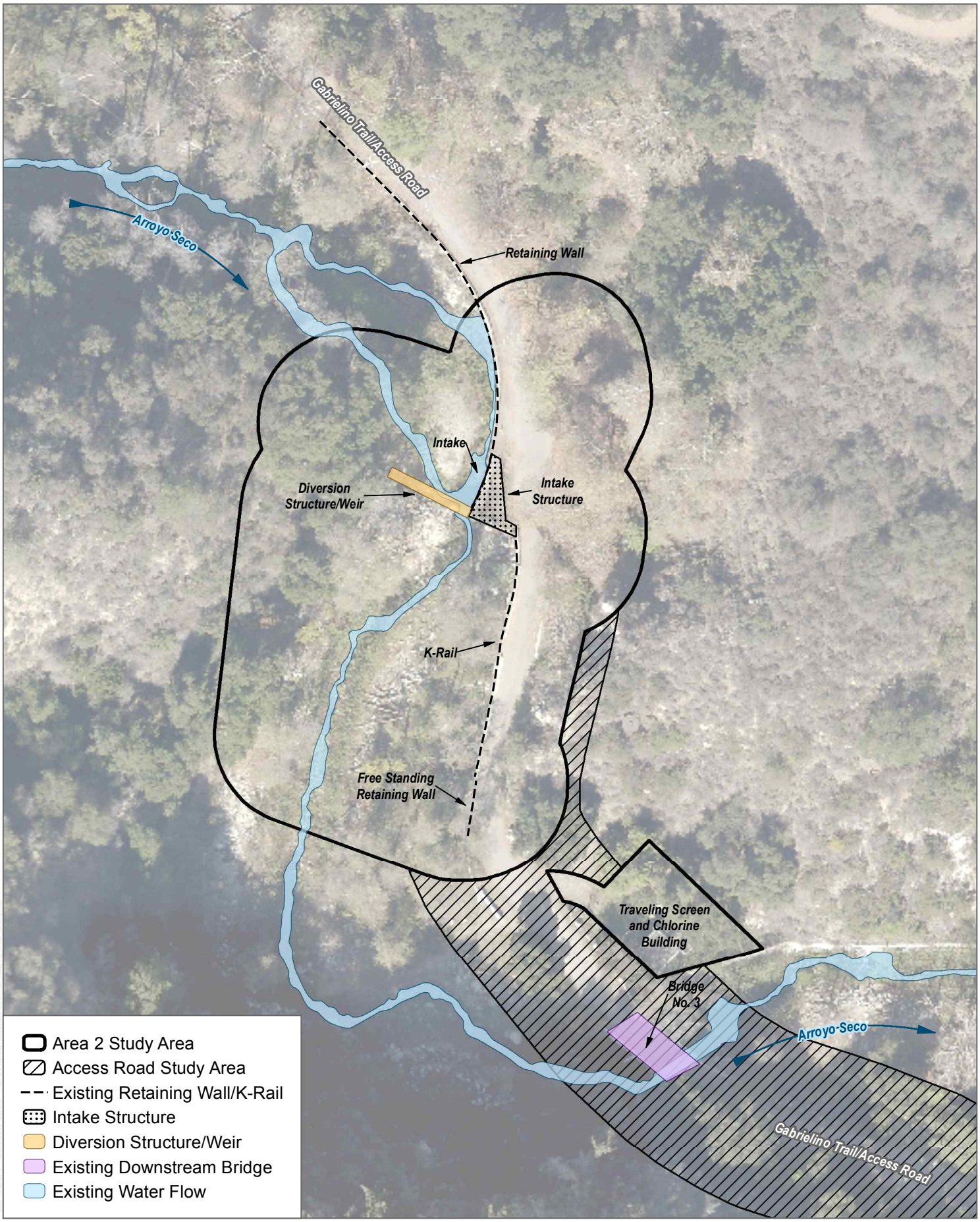
0 700 1,400 Feet

FIGURE 1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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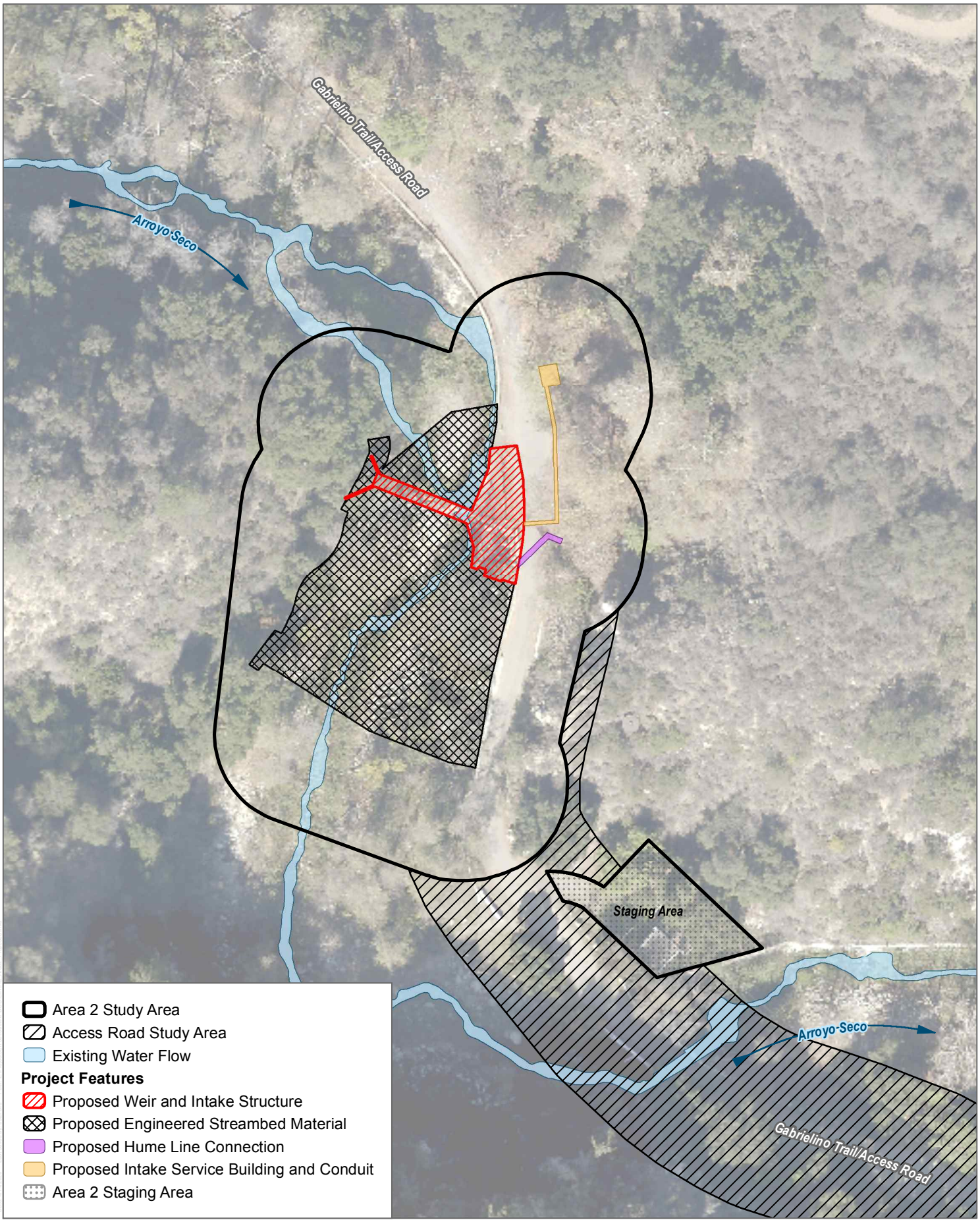
0 35 70 Feet

FIGURE 2

Area 2 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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0 35 70 Feet

FIGURE 3

Area 2 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Esri, Digital Globe 2019

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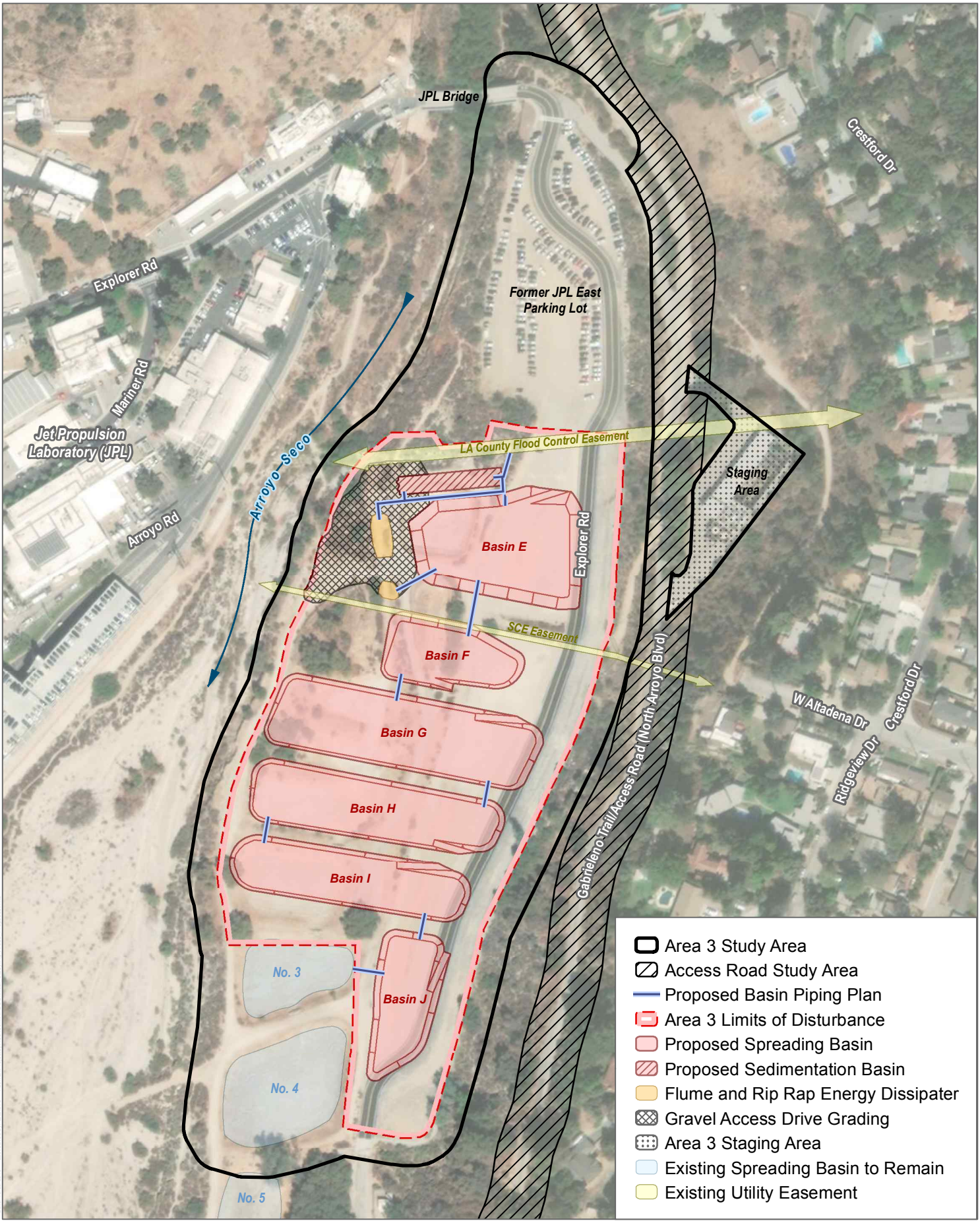
0 112.5 225 Feet

FIGURE 4

Area 3 Existing Conditions

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: Esri, Digital Globe 2019

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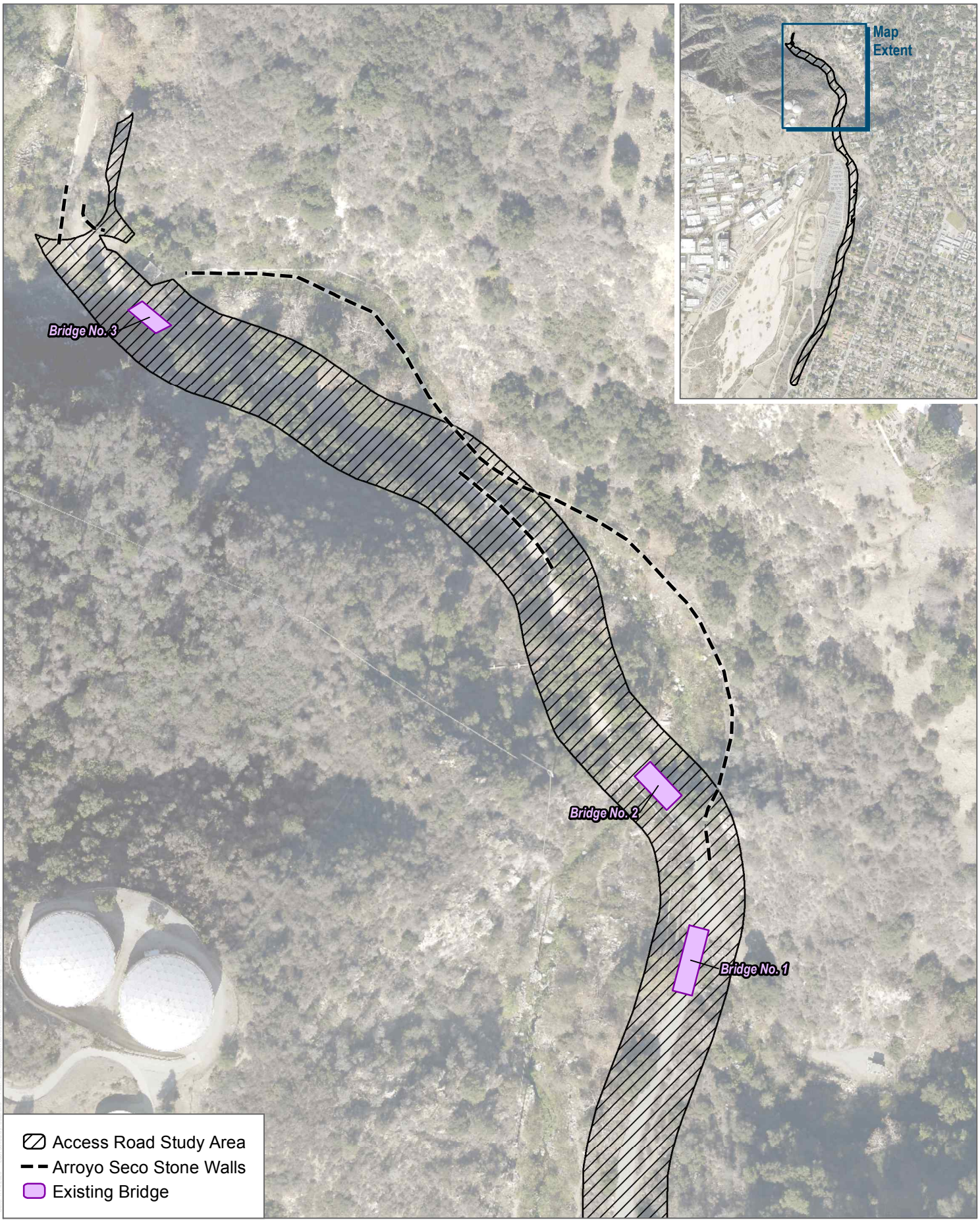
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FIGURE 5

Area 3 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

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SOURCE: LARIAC Aerials 2014

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0 75 150 Feet

FIGURE 6

Gabrielino Trail and Bridge Crossings Map

Arroyo Seco Canyon Project Areas 2 and 3

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1.2 Area of Potential Effects

In consideration of the Project's requirement to address Section 106 of the NHPA, an Area of Potential Effects (APE) has been defined for the Project. The APE is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties. Determination of the APE is influenced by a project's setting, the scale and nature of the undertaking, and the different kinds of effects that may result from the undertaking (36 CFR 800.16(d)). The proposed Project APE (Figure 7) includes consideration of the potential direct and indirect effects of the project/undertaking.

The APE is where ground disturbance is expected to occur, representing the proposed Project footprint, and includes the following components:

- Area 2, which will entail the demolition and removal of the existing concrete weir and portions of the intake structure and the construction of a new diversion structure
- Area 3, which will entail the reconfiguration and expansion of the existing spreading basins and demolition of facilities, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chainlink fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins
- Gabrielino Trail and Bridge Crossings, which will provide for vehicular access to and from Area 2, and sometimes Area 3.
- During construction activities, the Screen Building adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging.

The vertical extent of the APE for the proposed Project is defined as the depth of soils disturbed during Project construction that have the potential to contain intact cultural deposits. The amount of disturbed soils varies according to the topography and construction needs, but is anticipated to be roughly up to 10 feet below grade where trenching is anticipated.

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SOURCE: Bing 2019, Open Street Map 2019

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0 295 590 Feet

FIGURE 7

Area of Potential Effects Map

Arroyo Seco Canyon Project Areas 2 and 3

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1.3 Regulatory Setting

Federal

The NRHP is the United States' official list of districts, sites, buildings, structures, and objects worthy of preservation. Overseen by the National Park Service under the U.S. Department of the Interior, the NRHP was authorized under the NHPA, as amended. Its listings encompass all National Historic Landmarks and historic areas administered by the National Park Service.

NRHP guidelines for the evaluation of historic significance were developed to be flexible and to recognize the accomplishments of all who have made significant contributions to the nation's history and heritage. Its criteria are designed to guide state and local governments, federal agencies, and others in evaluating potential entries in the NRHP. For a property to be listed in or determined eligible for listing, it must be demonstrated to possess integrity and to meet at least one of the following criteria:

- The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association; and

    A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

    B. That are associated with the lives of persons significant in our past; or

    C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

    D. That have yielded, or may be likely to yield, information important in prehistory or history.

"Integrity" is defined in NRHP guidance, How to Apply the National Register Criteria, as "the ability of a property to convey its significance. To be listed in the NRHP, a property must not only be shown to be significant under the NRHP criteria, but it also must have integrity" (NPS 1990). NRHP guidance further states that properties be completed at least 50 years ago to be considered for eligibility. Properties completed fewer than 50 years before evaluation must be proven to be "exceptionally important" (criteria consideration G) to be considered for listing.

A historic property is defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the NRHP criteria" (36 CFR Sections 800.16(i)(1)).

Effects on historic properties under Section 106 of the NHPA are defined in the assessment of adverse effects in 36 CFR Sections 800.5(a)(1) as follows:

> An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

Adverse effects on historic properties are clearly defined and include the following (36 CFR 800.5(2)):

(i) Physical destruction of or damage to all or part of the property;

(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines;

(iii) Removal of the property from its historic location;

(iv) Change of the character of the property's use or of physical features within the property's setting that contributes to its historic significance;

(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

To comply with Section 106 of the NHPA, the criteria of adverse effect are applied to historic properties that exist in the area of potential effects (APE), pursuant to 36 CFR Section 800.5(a)(1). If no historic properties are identified in the APE, a finding of "no historic properties affected" are made for a project. If there are historic properties in the APE, application of the criteria of adverse effect will result in project-related findings of either "no adverse effect" or "adverse effect," as described above. A finding of no adverse effect may be appropriate when the undertaking's effects do not meet the thresholds in criteria of adverse effect 36 CFR Section 800.5(a)(1), in certain cases when the undertaking is modified to avoid or lessen effects, or if conditions were imposed to ensure review of rehabilitation plans for conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties (codified in 36 CFR Part 68).

If adverse effects findings were expected to result from a project, mitigation is required, as feasible, and resolution of those adverse effects by consultation may occur to avoid, minimize, or mitigate adverse effects on historic properties, pursuant to 36 CFR Section 800.6(a).

State

California Register of Historical Resources

In California, the term "historical resource" includes but is not limited to "any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California" (California Public Resources Code Section 5020.1(j)). In 1992, the California legislature established the CRHR "to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (California Public Resources Code Section 5024.1(a)). The criteria for listing resources on the CRHR were expressly developed to be in accordance with previously established criteria developed for listing in the NRHP, enumerated below. According to California Public Resources Code Section 5024.1(c)(1–4), a resource is considered historically significant if it (i) retains "substantial integrity," and (ii) meets at least one of the following criteria:

(1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

(2) Is associated with the lives of persons important in our past.

(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.

(4) Has yielded, or may be likely to yield, information important in prehistory or history.

In order to understand the historic importance of a resource, sufficient time must have passed to obtain a scholarly perspective on the events or individuals associated with the resource. A resource less than 50 years old may be considered for listing in the CRHR if it can be demonstrated that sufficient time has passed to understand its historical importance (see 14 CCR 4852(d)(2)).

The CRHR protects cultural resources by requiring evaluations of the significance of prehistoric and historic resources. The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing in the NRHP are automatically listed in the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys.

California Environmental Quality Act

As described further below, the following CEQA statutes and CEQA Guidelines are of relevance to the analysis of archaeological, historic, and tribal cultural resources:

- California Public Resources Code Section 21083.2(g) defines "unique archaeological resource."
- California Public Resources Code Section 21084.1 and CEQA Guidelines Section 15064.5(a) define "historical resources." In addition, CEQA Guidelines Section 15064.5(b) defines the phrase "substantial adverse change in the significance of an historical resource." It also defines the circumstances when a project would materially impair the significance of an historical resource.

- California Public Resources Code Section 21074(a) defines "tribal cultural resources."

- California Public Resources Code Section 5097.98 and CEQA Guidelines Section 15064.5(e) set forth standards and steps to be employed following the accidental discovery of human remains in any location other than a dedicated ceremony.

- California Public Resources Code Sections 21083.2(b)-(c) and CEQA Guidelines Section 15126.4 provide information regarding the mitigation framework for archaeological and historic resources, including examples of preservation-in-place mitigation measures; preservation-in-place is the preferred manner of mitigating impacts to significant archaeological sites because it maintains the relationship between artifacts and the archaeological context and may also help avoid conflict with religious or cultural values of groups associated with the archaeological site(s).

More specifically, under CEQA, a project may have a significant effect on the environment if it may cause "a substantial adverse change in the significance of an historical resource" (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(b).) If a site is either listed or eligible for listing in the CRHR, or if it is included in a local register of historic resources or identified as significant in a historical resources survey (meeting the requirements of California Public Resources Code Section 5024.1(q)), it is a "historical resource" and is presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)). The lead agency is not precluded from determining that a resource is an historical resource even if it does not fall within this presumption (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5(a)).

A "substantial adverse change in the significance of an historical resource" reflecting a significant effect under CEQA means "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines Section 15064.5(b)(1); California Public Resources Code Section 5020.1(q)). In turn, CEQA Guidelines section 15064.5(b)(2) states the significance of an historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or

2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or

3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

Pursuant to these sections, the CEQA inquiry begins with evaluating whether a project site contains any "historical resources," then evaluates whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource's historical significance is materially impaired.

If it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (California Public Resources Code Section 21083.2[a], [b], and [c]).

California Public Resources Code Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.

2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.

3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

Impacts to non-unique archaeological resources are generally not considered a significant environmental impact (California Public Resources Code section 21083.2(a); CEQA Guidelines Section 15064.5(c)(4)). However, if a non-unique archaeological resource qualifies as tribal cultural resource (California Public Resources Code Section 21074(c), 21083.2(h)), further consideration of significant impacts is required. CEQA Guidelines Section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. As described below, these procedures are detailed in California Public Resources Code Section 5097.98.

Local

City of Pasadena Historic Preservation Ordinance (Chapter 17.62)

This study was completed in consideration of all sections of the Pasadena Historic Preservation Ordinance (Chapter 17.62). Sections most relevant to this study are provided below.

17.62.010 - Purpose of Chapter

The purpose of this Chapter is to specify significance criteria for the designation of historic resources, procedures for designation, and review procedures to:

A. Encourage and promote the adaptive reuse of the City's historic resources;

B. Enhance, perpetuate, and preserve architecturally and historically significant structures and promote revitalization of historic neighborhoods and commercial areas;

C. Ensure that the rights of the owners of historic resources and owners of properties adjacent to historic resources are safeguarded;

D. Foster civic pride in the beauty and noble accomplishments of the past by promoting private stewardship of historic resources that represent these accomplishments;

E. Fulfill the City's responsibilities:

1. As a Certified Local Government under Federal preservation laws; and

2. For Federal Section 106 reviews and for the California Environmental Quality Act regarding historic resources.

F. Promote the identification, documentation, and evaluation of the significance of individual historic resources and districts;

G. Implement the historic preservation goals, policies, and programs of the General Plan;

H. Promote the City as a destination for tourists and as a desirable location for business;

I. Promote public awareness of the value of rehabilitation, restoration, and maintenance of the existing building stock as a means to conserve reusable material and energy resources;

J. Recognize the City's historic resources as economic assets; and

K. Stabilize and improve property values, and enhance the aesthetic and visual character and environmental amenities of the City's historic properties and areas.

17.62.040 - Criteria for Designation of Historic Resources

A. Evaluation of Historic Resources.

When considering applications to designate a historic monument, landmark, historic sign, landmark tree or landmark district, the Historic Preservation Commission shall apply the criteria below according to applicable National Register of Historic Places Bulletins for evaluating historic properties, including the seven aspects of integrity: location, design, setting, materials, workmanship, feeling and association (National Register of Historic Places Bulletin #15: "How to Apply the National Register Criteria for Evaluation").

B. Historic monuments.

1. A historic monument shall include all historic resources previously designated as historic treasures before adoption of this Chapter, historic resources that are listed in the National Register at the State-wide or Federal level of significance (including National Historic Landmarks) and any historic resource that is significant at a regional, State, or Federal level, and is an exemplary representation of a particular type of historic resource and meets one or more of the following criteria:

   a. It is associated with events that have made a significant contribution to the broad patterns of the history of the region, State, or nation.

   b. It is associated with the lives of persons who are significant in the history of the region, State, or nation.

   c. It is exceptional in the embodiment of the distinctive characteristics of a historic resource property type, period, architectural style, or method of construction, or that is an exceptional representation

of the work of an architect, designer, engineer, or builder whose work is significant to the region, State, or nation, or that possesses high artistic values that are of regional, State-wide or national significance.

d. It has yielded, or may be likely to yield, information important in prehistory or history of the region, State, or nation.

2. A historic monument designation may include significant public or semi-public interior spaces and features.

C. Landmarks.

1. A landmark shall include all properties previously designated a landmark before adoption of this Chapter and any historic resource that is of a local level of significance and meets one or more of the criteria listed in Subparagraph 2., below.

2. A landmark may be the best representation in the City of a type of historic resource or it may be one of several historic resources in the City that have common architectural attributes that represent a particular type of historic resource. A landmark shall meet one or more of the following criteria:

a. It is associated with events that have made a significant contribution to the broad patterns of the history of the City, region, or State.

b. It is associated with the lives of persons who are significant in the history of the City, region, or State.

c. It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the City or, to the region or possesses artistic values of significance to the City or to the region.

d. It has yielded, or may be likely to yield, information important locally in prehistory or history.

D. Historic signs.

1. A historic sign shall include all signs in the sign inventory as of the date of adoption of this Zoning Code and any sign subsequently designated historically significant by the Historic Preservation Commission that possesses high artistic values. A historic sign shall meet one or more or the following criteria:

a. The sign is exemplary of technology, craftsmanship or design of the period when it was constructed, uses historic sign materials and means of illumination, and is not significantly altered from its historic period. Historic sign materials shall include metal or wood facings, or paint directly on the façade of a building. Historic means of illumination shall include incandescent light fixtures or neon tubing on the exterior of the sign. If the sign has been altered, it must be restorable to its historic function and appearance.

b. The sign is integrated with the architecture of the building.

c. A sign not meeting criteria a or b above may be considered for inclusion in the inventory if it demonstrates extraordinary aesthetic quality, creativity, or innovation.

2. All other regulations relating to signs shall comply with Chapter 17.48 (Signs).

E. Landmark trees.

A tree shall qualify to be of historic or cultural significance and of importance to the community if it meets any one of the following criteria:

1. It is one of the largest or oldest trees of the species located in the City;

2. It has historical significance due to an association with a historic event, person, site, street, or structure; or

3. It is a defining landmark or significant outstanding feature of a neighborhood.

F. Landmark districts.

1. A landmark district shall include all landmark districts previously designated before adoption of this Chapter and any grouping of contiguous properties that also meet the following criteria:

   a. Within its boundaries, a minimum of 60 percent of the properties qualify as contributing; and

   b. The grouping represents a significant and distinguishable entity of Citywide importance and one or more of a defined historic, cultural, development and/or architectural context(s) (e.g., 1991 Citywide historic context, as amended, historic context prepared in an intensive-level survey or historic context prepared specifically for the nominated landmark district).

   2. When determining the boundaries of a landmark district, the Historic Preservation Commission shall use the National Register of Historic Places Bulletin #21: "Defining Boundaries for National Register Properties".

Arroyo Seco Master Plan

The Arroyo Seco Master Plans are a set of documents defining the community vision for the Arroyo Seco Natural Park. The set is comprised of four separate planning documents: the Lower Arroyo Master plan, Central Arroyo Master Plan, Hahamonga Watershed Park Master Plan, and Design Guidelines. The Hahamongna Watershed Park Master Plan and Design Guidelines are both relevant to this report.

The Hahamongna Watershed Park Master Plan (City of Pasadena 2003b) illustrates a vision for the 300-acres of open space that extends from Devil's Gate Dam north and into the Arroyo Seco Canyon, on the northwestern edge of the city. The Hahamongna Watershed Park Master Plan was adopted to establish a framework for recreation, water resources, flood management, habitat restoration, and cultural resources in this area. The Hahamonga Watershed Park Master Plan promotes the use of decorative Arroyo stone walls, gates, and fences, reflecting the historic heritage of the Arroyo Seco in Pasadena. They are established in this Master Plan as major enhancing and contributing to the unique setting of the natural habitats that are focal areas throughout the park.

Arroyo Seco Design Guidelines

The Arroyo Seco Design Guidelines (City of Pasadena 2003a) provide a unifying set of criteria for the site development improvements set forth in the Arroyo Seco Master Plan for on-going, long-range improvements for the Arroyo Seco. These guidelines will lead to a unified park design that reflects the heritage of the Arroyo Seco and its relationship to the tradition of the City of Pasadena. The Arroyo Seco Design Guidelines provide specific site design solutions that are consistent with the existing Arroyo Seco Ordinance and a vehicle by which practical inputs for ongoing improvements can take place. The Design Guidelines document gives more specific instances dictating how decorative cobblestone walls, gates, and fences should be utilized.

In the Architectural Design Concepts section guidelines, the "use of natural materials" and "arroyo stone" should be incorporated whenever appropriate. The guidelines also call for the preservation of stone walls in the Arroyo, when culturally significant. The arroyo stone walls and steps throughout the City of Pasadena and especially in the Arroyo Seco are considered an historic resource because many of them were built during the WPA years and in some locations designed by notable architects (City of Pasadena 2003a). See below:

7.2 General Guidelines

7.2.1 Walls

1. Where appropriate, vines and/or shrubs can be located against walls in areas where vandalism (graffiti) is a problem.

2. The stone walls in the Arroyo are culturally significant and shall be preserved.

3. Wall improvements in the Arroyo Seco shall primarily consist of walls that are faced in arroyo stone.

4. Walls constructed of split-faced block may be allowed in appropriate situations as determined by the Design Commission.

5. Wall improvements shall use the historic masonry style of the Arroyo by using a variety of sizes of stone, with large stones and boulders at the base of the wall including dry-stack techniques.

6. See the Wall Restoration Standards in Appendix E for improvements being considered to an existing stone wall or the construction of a new arroyo stone wall.

7. Where an existing stone retaining wall is in need of repair and posing a threat to the further degradation of the wall or to the public, the wall will be improved to ensure structural stability. See Appendix E, Wall Restoration Standards.

8. Wall improvements will consider drainage patterns immediate to the wall and provide weep holes at regular intervals and/or the appropriate drainage solution to protect the longevity of the wall.

9. Improvements to arroyo stone walls will be made by a qualified craftsman in the masonry trade with demonstrable experience with similar work.

10. Low stone walls will be finished so that the top of the wall is smooth, flat, and comfortable enough to be used as seating.

11. A well-crafted and proportionately sized cantilevered concrete cap atop an arroyo stone wall or pilaster is an acceptable design.

12. All construction and repair of the arroyo stone walls and steps shall be done in accordance with the current City of Pasadena's "Standard Specifications for Public Works Construction" (popularly known as the "Greenbook").

13. Arroyo stone walls along neighborhood trails shall be restored.

2 Background Research

2.1 CHRIS Records Search

A California Historical Resources Information System (CHRIS) records search was conducted for the Project site and surrounding 0.5-mile records search area at the South Central Coastal Information Center (SCCIC), located on the campus of California State University, Fullerton on October 3, 2019. This search included their collections of mapped prehistoric, historic, and built environment resources, Department of Parks and Recreation Site Records, technical reports, and ethnographic references. Additional consulted sources include historical maps of the study area, the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), the California Historic Property Data File, the lists of California State Historical Landmarks, California Points of Historical Interest, and the Archaeological Determinations of Eligibility. The confidential records search results are also provided in Confidential Appendix B.

Previously Conducted Cultural Resources Studies

The SCCIC records indicate that 35 cultural resources investigations have been conducted within 0.5-mile of the Project site. Of these, six studies were conducted within a portion of the Project site, (LA-01903, LA-06948, LA-08927, LA-11042, LA-11193, and LA-11194), and one study (LA-01312) was adjacent to the Project site. Table 1, below, summarizes all 35 previous cultural resources studies followed by a brief summary of each study that overlaps or is adjacent to the Project.

Table 1. Previous Cultural Resources Investigations Within 0.5-Mile of the Project Site

SCCIC Report Number	Title	Author	Year	Proximity to Project Site
LA-00294	A Preliminary Archaeological Literature Search for the Community Development Plan	Adams, Andrea	n.d.	Outside
LA-00880	Cultural Resources Overview for the Jet Propulsion Laboratory Environmental Resources Document, Pasadena, California	Chavez, David	1980	Outside
LA-01312	Archaeological Reconnaissance Report: Fuel Break System for the Crest-Millard Fuel Management Unit	Bridgewater, John W.	1976	Adjacent
LA-01659	Cultural Resources Assessment of the La Vina Property, Altadena, Los Angeles County, California	Bissell, Ronald M.	1987	Outside
LA-01903	Preliminary Assessment of the Prehistoric Cultural Resources of the Devil's Gate Reservoir, Pasadena, California	Blodgett, Leslie M	1987	Overlaps
LA-02098	Archaeological Research on the La Vina Property, Vesting Tentative Tract 45546. Altadena, Los Angeles County, California	Bissell, Ronald M.	1990	Outside
LA-02501	Letter Comments Concerning a Report Prepared by Ron Bissell for the La Vina Property	King, Chester	1991	Outside
LA-02602	eer Review of Previous Archaeological Studies Conducted on the La Vina Property	De Barros, Phillip	1992	Outside

Table 1. Previous Cultural Resources Investigations Within 0.5-Mile of the Project Site

SCCIC Report Number	Title	Author	Year	Proximity to Project Site
LA-02707	Arroyo Leach Field (L.A. County)	Kerr, David	1992	Outside
LA-02799	The La Vina Property: An Assessment of Historic Archaeological Resources Tentative Tract 45546	Weber, Carmen A.	1992	Outside
LA-02975	A Phase I Cultural Resources Survey of Alternative Locations for the Proposed Jet Propulsion Laboratory Parking Structure, Jet Propulsion Laboratory, Pasadena, Los Angeles County, California	McKenna, Jeanette A.	1993	Outside
LA-03372	Historic Resources Evaluation and Management Plan, United States Forest Service, Angeles National Forest	Triem, Judith	1993	Outside
LA-03619	Phase I Cultural Resources Investigations for the Proposed La Canada-Flintridge, Los Angeles County, California	McKenna, Jeanette A. and Richard S. Shepard	1997	Outside
LA-03927	Archaeological Assessment for Pacific Bell Mobile Services Telecommunications Facility LA 096-09, 4815 Oak Glen Drive, City of La Canada Flintridge, County of Los Angeles, California	McLean, Deborah K.	1998	Outside
LA-04232	Archaeological Monitoring of Grading and Summary of Previous Cultural Resources Studies for the La Vina Planned Development, Altadena, Los Angeles County, California	Maxon, Patrick O.	1998	Outside
LA-04469	Assessment of the Archaeological Impact by the Installation of a Sewer Pipeline in La Crescenta and Glendale	Romani, John F.	1977	Outside
LA-05160	Cultural Resource Assessment for Pacific Bell Wireless Facilities LA 977-01 and LA 978-01, County of Los Angeles, California	Lapin, Phillipe	2000	Outside
LA-05161	Cultural Resource Assessment for Pacific Bell Wireless Facilities LA 977-01 and LA 978-01	Lapin, Phillipe	2000	Outside
LA-05233	Phase I Cultural Resources Investigations for the Proposed Sanitary Sewer Improvements Project in the City of La Canada Flintridge, Los Angeles County, California	McKenna, Jeanette A.	2000	Outside
LA-05235	Cultural Resource Evaluation of the Oak Grove Ranger Station, Angeles National Forest A.R.P. #05-01-00-607	Vance, Darrell W.	2000	Outside
LA-05860	Review of Pacific Bell Wireless Facilities LA 977-01 and LA 978-01, County of Los Angeles, California	Duke, Curt	2000	Outside
LA-06946	Archaeological Reconnaissance Report 05-011-00-674, Teddy's Outpost Picnic Area, Angeles National Forest, Los Angeles County, California	Romani, Gwendolyn	2002	Outside
LA-06948	Archaeological Survey Report Southern California Edison Seco 16 Kv Circuit Deteriorated Pole Replacement Project	Romani, John F.	2002	Overlaps
LA-06950	La Canada Flintridge Sewer Improvement Project Summary	McKenna Jeanette A	2003	Outside

Table 1. Previous Cultural Resources Investigations Within 0.5-Mile of the Project Site

SCCIC Report Number	Title	Author	Year	Proximity to Project Site
LA-07464	Cultural Resources Records Search Results and Site Visit for Cingular Candidate SC-0065-01 (Hahamongna) 3531 Lincoln Avenue, Los Angeles County, California	Bonner, Wayne H.	2006	Outside
LA-07465	Cultural Resources Records Search Results and Site Visit for Sprint Nextel Candidate CA7717b (Mendocino), 599 West Mariposa Street, Altadena, Los Angeles County, California	Bonner, Wayne H.	2005	Outside
LA-08927	A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Sunset Overlook Trailhead Area of the Hahamongna Watershed Park in the City of Pasadena, Los Angeles County, California	McKenna, Jeanette A.	2007	Overlaps
LA-09728	ARR# 05-01-01109: Arroyo Seco Ranger Station Residence Window Replacement Project and Historic Resources Assessment of Arroyo Seco Administrative Site, Los Angeles River Ranger District, Angeles National Forest, Los Angeles County, California	Peebles, David S.	2008	Outside
LA-09899	Results of the Cultural Resources Assessment for the Ravine New Circuit and Reconductoring Distribution Substation Plan Project, Los Angeles County, California	Delu, Antonina	2009	Outside
LA-11042	A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Eastside Neighborhood and JPL Connector Trail Improvements Project Area in the Hahamongna Watershed Park, City of Pasadena, Los Angeles County, California	McKenna, Jeanette A.	2009	Overlaps
LA-11193	Sunset Overlook Trailhead Area in Hahamongna Watershed Park, Master EIR Initial Study Environmental Checklist	Bellas, John	2007	Overlaps
LA-11194	Hahamongna Watershed Park Master Plan, A Component of the Arroyo Seco Master Plan	Unknown	2002	Overlaps
LA-11625	A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Hahamongna Multi-Benefit/ Multi-Use Project in the Hahamongna Watershed Park, City of Pasadena, Los Angeles County, California	McKenna, Jeanette A.	2012	Outside
LA-12621	Historic Archaeology Concerns Related to the La Vina Property, Vesting Tentative Tract 45546, Altadena, Los Angeles County, California	Bissell, Ronald	1990	Outside
LA-12622	Test Excavation at CA-LAN-1599, La Vina Property, Altadena, Los Angeles County, California	Bissell, Ronald	1992	Outside

LA-01312

In 1976, John Bridgewater of the Saugus Ranger District conducted an Archaeological Reconnaissance Report (ARR) for Crest-Millard Fuel Management Unit on locations in Arroyo Seco and Tujunga Districts. The resulting report, *Fuel Break System for the Crest-Millard Fuel Management System* (Bridewater 1976), studied dispersed sections of the Angeles National Forest potentially affected by the maintenance and expansion of a fuel break system. The study area included an APE that extended to the first major ridge in the San Gabriel Mountain north of the area between the foothill cities of Tujunga and Pasadena, roughly adjacent to the current Project site. One prehistoric site was identified within the vicinity of the APE (P-19-000342) as a result of the records search and field survey, however, it was determined that it would only be impacted if future plans pushed construction north of the Vasquez Break. A site survey record from 1965 for P-19-000342 was attached to Mr. Bridgewater's report which included surface survey of a general village site, identification of a cogstone, milling stones, and interviews of the property owners who attested to a purported village having existed according to the local cultural memory.

LA-01903

In 1987, Leslie Blodgett was contracted by Cotton/Beland and Associates to prepare an Archaeological Survey Report in support of repair and reuse of the Devil's Gate Reservoir, in the City of Pasadena. The study area consisted of the reservoir property located directly north of the I-210 Foothill Freeway and directly south of the Cal Tech Jet Propulsion Laboratory. The study area overlapped a portion of the current Project site at Area 3. The resulting report, *Preliminary Assessment of the Prehistoric Cultural Resources of the Devil's Gate Reservoir, Pasadena, California* (Blodgett 1987), consisted of a records search and pedestrian survey. No prehistoric cultural resources were identified within the study area as a result of the archival review and field inspection. However, the records search identified two prehistoric sites within 1-mile of the study area: the aforementioned P-19-000342 purported village site, and P-19-000026, known as the Sheldon Reservoir site, which consists of a multi-level prehistoric graveyard. As a result of these findings, the study area was determined archaeologically sensitive given the close proximity of these sites to the study area.

LA-06948

In 2002, Southern California Edison Company (SCE) retained Compass Rose Archaeological, Inc. to conduct a Phase I Inventory in support of the proposed replacement and relocation of two deteriorated H-frame structures on the Seco 16 kV circuit. One structure location is within the current Project site. The study impact areas consisted of individual structure locations and a 30-meter diameter surrounding each structure. No prehistoric or historic-age cultural resources were identified within the impact areas as a result of the CHRIS records search and pedestrian survey. The resulting letter report, *Southern California Edison Seco 16 kV Circuit Edison Company Circuit Deteriorated Pole Replacement Project* (Romani 2002), stated that no further cultural resources considerations were warranted for the project aside from standard management recommendations for the unanticipated discovery of cultural resources uncovered during construction activities.

LA-08927

In 2007, Willdan retained McKenna et. al. to conduct a cultural resources study in support of the Arroyo Seco Master Plan Project with improvements to the Sunset Overlook Trailhead area located at Windsor Avenue within the Hahamongna Watershed Park in the City of Pasadena. The project consisted of improvements to the parking lot, as well as the widening of the trailhead, extending to where the Gabrieleno Trail meets the Sunset Overlook,

overlapping the southern portion of the current Project site. The study consisted of a CHRIS records search, Native American coordination, and a pedestrian survey. No cultural resources were identified within the study area as a result of the records search and pedestrian survey. However, based on communications with the Gabrielino/Tongva Tribe, the Tribe considers the area of Arroyo Seco sensitive for the presence of cultural resources of Native American origin. The resulting letter report, *A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Sunset Overlook Trailhead Area of the Hahamongna Watershed Park in the City of Pasadena, Los Angeles County, California* (McKenna et.al. 2007), stated that the study area should be considered moderately sensitive for the presence of prehistoric archaeological resources and provided recommendations for archaeological monitoring during construction.

LA-11042

In 2009, Willdan retained McKenna et. al. to conduct a cultural resources study in support of the Eastside Neighborhood and JPL Connector Trail Project with improvements to all trail-ways north of Devil's Gate Reservoir in the Arroyo Seco area west of the City of Pasadena. Specifically, the study area included approximately 1619 linear feet of trail improvements between the City of Altadena (from the terminus of Altadena Drive) and Hahamongna Watershed Park, overlapping a portion of Area 3 within the current Project site. The study consisted of a CHRIS records search, Native American coordination, and a pedestrian survey. No cultural resources were identified within the study area as a result of the records search and pedestrian survey. However, based on communications with the Gabrielino/Tongva Tribe, the Tribe considers the area of Arroyo Seco sensitive for the presence of cultural resources of Native American origin. The resulting letter report, *A Phase I (CEQA) and Class III (NEPA) Cultural Resources Investigation for the Eastside Neighborhood and JPL Connector Trail Improvements Project Area in the Hahamongna Watershed Park, City of Pasadena, Los Angeles County, California* (McKenna et.al. 2009), stated that the study area should be considered moderately sensitive for the presence of prehistoric archaeological resources and provided recommendations for archaeological monitoring during construction.

LA-11193

In 2007, the City of Pasadena, Parks and Natural Resources Division prepared a Master EIR Initial Study in support of the Sunset Overlook Trailhead Area in Hahamongna Watershed Park. Details of this project were discussed above in SCCIC report LA-08927. The Initial Study published the results of the McKenna et.al. 2007 study, which determined that the study area is sensitive for the presence of Native American cultural resources, and provided mitigations for archaeological monitoring.

LA-11194

In 2002, the City of Pasadena, Parks and Natural Resources Division prepared the Hahamongna Watershed Park Master Plan. The Hahamongna Watershed Park overlaps the southern portion of the current Project site. The document referenced the Blodgett (1987) study discussed above in SCCIC report LA-01903, which stated that although no prehistoric cultural resources were identified within the Hahamongna Watershed Park as a result of a records search and pedestrian survey, the presence of two known prehistoric sites within the vicinity of the park suggests that the area is sensitive for the presence of prehistoric cultural resources.

Previously Recorded Cultural Resources

The CHRIS records indicate that one previously recorded resource (P-19-189942) overlaps the Project site, and one resource (P-19-186535) is adjacent to the Project site. Resource P-19-189942 consists of the Hahamongna

Watershed Park and associated recreational facilities. The resource was previously found ineligible for the CRHR. Resource P-19-186535 consists of the Angeles National Forest, a registered California Historical Landmark. The Project does not overlap the forest and is not anticipated to impact this resource.

Thirteen additional previously recorded cultural resources are within 0.5-mile of the Project site. Of these, two consist of prehistoric archaeological resources, including P-19-000342, the purported village site discussed above in SCCIC report LA-01312, and an isolated granitic discoidal recovered from fill material. There is one multi-component resource consisting of multiple loci of sparse prehistoric lithic scatters, as well as a historic-era domestic refuse scatter and purported historic-era burial from the late 1800s. There are two historic-era archaeological resources consisting of a granite headstone fragment from 1865, which is associated with the multi-component site, and the remnants of an early twentieth century campground known as Teddy's Outpost. None of these prehistoric or historic-era archaeological resources have been evaluated for the NRHP or CRHR.

Additionally, there are eight built environment resources within 0.5-mile of the Project site. These resources include the Jet Propulsion Laboratory campus, the registered National Historic Landmark Space Flight Operations Facility and the NRHP eligible Space Simulator, which are both within the Jet Propulsion Laboratory campus; the USDA Forest Service Oak Grove administrative site; two individual buildings within the Arroyo Seco Ranger Station administration site; a USDA Forest Service road; and the CRHR listed single-family property built in 1924 known as the Buffum House. Table 2, below, provides further details of all previously recorded cultural resources within the records search area.

Table 2. Previously Recorded Cultural Resources Within 0.5-Mile of the Project Site

Primary Number	Trinomial	Age and Type	Description	NRHP/CRHR Eligibility	Recorded By and Year	Proximity to Project Site
P-19-000342	CA-LAN-000342	Prehistoric: Site	Suspected location of prehistoric village site known as the Millard Canyon Site. Information gathered from informal interviews conducted with the property owners in the 1960s. A cogged stone and metate fragment were identified on the property. No archaeological testing was conducted at the site.	7R: Not evaluated	Cowper, D. (1965); Eberhart, H. (1965); King, C. (1989)	Outside

Table 2. Previously Recorded Cultural Resources Within 0.5-Mile of the Project Site

Primary Number	Trinomial	Age and Type	Description	NRHP/CRHR Eligibility	Recorded By and Year	Proximity to Project Site
P-19-001599	CA-LAN-001599	Multi-component Prehistoric and Historic-age: Site	Four loci consisting of sparse prehistoric scatters of ground and chipped stone tools and a historic-age scatter of early twentieth century domestic refuse. A historic-era burial is purported in the vicinity, though no remains were identified (see P-19-002679 below).	7R: Not evaluated	King, C. (1989); Bissell, R. (1992); King, C. (1992)	Outside
P-19-002189	CA-LAN-002189	Built Environment: Government campus	Remnants of the Jet Propulsion Laboratory campus constructed in 1936.	7R: Not evaluated	McKenna, J. (1993)	Outside
P-19-002679	CA-LAN-002679	Historic-age: Feature	Partial headstone identified within previously recorded site P-19-001599. Granite headstone engraved with "M/1865" and a Christian cross.	7R: Not evaluated	Maxon, P. (1998)	Outside
P-19-003086	CA-LAN-003086	Historic-age: Site	Former location of Teddy's Outpost, an early twentieth century tourist camp site razed in 1925. None of the original buildings remain. Site is currently used as a picnic area.	7R: Not evaluated	Romani, G. (2002)	Outside
P-19-100276	—	Prehistoric: Isolate	Discoidal, granitic. Recovered from a disturbed context within fill material.	7R: Not evaluated	Maxon, P. (1998)	Outside

Table 2. Previously Recorded Cultural Resources Within 0.5-Mile of the Project Site

Primary Number	Trinomial	Age and Type	Description	NRHP/CRHR Eligibility	Recorded By and Year	Proximity to Project Site
P-19-150023	—	Built Environment: Government building	Building #1015 within the Arroyo Seco Ranger Station administration site constructed in 1934.	7R: Not evaluated	Stone, M. (1992)	Outside
P-19-150024	—	Built Environment: Government building	Building #1016 within the Arroyo Seco Ranger Station administration site constructed in 1934.	7R: Not evaluated	Stone, M. (1992)	Outside
P-19-180710	—	Built Environment: Government building	Space Flight Operations Facility built 1963 within the Jet Propulsion Laboratory campus.	3S: Appears eligible for NRHP (1984); National Historic Landmark (1985)	Butowsky, H. (1984)	Outside
P-19-180711	—	Built Environment: Government building	Space Simulator built 1961 within the Jet Propulsion Laboratory campus.	3S: Appears eligible for NRHP (1984)	Butowsky, H. (1984)	Outside
P-19-186535	—	Cultural Resource: Forest	Angeles National Forest declared in 1892.	California Historical Landmark No. 717 (1960)	Arbuckle, J. (1979)	Adjacent
P-19-186872	—	Built Environment: Road	USDA Forest Service Road 2N66 depicted on maps as early as 1926.	7R: Not evaluated	Schmidt, J. and J. Schmidt (2005)	Outside

Table 2. Previously Recorded Cultural Resources Within 0.5-Mile of the Project Site

Primary Number	Trinomial	Age and Type	Description	NRHP/CRHR Eligibility	Recorded By and Year	Proximity to Project Site
P-19-186878	—	Built Environment: Government facility	USDA Forest Service facility known as the Oak Grove Administrative Site constructed in 1941.	7R: Not evaluated	Vance, D. (2000)	Outside
P-19-188157	—	Built Environment: Single-family property	Buffum House (built 1924) located at 711 West Calaveras Street.	1CS: Listed in the CRHR (2007)	Merchell, A. (2007)	Outside
P-19-189942	—	Built Environment: Park	Hahamongna Watershed Park, formerly Oak Grove Park, in use as open-space park area since the 1880s.	6Z: found ineligible for the CRHR (2012)	McKenna, J. (2012)	Overlaps

P-19-189942 (Hahamongna Watershed Park)

The Hahamonga Watershed Park overlaps the southern portion of the Project area at Area 3 and the Gabrielino Trail/ Access Road area. The park consists of picnic areas, hiking trails, ball fields, a golf course, disc golf course, equestrian trails, parking lots, support facilities, Devil's Gate Dam and improvements, flood control reservoir, and an open recreational landscape. According to the record, Hahamongna Watershed Park has been used for recreation, to varying extents, since the 1880s. In more recent years, the park became strongly associated with the sport of disc golf in the 1970s, as one of the first courses in the Los Angeles area. In 2003, The Hahamongna Watershed Park was adopted in the Arroyo Seco Master Plan. However, according to the site record, the Hahamongna Watershed Park the Disc Golf Course did not meet the minimum age requirements for consideration as historic period resources. Though the park has had recreation related activities dating back to the 1880s, the park itself, as currently established, is a modern, post-1988 facility that has evolved since its opening to meet the demands of users and citizens. As such, the park fails to meet any of the requirements for federal or state level listings as a historical resource. The Oak Grove Disc Golf Course is a feature within the park that, in and of itself, has a unique history and recognition. However, since the original course is no longer intact and the existing course has enlarged, adapted, and reconfigured to accommodate changes in the game, rules, and levels of participation, it does not meet the basic integrity requirements for consideration in the NRHP or CRHR. The Disc Golf Course, however, was recommended eligible by the record author as a local resource "for its inception in the City of Pasadena, the development of the game, and its association with world-wide competitions and recognition by fans of the game. The Disc Golf Course does not overlap the current Project site.

2.2 Native American Coordination

Sacred Lands File and Tribal Outreach

Dudek contacted the NAHC on September 16, 2019, and requested a review of the Sacred Lands File (SLF). The NAHC replied via email on October 7, 2019 stating that the result of the SLF search was positive. Moreover, the NAHC recommended contacting the Gabrieleno Band of Mission Indians – Kizh Nation for more information. The NAHC also provide contact information for an additional four Native American individuals and/or tribal organizations who may have direct knowledge of cultural resources in or near the Project site; however, the additional four Native American individuals and/or tribal organizations have not, as of the preparation of this technical report, contacted the City requesting that the lead agency (City) provide notification to the tribe of projects in the tribe's area of traditional and cultural affiliation. No additional tribal outreach was conducted by Dudek; however, in compliance with Assembly Bill (AB) 52, the City has contacted tribal representatives that have requested to be notified of projects in Pasadena. Details of the SLF request and results including the tribal outreach process are presented in Appendix C.

The City sent notification of the proposed Project, pursuant to AB 52 on November 7, 2019, to all California Native American tribal representatives that have requested to be notified of projects within the City. The notification letter included a Project map and description inquiring if the tribe entities would like to request formal consultation in order to discuss the Project and the potential to impact any TCRs. AB 52 allows tribes 30 days after receiving notification to request consultation. If a response is not received within the allotted 30 days, it is assumed that consultation is declined. To date, one response to the City's notification letters has been received and one formal consultation has been requested. In a letter from Andrew Salas, Chairperson of the Gabrieleño Band of Mission Indians – Kizh Nation (Tribe) received by the City on November 15, 2019, Mr. Salas stated that the Project site is located within the Tribe's ancestral territory and that formal consultation was requested of the City by the Tribe.

Formal consultation was conducted over the phone on April 2, 2020 with three representatives from the City and two representatives from the Tribe present. After a description of the Project, history of water improvements and the nature of soils in the Project area were provided by the City, the Tribal representatives presented their knowledge of cultural resources in the area as well as their concerns regarding what the Tribe believes to be potential impacts to unknown cultural resources as a result of the proposed Project. The Tribal representatives stated that they request monitoring of soils during ground disturbing activities and that the Tribe is not requesting any Project alternatives or avoidance. The City contacted the Tribe via email on April 29, 2020 and provided proposed mitigation language developed based on the Tribe's input during the April 2, 2020 consultation. Within the email, the City stated that the consultation process will be considered complete absent of further communication to the contrary from the Tribe on or before May 15, 2020. On May 12, 2020, the Tribe emailed the City and provided further language and documentation supporting their request for mitigation measures stating, "we have provided to the Lead Agency substantial evidence that the proposed project may have a significant impact on our TCRs." The Tribe attached to the email specific mitigation language approved by their Tribal Government and requested the mitigation measures be incorporated into the EIR. Table 3 summarizes the results of the AB 52 process for the proposed Project. Documentation of the City's AB-52 efforts with Native American groups and/or individuals is provided in Appendix C.

Table 3. Summary of Project AB-52 Notification and Outreach

Native American Tribal Representatives	Method of Notification/Date	Response Received
Andrew Salas, Chairperson Gabrieleno Band of Mission Indians - Kizh Nation	Certified Mail; November 7, 2019	Tribe requested formal consultation, via email, regarding the proposed Project on November 15, 2019. Consultation meeting between the City and the Tribe occurred on April 2, 2020. The Tribe requested monitoring of ground disturbance during the April 2, 2020 consultation meeting. The City contacted the Tribe via email on April 29, 2020 and provided proposed mitigation language. On May 12, 2020 the Tribe emailed the City and provided further language supporting their request for mitigation measures as well as specific mitigation language approved by their Tribal Government. In response to the Tribe's request, the City revised the mitigation language to be consistent with the Tribe's requested mitigation measures via email on June 8, 2020. The Tribe responded to this email on the same day and proposed a different revised measure. This revised language is set forth in MM-TCR-1 and MM-TCR-2 of this Draft EIR. This email signifies the conclusion of the consultation pursuant to AB-52.
Sam Dunlap Gabrielino – Tongva Tribe	Certified Mail; November 7, 2019	No response received

Assembly Bill 52 Consultation

The proposed Project is subject to compliance with AB 52 (PRC 21074), which requires consideration of impacts to TCRs as part of the CEQA process, and that the lead agency notify California Native American Tribal representatives (that have requested notification) who are traditionally or culturally affiliated with the geographic area of the proposed Project. All NAHC-listed California Native American Tribal representatives that have requested project notification pursuant to AB 52 were sent letters by the City on November 7, 2019. The letters contained a project description, outline of AB 52 timing, request for consultation, and contact information for the appropriate lead agency representative. Documents related to AB 52 consultation are on file with the City. Tribal cultural resources are discussed in Section 4.9, Tribal Cultural Resources of the Draft Environmental Impact Report (EIR) for the proposed Project.

2.3 CHRID Review

Dudek also conducted a review of the California Historical Resources Inventory Database (CHRID), specifically for properties entered by the City of Pasadena. The CHRID promotes and protects cultural heritage through documenting and sharing information on historical resources. CHRID was developed through the California State Office of Historic Preservation's Certified Local Government (CLG) Grant Program and partially funded through the Federal Historic Preservation Fund Program.

All properties within the Project site were searched in the online CHRID. As a result, none of the properties located within the Project site are listed in the online CHRID and therefore have not been previously evaluated. A review of Pasadena's Historic and Landmark Districts indicates that the Project site does not fall within any existing historic districts. NASA's Space Flight Operations Facility (Jet Propulsion Laboratory), which is listed in the NRHP, is adjacent

to the Project area on the western side. A review of the CHRID confirmed that no properties within the Project site have been previously evaluated for historical significance.

Although not listed in the CHRID, 3139 Ridgeview Drive (APN 5829-026-053) is adjacent to the Project area on the eastern side. The property contains an historic house designed by Frank Lloyd Wright, Jr., and is eligible for listing in the CRHR.

2.4 Building Development and Archival Research

Building development and archival research were conducted for the Project site in an effort to establish a thorough and accurate historic context for the significance evaluations, and to confirm the building development history of the Project site and associated parcels.

Los Angeles County Office of the Assessor

On November 15, 2019, Dudek researched property characteristic records for the Project site in order to establish APNs and dates of construction.

Historical Newspaper Search

Dudek reviewed historical newspapers for the City of Pasadena and City Los Angeles in an effort to understand the development of the Project site. Sources were collected from the Pasadena Public Library, Los Angeles Public Library and online newspaper repository Newspapers.com. All information obtained from the historical newspaper search was incorporated into the historic context.

Pasadena Digital History Collaboration

Dudek reviewed historical photographs, newspaper clippings, maps, and directories held by the PDHC (Pasadena Digital History Collaboration), available online through the PDHC website. The PDHC is a cooperative partnership with Pasadena City College Shatford Library, Pasadena Museum of History, Pasadena Public Library, and other community partners. All information obtained from PDHC was incorporated into the historic context.

Historical Aerial Photographs

Historic aerial photographs of the Project site were available from Nationwide Environmental Title Research LLC (NETR) maps for the years 1952, 1953, 1954, 1964, 1972, 1977, 1978, 1980, 1982, 1994, 2002, 2003, 2004, 2005, 2009, 2010, 2012, 2014, and 2016 and from the University of California, Santa Barbara (UCSB), FrameFinder Maps for the years 1927, 1935, 1938, 1944, 1952, 1956, 1960, 1968, 1976, 1981, and 1982 (NETR 2019; UCSB 2019).

The earliest aerial photograph dates from 1927 and indicates that the Project site was a relatively undeveloped watershed, with evidence of flood damage within the canyon and at the mouth of the canyon. Informal trails and unpaved formal roads are visible in the canyon, including a short, unpaved road spur near the Bridge No. 1 location which leads to a turnaround area and a small square-plan building. This building was outside the Project site, but appears to be a square-plan, river cobble-clad building on a concrete platform, still located at the end of the spur road. Bridge No. 2 is also visible in the 1927 photograph (NETR 2019; UCSB 2019).

In the next available photograph from 1935, a king truss bridge at the canyon mouth, a bridge where Bridge No 1 (southernmost) is located, a potential above ground pipeline near Bridge No. 1, Bridge No. 2, the rock retaining walls between Bridge No. 2 and the screen building are all present, and the weir intake structure are all visible. A single structure and retaining wall are visible where the screen building is located, but it is not clear if this is the same structure (NETR 2019; UCSB 2019).

The next photograph from 1938 was taken in July 1938, and still shows extensive flood damage from the January and February 1938 floods. All bridges except Bridge No. 2 appear to have been destroyed. The Arroyo Seco Road appears to be washed out in several locations, including where the rock retaining walls were located. All buildings near the weir/intake, as well as the weir/intake have been destroyed. The structures identified as a pipeline in the original 1935 photograph appear to have been destroyed by the 1938 photograph and do not reappear in subsequent photographs until 1980 (NETR 2019; UCSB 2019).

In 1944, the Arroyo Seco Road appears repaired and paved. Bridge No 2 is visible, as well as the improved road, rock retaining walls, screen building, and a new weir intake structure, spanning the drainage. Bridge No. 3, the CCC-built king truss bridge, is obscured from view by vegetation and shadow (NETR 2019; UCSB 2019).

In 1952, the spreading basins, then-owned by Los Angeles County Flood Control District (LACFCD) first appear, as well as the LACFCD-owned flow control dams, Altadena Storm Drain, and sheds associated with the spreading basins. The gated Pasadena Water and Power (PWP)-owned sludge basins do not appear yet. The Jet Propulsion Laboratory (JPL) has begun using the basin area as an informal parking lot accessed by a bailey bridge across the creek bed, parking vehicles northeast of the spreading basins. Arroyo Seco Road is now accessed via a single switchback from the canyon floor and spreading basins. Further up-canyon, new buildings at the screen building appear. Bridge No. 3 is visible in 1952, due to vegetation changes. Bridge No. 2 and the rock retaining walls are in place and visible (NETR 2019; UCSB 2019).

There are no visible changes to the Project site in the 1956 photograph, but in the 1960 photograph the JPL parking lot has expanded and replaced the access bridge, removing the switchback access road. The gated, PWP sludge basins are still not present. By the 1968 photograph, the JPL parking lot has expanded south several hundred feet, south to the fourth spreading basin (NETR 2019; UCSB 2019).

In the 1976 photograph, Bridge No. 1, the simple slab bridge appears for the first time. Behner Wastewater Treatment Plant also first appears in the 1976 aerial photograph. The two sludge basins also appear, between the intake structure and the north-most spreading basin, in the 1976 photograph; however they do not yet have gates around them. Between the 1977 and 1980 aerial photograph, a pipeline appears just west of Bridge No. 1, and southwest of Bridge No. 2, before taking a sharp turn due west and up a steep slope. No changes were noted in 1981 or 1982 aerials. The sludge basins appear gated for the first time in 2002. No other changes were noted (NETR 2019; UCSB 2019).

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3 Cultural Setting

3.1 Prehistoric Overview

Evidence for continuous human occupation in Southern California spans the last 10,000 years. Various attempts to parse out variability in archaeological assemblages over this broad period have led to the development of several cultural chronologies; some of these are based on geologic time, most are based on temporal trends in archaeological assemblages, and others are interpretive reconstructions. To be more inclusive, this research employs a common set of generalized terms used to describe chronological trends in assemblage composition: Paleoindian (pre-5500 BC), Archaic (8000 BC–AD 500), Late Prehistoric (AD 500–1769), and Ethnohistoric (post-AD 1769).

Paleoindian Period (pre-5500 BC)

Evidence for Paleoindian occupation in the region is tenuous. Our knowledge of associated cultural pattern(s) is informed by a relatively sparse body of data that has been collected from within an area extending from coastal San Diego, through the Mojave Desert, and beyond. One of the earliest dated archaeological assemblages in the region is located in coastal Southern California (though contemporaneous sites are present in the Channel Islands) derives from SDI-4669/W-12 in La Jolla. A human burial from SDI-4669 was radiocarbon dated to 9,590–9,920 years before present (95.4% probability) (Hector 2006). The burial is part of a larger site complex that contained more than 29 human burials associated with an assemblage that fits the Archaic profile (i.e., large amounts of ground stone, battered cobbles, and expedient flake tools). In contrast, typical Paleoindian assemblages include large stemmed projectile points, high proportions of formal lithic tools, bifacial lithic reduction strategies, and relatively small proportions of ground stone tools. Prime examples of this pattern are sites that were studied by Emma Lou Davis (1978) on Naval Air Weapons Station China Lake near Ridgecrest, California. These sites contained fluted and unfluted stemmed points and large numbers of formal flake tools (e.g., shaped scrapers, blades). Other typical Paleoindian sites include the Komodo site (MNO-679)—a multi-component fluted point site, and MNO-680—a single component Great Basined Stemmed point site (see Basgall et al. 2002). At MNO-679 and -680, ground stone tools were rare while finely made projectile points were common.

Warren et al. (2004) claimed that a biface manufacturing tradition present at the Harris site complex (SDI-149) is representative of typical Paleoindian occupation in the region that possibly dates between 10,365 and 8,200 BC (Warren et al. 2004). Termed San Dieguito (see also Rogers 1945), assemblages at the Harris site are qualitatively distinct from most others in the region because the site has large numbers of finely made bifaces (including projectile points), formal flake tools, a biface reduction trajectory, and relatively small amounts of processing tools (see also Warren 1968). Despite the unique assemblage composition, the definition of San Dieguito as a separate cultural tradition is hotly debated. Gallegos (1987) suggested that the San Dieguito pattern is simply an inland manifestation of a broader economic pattern. Gallegos's interpretation of San Dieguito has been widely accepted in recent years, in part because of the difficulty in distinguishing San Dieguito components from other assemblage constituents. In other words, it is easier to ignore San Dieguito as a distinct socioeconomic pattern than it is to draw it out of mixed assemblages.

The large number of finished bifaces (i.e., projectile points and non-projectile blades), along with large numbers of formal flake tools at the Harris site complex, is very different than nearly all other assemblages throughout the region, regardless of age. Warren et al. (2004) made this point, tabulating basic assemblage constituents for key early Holocene sites. Producing finely made bifaces and formal flake tools implies that relatively large amounts of time were spent for tool manufacture. Such a strategy contrasts with the expedient flake-based tools and cobble-core reduction strategy that typifies non-San Dieguito Archaic sites. It can be inferred from the uniquely high degree of San Dieguito assemblage formality that the Harris site complex represents a distinct economic strategy from non-San Dieguito assemblages.

San Dieguito sites are rare in the inland valleys, with one possible candidate, RIV-2798/H, located on the shore of Lake Elsinore. Excavations at Locus B at RIV-2798/H produced a toolkit consisting predominately of flaked stone tools, including crescents, points, and bifaces, and lesser amounts of groundstone tools, among other items (Grenda 1997). A calibrated and reservoir-corrected radiocarbon date from a shell produced a date of 6630 BC. Grenda (1997) suggested this site represents seasonal exploitation of lacustrine resources and small game and resembles coastal San Dieguito assemblages and spatial patterning.

If San Dieguito truly represents a distinct socioeconomic strategy from the non-San Dieguito Archaic processing regime, its rarity implies that it was not only short-lived, but that it was not as economically successful as the Archaic strategy. Such a conclusion would fit with other trends in Southern California deserts, where hunting-related tools were replaced by processing tools during the early Holocene (see Basgall and Hall 1990).

Archaic Period (8000 BC – AD 500)

The more than 2,500-year overlap between the presumed age of Paleoindian occupations and the Archaic period highlights the difficulty in defining a cultural chronology in Southern California. If San Dieguito is the only recognized Paleoindian component in the coastal Southern California, then the dominance of hunting tools implies that it derives from Great Basin adaptive strategies and is not necessarily a local adaptation. Warren et al. (2004) admitted as much, citing strong desert connections with San Dieguito. Thus, the Archaic pattern is the earliest local socioeconomic adaptation in the region (see Hale 2001, 2009).

The Archaic pattern, which has also been termed the Millingstone Horizon (among others), is relatively easy to define with assemblages that consist primarily of processing tools, such as millingstones, handstones, battered cobbles, heavy crude scrapers, incipient flake-based tools, and cobble-core reduction. These assemblages occur in all environments across the region with little variability in tool composition. Low assemblage variability over time and space among Archaic sites has been equated with cultural conservatism (see Basgall and Hall 1990; Byrd and Reddy 2002; Warren 1968; Warren et al. 2004). Despite enormous amounts of archaeological work at Archaic sites, little change in assemblage composition occurred until the bow and arrow was adopted around AD 500, as well as ceramics at approximately the same time (Griset 1996; Hale 2009). Even then, assemblage formality remained low. After the bow was adopted, small arrow points appear in large quantities and already low amounts of formal flake tools are replaced by increasing amounts of expedient flake tools. Similarly, shaped millingstones and handstones decreased in proportion relative to expedient, unshaped ground stone tools (Hale 2009). Thus, the terminus of the Archaic period is equally as hard to define as its beginning because basic assemblage constituents and patterns of manufacturing investment remain stable, complemented only by the addition of the bow and ceramics.

Late Prehistoric Period (AD 500-1769)

The period of time following the Archaic and before Ethnohistoric times (AD 1769) is commonly referred to as the Late Prehistoric (Rogers 1945; Wallace 1955; Warren et al. 2004); however, several other subdivisions continue to be used to describe various shifts in assemblage composition. In general, this period is defined by the addition of arrow points and ceramics, as well as the widespread use of bedrock mortars. The fundamental Late Prehistoric assemblage is very similar to the Archaic pattern, but includes arrow points and large quantities of fine debitage from producing arrow points, ceramics, and cremations. The appearance of mortars and pestles is difficult to place in time because most mortars are on bedrock surfaces. Some argue that the Ethnohistoric intensive acorn economy extends as far back as AD 500 (Bean and Shipek 1978). However, there is no substantial evidence that reliance on acorns, and the accompanying use of mortars and pestles, occurred before AD 1400. Millingstones and handstones persisted in higher frequencies than mortars and pestles until the last 500 years (Basgall and Hall 1990); even then, weighing the economic significance of millingstone-handstone versus mortar-pestle technology is tenuous due to incomplete information on archaeological assemblages.

3.2 Ethnographic Overview

The history of the Native American communities prior to the mid-1700s has largely been reconstructed through later mission-period and early ethnographic accounts. The first records of the Native American inhabitants of the region come predominantly from European merchants, missionaries, military personnel, and explorers. These brief, and generally peripheral, accounts were prepared with the intent of furthering respective colonial and economic aims and were combined with observations of the landscape. They were not intended to be unbiased accounts regarding the cultural structures and community practices of the newly encountered cultural groups. The establishment of the missions in the region brought more extensive documentation of Native American communities, though these groups did not become the focus of formal and in-depth ethnographic study until the early twentieth century (Bean and Shipek 1978; Boscana 1846; Geiger and Meighan 1976; Harrington 1934; Laylander 2000; Sparkman 1908; White 1963). The principal intent of these researchers was to record the precontact, culturally specific practices, ideologies, and languages that had survived the destabilizing effects of missionization and colonialism. This research, often understood as “salvage ethnography,” was driven by the understanding that traditional knowledge was being lost due to the impacts of modernization and cultural assimilation. Alfred Kroeber applied his “memory culture” approach (Lightfoot 2005: 32) by recording languages and oral histories within the region. Ethnographic research by Dubois, Kroeber, Harrington, Spier, and others during the early twentieth century seemed to indicate that traditional cultural practices and beliefs survived among local Native American communities.

It is important to note that even though there were many informants for these early ethnographies who were able to provide information from personal experiences about native life before the Europeans, a significantly large proportion of these informants were born after 1850 (Heizer and Nissen 1973); therefore, the documentation of pre-contact, aboriginal culture was being increasingly supplied by individuals born in California after considerable contact with Europeans. As Robert F. Heizer (1978) stated, this is an important issue to note when examining these ethnographies, since considerable culture change had undoubtedly occurred by 1850 among the Native American survivors of California.

Based on ethnographic information, it is believed that at least 88 different languages were spoken from Baja California Sur to the southern Oregon state border at the time of Spanish contact (Johnson and Lorenz 2006, p.

34). The distribution of recorded Native American languages has been dispersed as a geographic mosaic across California through six primary language families (Golla 2007).

Victor Golla has contended that one can interpret the amount of variability within specific language groups as being associated with the relative "time depth" of the speaking populations (Golla 2007: 80) A large amount of variation within the language of a group represents a greater time depth then a group's language with less internal diversity. One method that he has employed is by drawing comparisons with historically documented changes in Germanic and Romantic language groups. Golla has observed that the "absolute chronology of the internal diversification within a language family" can be correlated with archaeological dates (2007:71). This type of interpretation is modeled on concepts of genetic drift and gene flows that are associated with migration and population isolation in the biological sciences.

The tribes of this area have traditionally spoken Takic languages that may be assigned to the larger Uto–Aztecan family (Golla 2007, p. 74). These groups include the Gabrielino (alternately Gabrieleño), Cahuilla, and Serrano. Golla has interpreted the amount of internal diversity within these language-speaking communities to reflect a time depth of approximately 2,000 years. Other researchers have contended that Takic may have diverged from Uto–Aztecan ca. 2600 BC–AD 1, which was later followed by the diversification within the Takic speaking tribes, occurring approximately 1500 BC–AD 1000 (Laylander 2000).

Gabrielino (Gabrieleño)/Tongva

The archaeological record indicates that project site and vicinity was occupied by the Gabrieleño, who arrived in the Los Angeles Basin around 500 B.C. Surrounding cultural groups included the Chumash and Tataviam to the northwest, the Serrano and Cahuilla to the northeast, and the Juaneño and Luiseño to the southeast.

The name "Gabrieliño" or "Gabrieleño" denotes those people who were administered by the Spanish from the San Gabriel Mission, which included people from the Gabrieleño area proper as well as other social groups (Bean and Smith 1978; Kroeber 1925). Therefore, in the post-Contact period, the name does not necessarily identify a specific ethnic or tribal group. The names by which Native Americans in southern California identified themselves have, in some cases, been lost. Many modern Gabrieleño identify themselves as the Tongva (King 1994), within which there are a number of regional bands. Though the names "Tongva" or "Gabrieleño" are the most common names used by modern Native American groups, and are recognized by the Native American Heritage Commission, there are groups within the region that self-identify differently, such as the Gabrielino Band of Mission Indians - Kizh Nation. In order to be inclusive of the majority of tribal entities within the region, the name "Tongva" or "Gabrieleño" are used within this report.

Tongva lands encompassed the greater Los Angeles Basin and three Channel Islands, San Clemente, San Nicolas, and Santa Catalina. The Tongva established large, permanent villages in the fertile lowlands along rivers and streams, and in sheltered areas along the coast, stretching from the foothills of the San Gabriel Mountains to the Pacific Ocean. A total tribal population has been estimated of at least 5,000 (Bean and Smith 1978), but recent ethnohistoric work suggests a number approaching 10,000 (O'Neil 2002). Houses constructed by the Tongva were large, circular, domed structures made of willow poles thatched with tule that could hold up to 50 people (Bean and Smith 1978). Other structures served as sweathouses, menstrual huts, ceremonial enclosures, and probably communal granaries. Cleared fields for races and games, such as lacrosse and pole throwing, were created adjacent to Tongva villages (McCawley 1996). Archaeological sites composed of villages with various sized structures have been identified.

The largest, and best documented, ethnographic Tongva village in the vicinity was that of *Yanga* (also known as Yaangna, Janga, and Yabit), which was in the vicinity of the downtown Los Angeles (McCawley 1996:56-57; NEA and King 2004). This village was reportedly first encountered by the Portola expedition in 1769. In 1771, Mission San Gabriel was established. Yanga provided a large number of the recruitments to this mission; however, following the founding of the Pueblo of Los Angeles in 1781, opportunities for local paid work became increasingly common, which had the result of reducing the number of Native American neophytes from the immediately surrounding area (NEA and King 2004). Mission records indicate that 179 Gabrieleno inhabitants of Yanga were recruited to San Gabriel Mission (King 2000; NEA and King 2004: 104). Based on this information, Yanga may have been the most populated village in the Western Gabrieleno territory. Second in size, and less thoroughly documented, the village of Cahuenga was located slightly closer, just north of the Cahuenga Pass.

Father Juan Crespi passed through the area near Yanga on August 2-3, 1769. The pertinent sections from his translated diary are provided here:

> Sage for refreshment is very plentiful at all three rivers and very good here at the Porciúncula [the Los Angeles River]. At once on our reaching here, eight heathens came over from a good sized village encamped at this pleasing spot among some trees. They came bringing two or three large bowls or baskets half-full of very good sage with other sorts of grass seeds that they consume; all brought their bows and arrows but with the strings removed from the bows. In his hands the chief bore strings of shell beads of the sort that they use, and on reaching the camp they threw the handfuls of these beads at each of us. Some of the heathens came up smoking on pipes made of baked clay, and they blew three mouthfuls of smoke into the air toward each one of us. The Captain and myself gave them tobacco, and he gave them our own kind of beads, and accepted the sage from them and gave us a share of it for refreshment; and very delicious sage it is for that purpose.
>
> We set out at a half past six in the morning from this pleasing, lush river and valley of Our Lady of Angeles of La Porciúncula. We crossed the river here where it is carrying a good deal of water almost at ground level, and on crossing it, came into a great vineyard of grapevines and countless rose bushes having a great many open blossoms, all of it very dark friable soil. Keeping upon a westerly course over very grass-grown, entirely level soils with grand grasses, on going about half a league we came upon the village belonging to this place, where they came out to meet and see us, and men, women, and children in good numbers, on approaching they commenced howling at us though they had been wolves, just as before back at the spot called San Francisco Solano. We greeted them and they wished to give us seeds. As we had nothing at hand to carry them in, we refused [Brown 2002:339-341, 343].

The Tongva subsistence economy was centered on gathering and hunting. The surrounding environment was rich and varied, and the tribe exploited mountains, foothills, valleys, deserts, riparian, estuarine, and open and rocky coastal eco-niches. Like that of most native Californians, acorns were the staple food (an established industry by the time of the early Intermediate Period). Acorns were supplemented by the roots, leaves, seeds, and fruits of a wide variety of flora (e.g., islay, cactus, yucca, sages, and agave). Fresh water and saltwater fish, shellfish, birds, reptiles, and insects, as well as large and small mammals, were also consumed (Bean and Smith 1978: 546; Kroeber 1925; McCawley 1996).

A wide variety of tools and implements were used by the Tongva to gather and collect food resources. These included the bow and arrow, traps, nets, blinds, throwing sticks and slings, spears, harpoons, and hooks.

Groups residing near the ocean used oceangoing plank canoes and tule balsa canoes for fishing, travel, and trade between the mainland and the Channel Islands (McCawley 1996).

Tongva people processed food with a variety of tools, including hammerstones and anvils, mortars and pestles, manos and metates, strainers, leaching baskets and bowls, knives, bone saws, and wooden drying racks. Food was consumed from a variety of vessels. Catalina Island steatite was used to make ollas and cooking vessels (Blackburn 1963; Kroeber 1925; McCawley 1996).

At the time of Spanish contact, the basis of Tongva religious life was the Chinigchinich cult, centered on the last of a series of heroic mythological figures. Chinigchinich gave instruction on laws and institutions, and also taught the people how to dance, the primary religious act for this society. He later withdrew into heaven, where he rewarded the faithful and punished those who disobeyed his laws (Kroeber 1925). The Chinigchinich religion seems to have been relatively new when the Spanish arrived. It was spreading south into the Southern Takic groups even as Christian missions were being built and may represent a mixture of native and Christian belief and practices (McCawley 1996).

Deceased Tongva were either buried or cremated, with inhumation more common on the Channel Islands and the neighboring mainland coast and cremation predominating on the remainder of the coast and in the interior (Harrington 1942; McCawley 1996). Cremation ashes have been found in archaeological contexts buried within stone bowls and in shell dishes (Ashby and Winterbourne 1966), as well as scattered among broken ground stone implements (Cleland et al. 2007). Archaeological data such as these correspond with ethnographic descriptions of an elaborate mourning ceremony that included a wide variety of offerings, including seeds, stone grinding tools, otter skins, baskets, wood tools, shell beads, bone and shell ornaments, and projectile points and knives. Offerings varied with the sex and status of the deceased (Johnston 1962; McCawley 1996; Reid 1926). At the behest of the Spanish missionaries, cremation essentially ceased during the post-Contact period (McCawley 1996).

3.3 Historic Period Overview

Post-Contact history for the State of California is generally divided into three periods: the Spanish Period (1769–1821), Mexican Period (1821–1848), and American Period (1846–present). Although Spanish, Russian, and British explorers visited the area for brief periods between 1529 and 1769, the Spanish Period in California begins with the establishment in 1769 of a settlement at San Diego and the founding of Mission San Diego de Alcalá, the first of 21 missions constructed between 1769 and 1823. Independence from Spain in 1821 marks the beginning of the Mexican Period, and the signing of the Treaty of Guadalupe Hidalgo in 1848, ending the Mexican–American War, signals the beginning of the American Period when California became a territory of the United States.

Spanish Period

Spanish explorers made sailing expeditions along the coast of southern California between the mid-1500s and mid-1700s. In search of the legendary Northwest Passage, Juan Rodríquez Cabríllo stopped in 1542 at present-day San Diego Bay. With his crew, Cabríllo explored the shorelines of present Catalina Island as well as San Pedro and Santa Monica Bays. Much of the present California and Oregon coastline was mapped and recorded in the next half-century by Spanish naval officer Sebastián Vizcaíno. Vizcaíno's crew also landed on Santa Catalina Island and at San Pedro and Santa Monica Bays, giving each location its long-standing name. The Spanish crown laid claim to California based on the surveys conducted by Cabríllo and Vizcaíno (Bancroft 1885; Gumprecht 1999).

More than 200 years passed before Spain began the colonization and inland exploration of Alta California. The 1769 overland expedition by Captain Gaspar de Portolá marks the beginning of California's Historic period, occurring just after the King of Spain installed the Franciscan Order to direct religious and colonization matters in assigned territories of the Americas. With a band of 64 soldiers, missionaries, Baja (lower) California Native Americans, and Mexican civilians, Portolá established the Presidio of San Diego, a fortified military outpost, as the first Spanish settlement in Alta California. In July of 1769, while Portolá was exploring southern California, Franciscan Fr. Junípero Serra founded Mission San Diego de Alcalá at Presidio Hill, the first of the 21 missions that would be established in Alta California by the Spanish and the Franciscan Order between 1769 and 1823.

The Portolá expedition first reached the present-day boundaries of Los Angeles in August 1769, thereby becoming the first Europeans to visit the area. Father Crespi named "the campsite by the river Nuestra Señora la Reina de los Angeles de la Porciúncula" or "Our Lady the Queen of the Angels of the Porciúncula." Two years later, Friar Junípero Serra returned to the valley to establish a Catholic mission, the Mission San Gabriel Arcángel, on September 8, 1771 (Hoover et al 2002). In 1795 Fr. Fermin Lasuen ordered a new report on possible mission sites, and the Francisco Reyes Rancho was ultimately chosen as the new mission site, with Mission San Fernando Rey de España being formally founded in 1797 (Perkins 1957). Shortly thereafter, many of the local Gabrielino and Tataviam people were removed from their homeland, relocated to the mission, and their native lifeways taken away.

Mexican Period

A major emphasis during the Spanish Period in California was the construction of missions and associated presidios to integrate the Native American population into Christianity and communal enterprise. Incentives were also provided to bring settlers to pueblos or towns, but just three pueblos were established during the Spanish Period, only two of which were successful and remain as California cities (San José and Los Angeles). Several factors kept growth within Alta California to a minimum, including the threat of foreign invasion, political dissatisfaction, and unrest among the indigenous population. After more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain in 1821. In 1822, the Mexican legislative body in California ended isolationist policies designed to protect the Spanish monopoly on trade, and decreed California ports open to foreign merchants (Dallas 1955).

Extensive land grants were established in the interior during the Mexican Period, in part to increase the population inland from the more settled coastal areas where the Spanish had first concentrated their colonization efforts. Rancho San Vicente y Santa Monica, where the project site is located, was granted by Governor Juan Alvarado to Francisco Sepulveda in 1838. The Rancho encompasses present day Santa Monica, Brentwood, Mandeville Canyon, portions of the Santa Monica Mountains, and parts of West Los Angeles (Hoffman 1862: 63).

During the supremacy of the ranchos (1834–1848), landowners largely focused on the cattle industry and devoted large tracts to grazing. Cattle hides became a primary southern California export, providing a commodity to trade for goods from the east and other areas in the United States and Mexico. The number of nonnative inhabitants increased during this period because of the influx of explorers, trappers, and ranchers associated with the land grants. The rising California population contributed to the introduction and rise of diseases foreign to the Native American population, who had no associated immunities.

American Period

War in 1846 between Mexico and the United States precipitated the Battle of Chino, a clash between resident Californios and Americans in the San Bernardino area. The Mexican-American War ended with the Treaty of Guadalupe Hidalgo in 1848, ushering California into its American Period.

California officially became a state with the Compromise of 1850, which also designated Utah and New Mexico (with present-day Arizona) as U.S. Territories (Waugh 2003). Horticulture and livestock, based primarily on cattle as the currency and staple of the rancho system, continued to dominate the southern California economy through 1850s. The Gold Rush began in 1848, and with the influx of people seeking gold, cattle were no longer desired mainly for their hides but also as a source of meat and other goods. During the 1850s cattle boom, rancho vaqueros drove large herds from southern to northern California to feed that region's burgeoning mining and commercial boom. Cattle were at first driven along major trails or roads such as the Gila Trail or Southern Overland Trail, then were transported by trains when available. The cattle boom ended for southern California as neighbor states and territories drove herds to northern California at reduced prices. Operation of the huge ranchos became increasingly difficult, and droughts severely reduced their productivity (Cleland 2005).

Historical Overview of the City of Pasadena

Like many cities in the San Gabriel Valley, the City of Pasadena's history is linked to the Mission San Gabriel and the subsequent privatization of ranchos once owned by the Mission in the eighteenth and nineteenth centuries. By 1827, the Mission ranchos were being partitioned, sold, and developed independent of the Mission. The first rancho sold was Rancho San Pasqual in 1827 (Figure 8), followed by Rancho Santa Anita and Rancho San Rafael. Portions of these three ranchos would later become the City of Pasadena (HRG 2007).

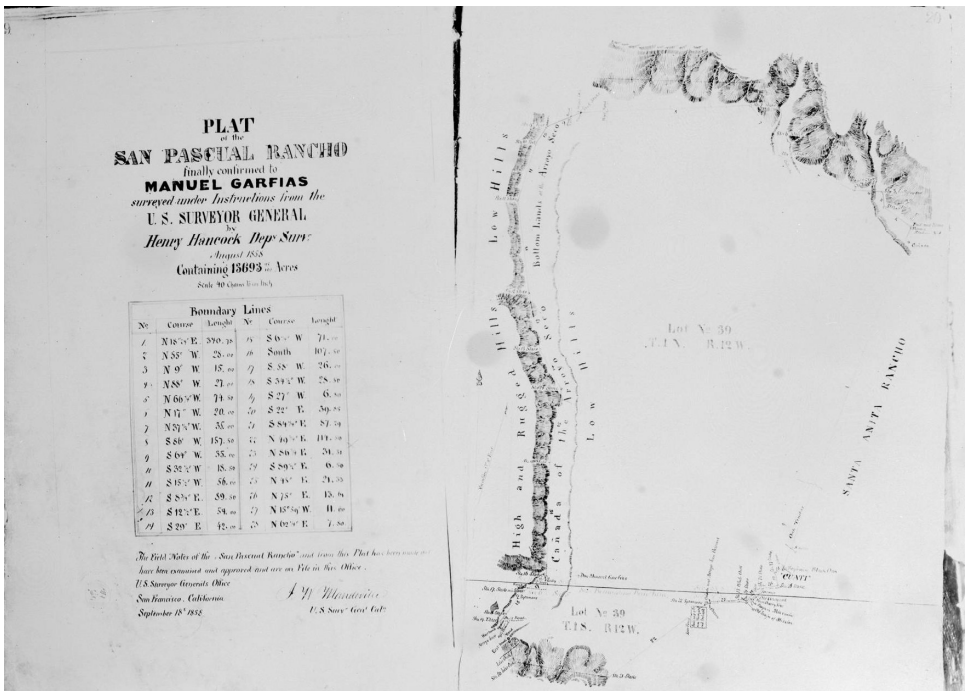


Figure 8. San Pasqual Rancho, 1858 (C.C. Pierce Collection of Photographs, Huntington Digital Library)

In 1874 Benjamin Davis Wilson, owner of a portion of the Rancho San Pasqual, negotiated a deal with Daniel Berry from Indiana. Berry, like many Americans at the time, was caught up in the concept of Manifest Destiny and sought land in the west with his fellow farmers from Indiana. He hoped to cultivate the warm climate crops that were not possible to grow in his home state. Berry secured a deal with Wilson for a portion of the Rancho San Pasqual and immediately surveyed and subdivided the property into 100 parcels. Quick development of the parcels and the establishment of a water conveyance system made the area conducive to farming and development. By 1875, the name Pasadena was chosen for the area. Growth and development continued rapidly in Pasadena and by 1880 the population had reached 383 (HRG 2007).

Growth and development continued in Pasadena throughout the 1880s and like other areas of Southern California, Pasadena experienced a land speculation boom. The land speculation boom was a result of the development of the railroad in Southern California and cities like Pasadena saw increases in land values with land selling for $1,000 per acre in 1886. The boom of the 1880s gave way to huge property subdivisions and population increases in Pasadena, as evidenced by the fact that more than 400 new buildings were constructed during this time (Grimes 2010; O'Conner 1993).

During the 1880s, Pasadena also became a desirable destination and greatly benefited from the tourism industry and grew to support temporary visitors. Pasadena was a particularly attractive climate, and health tourism was also a major component of its early economy. Events like the Tournament of Roses parade and East-West football game, which began in 1902 as the first of its kind in the nation introduced visitors to a mild winter climate and the beauty of the city. By 1900, Pasadena was supporting approximately 60,000 visitors during the winter months. The once-agricultural community quickly became a tourist destination, which led to the development of the commercial center, but also the hotel industry and other supporting service industries for seasonal visitors (Bricker et. al. 1992; HRG 2007; O'Conner 1993).

In addition to becoming a tourist destination, advancements in transportation including rail and trolley lines, made Pasadena a desirable place to live outside of the city of Los Angeles. Although the population boom precipitated the need for residential buildings, it also created a need for a more substantial commercial district in Pasadena. Colorado Boulevard became the main commercial thoroughfare with subsequent development on streets intersecting Colorado Boulevard like Fair Oaks Avenue and Raymond Avenue (Grimes 2010; HRG 2007).

By the 1890s, the population of the City reached 4,882 and expansion from the central city core led to development in all directions. Population increases and continued increases in tourism led to expanded cultural and social services in the city including an opera house, firehouse, and public library. The most remarkable institutions from the 1890s however, were the Tournament of Roses in 1890 and California Institute of Technology in 1891 (which became known as Caltech). Transportation also improved greatly during the 1890s with the electric streetcar service from Los Angeles to Pasadena established in 1895. The social and technological growth of the City in the 1890s led to the annexation of East Pasadena in 1904 and North Pasadena in 1906 (Grimes 2010; HRG 2007; O'Conner 1993).

Architectural history development patterns in Pasadena ran parallel to the population growth and development going on in the late 1800s. By the 1880s, large mansions began to emerge and prominent architects began to design homes for the wealthy residents of the City. One of the most significant movements of the time seen in Pasadena is the Arts and Crafts Movement, which dominated the architectural development of Southern California for years to come. Leading the movement in Pasadena were Charles and Henry Greene, who revolutionized the architectural development of Southern California with their high style California Bungalows. Population growth and

development also warranted a switch in Pasadena from only single-family residential living to higher density urban options. Pulling from the traditions of Greene and Greene, the Bungalow Court emerged to meet the growing housing needs of Pasadena. The Bungalow Court became a model for middle class architecture throughout Southern California and provided solutions to housing issues for many years to come (Grimes 2010; HRG 2007; Makinson 1977).

Technology was also increasingly important at the turn of the century and Pasadena like other cities saw the influence of the motor vehicle start to change the City's landscape and development. Pasadena embraced the automobile and by 1915 there was one automobile for every four residents of the City, which was significantly higher than other cities in the United States. Growing dependency on automobiles led to major thoroughfares like Colorado Boulevard developing to support the new industry with numerous car dealerships and related services. Infrastructure projects also began during the early years of the twentieth century with large-scale projects like the Colorado Street Bridge in 1913, the first of several Beaux Arts-style bridges which spanned the Arroyo Seco, connecting Pasadena to the towns of Eagle Rock and Glendale. Subsequent road constructions and bridge constructions continued in the 1920s and 1930s to support the influx of people to Pasadena and California (HRG 2007; O'Conner 1993).

Like other cities in the 1920s, Pasadena saw another population boom. The population of the city began the decade at 45,000 and ended the decade in 1930 with a population of 76,000. Pasadena's development at this time was largely influenced by the City Beautiful Movement and this period of growth led to the erection of the City Hall building. As seen in the previous population boom, Pasadena also experienced cultural expansion during this time with the erection of the Pasadena Playhouse in 1925 and the Rose Bowl Stadium in 1922. Despite these grand additions to the City in the 1920s, the City was also effected by the Great Depression and experienced a brief economic downturn. The Great Depression marked a slower economic period in Pasadena, but the city favored well in comparison to other cities throughout California. One of the hardest hit industries in Pasadena at the time was the tourism industry, as many people lacked the money for extravagant vacations and resorts. By the late 1930s the tourism industry was devastated and most of the resort hotels and amenities were closed (O'Conner 1993).

Although the post-war and depression years marked a bleak time in American history, the shift in architectural design during this period forever changed the American landscape. The work of early Modernists like Richard Neutra and Rudolph M. Schindler set the stage for Modernism to grow in Los Angeles with their use of International Style. The International Style combined economical materials, forward thinking and innovation. Important architects like Irving Gill, Frank Lloyd Wright, and Harwell Hamilton Harris made significant contributions to the Modernist movement in California (HRG 2007; O'Conner 1993).

The importance of innovation and forward thinking worked well for Pasadena once the United States entered World War II. Resort-era hotels remaining in the city were converted to military functions and with Caltech and Jet JPL research and development going toward the war effort, Pasadena was revived. Innovation and forward thinking also became a huge factor in the housing market once the war concluded as there was an influx of returning soldiers who required housing. Government agencies like the Federal Housing Administration (FHA) provided instructions for developers and builders for the best ways to deal with the population boom. They stressed the importance of proper planning, mass produced materials, and small house types. Following the war, these ideas were heavily implemented throughout the United States (HRG 2007).

Victory in World War II also ushered in a new era of hope and prosperity for the United States and from an architectural perspective, designers and architects embraced this optimism and saw it as a chance to move design

forward. The focus on economical materials started by the early Modernists had a resurgence, as did the mass production of materials perfected during the war years. The other factor that became so important was the relationship between the automobile and commercial and residential living. New technologies and population increases made automobiles more prevalent than ever, and architectural development moved ahead, making Pasadena a key location for these modern movements (HRG 2007).

In the 1940s and 1950s, new industries including manufacturing and science companies came to the city, the population continued to boom, and the city developed at a rapid speed. Culture remained a high priority in Pasadena during this time of growth and development with the Pasadena Playhouse and the Pasadena Art Museum. However, this growth and development came with a host of logistical problems as the city began to run out of space and experienced major issues with traffic congestion. For these reasons, many industries felt they could no longer grow and expand in Pasadena and they sought land elsewhere (HRG 2007).

The City of Pasadena responded to this industrial exodus with the establishment of the Chamber of Commerce in 1959 and the formation of a redevelopment agency. Attracting new forms of business was key for Pasadena and the first step in preserving the vast historical resources of the city. The primary business district moved east of Fair Oaks and Colorado leaving the downtown full of vacant storefronts and dilapidation. In 1969, the Pasadena Art Museum of Modern Art (now the Norton Simon Museum of Art) opened while the renowned Pasadena Playhouse closed and was sold at auction (HRG 2007; City of Pasadena 2019).

Pasadena began to experience a period of economic revitalization at the start of the 1970s. Plans were made for the construction of the Foothill and Long Beach Freeways that would link Pasadena to other major freeways to the east, west, and south. Old Pasadena was slated for demolition in 1971 under the city's Central District Improvement Plan despite strong opposition to save it. Groups like the Pasadena Development Agency and Pasadena Heritage worked to protect the architectural history of the city, including Old Pasadena, and bring back economic stability. Large corporations began to relocate their headquarters to Pasadena. Development restarted with the construction of the Conference Center, the Plaza Pasadena Mall, condominiums, office space, and commercial buildings. In 1979, the city passed the Urban Conservation Overlay Zone, which saved the historic structures of Old Pasadena from demolition (City of Pasadena 2019b; Old Pasadena 2016).

Between 1980 and 1990, the population of Pasadena increased by 11% and with the increase in population came a surge in development and ethnic diversity. In 1980, a charter amendment approved by voters changed Pasadena's election system to district only elections allowing for more diversity in the local government. In 1993, the Board of Directors changed their name to the City Council and a mayor was elected on a rotating basis from the senior City Councilmembers. Throughout the 1990s, Pasadena continued to experience civic beautification campaigns including the 1993 Old Pasadena Streetscape and Alleyways Project. Newly installed parking meters in Old Pasadena and a borrowed $5 million payed for the construction of new sidewalks, street furniture, trees, and lighting. The city turned the alleys info functional walkways that granted easy access to restaurants and shops. Old Pasadena boomed and encouraged other business districts to install parking meters in order to finance public improvements. In 2002, the Los Angeles County Metro's Gold Line light rail reopened Pasadena for rapid transit. High-density condominiums began to be constructed throughout the city, which increased the city's population (Shoup 2018; City of Pasadena 2019b; Old Pasadena 2016).

3.4 Project Site History

Arroyo Seco Canyon Developments (1887-present)

The Project site is located within the Hahamongna Watershed Master Plan Area, within the larger Arroyo Seco which also includes the Central and Lower Arroyo Seco Master Plan Areas. Arroyo Seco Canyon is an important watershed which begins in the San Gabriel Mountains at Mount Wilson, continues west of the cities of Pasadena and Altadena, and extends south to join the Los Angeles River. The canyon was used as a prehistoric through-route for the Hahamong'nas (a band of native Tongva people), connecting the area that is now Hahamongna Watershed Park to trade partners to the north. The canyon continued to be a source of water, recreation, and travel route well into the nineteenth century. As early as 1887, the City of Pasadena and citizens were recognizing the Arroyo Seco as a whole for its benefits as a park. Locals swam at the pools at Devil's Gate, hiked to the waterfall at Millard Canyon, and took pack animal trips to Mount Wilson. At the turn of the twentieth century, Arroyo Seco enjoyed a long period of recreational development, such as at Camp Oakwilde, a rustic resort constructed in 1911, and several private and public cabins throughout the canyon. In 1911, the City of Pasadena annexed the lower and middle sections of the Arroyo Seco, and in 1919, the area now known as Hahamongna Watershed Park was annexed to the city (City of Pasadena 2019b).

With the recreation movement taking hold in the Arroyo Seco, and the Arts and Crafts Movement (1895-1920) influencing building and landscape architecture at large in southern California, the area within and around the Arroyo Seco developed several unifying features that were consistently used throughout the Arroyo Seco canyon area, including parks, trails, landscaping features, neighborhoods, and civic structures. These included the emphasis on the natural environment and use of native cobblestone in walls, gates, and fences, especially as accents to pedestrian walkways and roads that might otherwise have a utilitarian appearance. Native rock cobblestone walls also complemented the larger Arts and Crafts-style residential architecture of Pasadena. Even after the Arts and Crafts Movement waned in popularity, the use of native cobblestone persisted as a unifying landscape feature in the Arroyo Seco (Bricker et al. 1992; Pasadena 2003a).

A road through Arroyo Seco Canyon has been visible on maps since the 1894 "Los Angeles, Calif." topographical map of the area. This earliest topographical map of the area shows the road extending between the Los Angeles Terminal Railroad Line and a mountain hamlet called Las Casitas before looping back west and south to La Cañada, following an older trail forged by the native Gabrielinos. The road was subjected to several floods over the years, damaging the road bed, bridges, dams and other infrastructure placed along it. Arroyo Seco Canyon Road, also known as Arroyo Boulevard, was paved for use as a county highway c. 1920, during which time Bridge No. 2 was constructed as a necessary improvement along the Arroyo Boulevard/Gabrielino Trail. Bridge No. 2 appears on the very first available aerial map from 1927, as well as other smaller bridges along the road and at the mouth of the canyon. A secondary spur road, leading east from the Bridge No. 1 crossing location, is also present on aerial photos as early as 1927. At the end of this spur road was a square-plan, river cobble-clad building on a concrete platform and a small, concrete diversion dam. Both of these structures are located outside of the Project site (LAT 1919; USGS 2019).

Arroyo Seco Road appears improved by bridges in the earliest available aerial photograph from 1927; however, subsequent floods in 1934 and 1938 appear to obliterate the road and bridges in the canyon, with the exception of Bridge No. 2. The road between Devil's Gate Dam and Oak Wilde, a forest community some 4 miles up Arroyo Seco Road, remained closed until 1939, the same year local Civilian Conservation Corps (CCC) Company 903

constructed Bridge No. 3. Despite the CCC improvements, the City of Pasadena road section outside of U. S. Forest Service lands was not officially repaired until 1941 (LAT 1938, 1940a, 1940b; Pasadena Star News 1939).

Local CCC Company 903 was assigned to the U.S. Forest Service in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great Depression. By June 1, 1933, over 1,400 working camps were established, employing more than 300,000 men, representing the most rapid peace-time mobilization in U.S history. Working on projects for the U.S. Forest Service, the National Park Service, and the Departments of Agriculture and Interior, CCC workers fought forest fires, planted trees, cleaned and maintained access roads, re-seeded grazing lands, implemented soil erosion controls, and built wildlife refuges, fish-rearing facilities, animal shelters, and water storage basins. Roosevelt also authorized the CCC to build bridges and campground facilities in an effort to encourage people to go enjoy America's natural resources. Although focused on providing employment for young unskilled men between 18 and 25 years of age, the CCC also employed WW1 army veterans, skilled foresters and craftsmen, and approximately 88,000 Native Americans from Indian reservations. The CCC reached its largest employment in August 1935, with more than 500,000 men working in 2,900 camps. Estimates indicate that approximately five percent of the US male population, about three million men, participated in the CCC.

The CCC planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems (History.com 2010). In 1941, the Arroyo Seco Project, part of a Los Angeles River watershed upstream work project, began with the Millard Canyon channel and road improvement project. A joint effort between Forest Service and the City of Pasadena engineers, the improvements in Millard Canyon entailed channel improvements and creating a new road cut above the channel bed with a "seven foot wall of native rock" (Pasadena Post 1941:17). The stretch of road to be improved by the retaining walls and barriers was described as above Devil's Gate Dam, and below the Brown Mountain truck trail turn off. The road improvements were in support of the larger goal of the watershed upstream work project: to build the Brown Mountain Dam near Arroyo Seco headwaters as a means of flood control. When the upstream project was completed, the City entered into a contract with the Forest Service to share costs of maintenance and patrols for the sections of Arroyo Seco and Millard Canyon that were in City of Pasadena Land, but adjacent to Forest Service land. Improvements are also visible in aerial photographs between 1938 and 1944, such as the construction of Bridge No. 1, road pavement, and the construction of native rock retaining walls and barriers (Pasadena Post, 1941a, 1941b; Pasadena Star News 1941, 1944; UCSB 2019).

Screen Building Complex (c. 1932-1944)

The Screen Building Complex consists of the screen building (formerly known as the Chlorine Plant, per as-built drawings), intake structure, and a flashboard dam/weir. The screen building is identified on 1932 as-built plans for the Arroyo Seco Headworks (Work Order 2802, Pasadena Water Department 1932), indicating that it was constructed around this time. As such, it is likely that these components were constructed by the CCC during their Arroyo Seco improvements campaign in the 1930s. A flashboard dam/weir was also part of this as-built drawing set, and was constructed at this location in 1932. It is possible that an earlier weir, dam, or pipeline preceded its construction, but this could not be verified in archival research, including aerial photographs or historical maps. An image of the weir from March 5, 1937, shows that there was a modest concrete structure with angled buttresses and a paved horizontal surface downstream, leading to a short drop off to the natural streambed (Figure 9). The drop off aligns with retaining walls on either end. A concrete wing wall lines the cut bank side of the stream where the weir meets it, and a small concrete platform (the top deck of the intake structure) rests adjacent to the wing

wall on mounded soil. The 1938 historic aerial image shows the devastation wrought by flooding that year; the screen building is visible, but the c. 1932 weir appears to have been destroyed. In the next 1944 historic aerial image clearly shows the screen building, intake structure, and a new weir. The new weir, visible in the 1944 aerial photograph, is of a different design than the 1932 weir, and a cobblestone wall is visible rising from the original retaining wall on the right (east or cutbank) side of the weir. The cobblestone wall supports a concrete platform, of which the original rectangular concrete platform is incorporated, indicating extensive repairs and/or additional damage during later flood events.

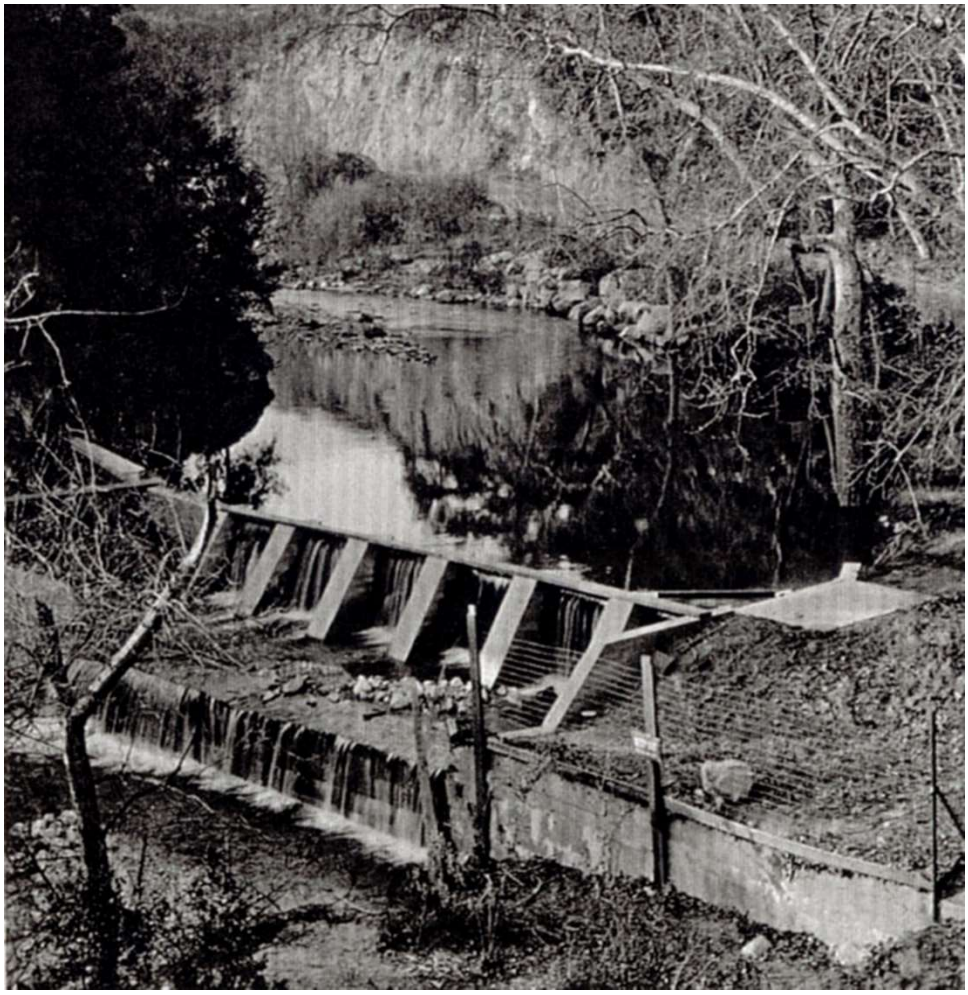


Figure 9. Weir and intake structure, dated March 5, 1937, view looking upstream (ASF 2019)

Debris basins and flood control infrastructure (1948)

Flood control in Arroyo Seco began after the especially costly 1914 and 1916 floods damaged large portions of Los Angeles County farmland and urban areas. In 1915, the LACFCD was established in response to the in 1914 flood, and would protect an area of 2,760 square miles. Investment was initially delayed by the onset of World War I, but the first flood control feature built in the Arroyo Seco was the Devil's Gate Dam: designed in 1916, funded by bonds in 1917, and erected by Los Angeles County Department of Public Works by 1920 (Brick 2011; Pasadena Star News 1916; SB&C 1919; Van Wormer 1991).

The City of Pasadena, which had water rights to Arroyo Seco, began a spreading program in Arroyo Seco in 1914 to replenish the Raymond Basin aquifer; however, the program was abandoned in 1924 due to drought. The remnants of the 1914 spreading basins were washed out in 1936 when the Arroyo Seco stream changed its course to the east side of the Arroyo. Historic aerial photographs and maps indicate that the LACFCD-owned spreading grounds were installed in 1948, as a result of a 1940 push to build upstream flood control features in the Angeles National Forest. $1.17 million was used towards the establishment of silt and debris check dams on the upstream side of the Devil's Gate reservoir and the Brown Mountain Dam. The first funding installment was approved in 1941 and another in 1944, resulting from the 1944 storm and subsequent flood. Federal funds also went to the channelization of Arroyo Seco Canyon further downstream of Devil's Gate Dam By 1952, the Los Angeles County-owned Altadena Storm Drain and sheds were completed as well (Figure 10). The PWP-owned sludge basins were added in the 1970s, after the construction of the Behner Water Treatment Plant (Brown and Taylor 1982; City of Pasadena 2003b; ETA 1941; LAT 1940c, 1946; SCPR 2016; UCSB 2019; Van Wormer 1991).

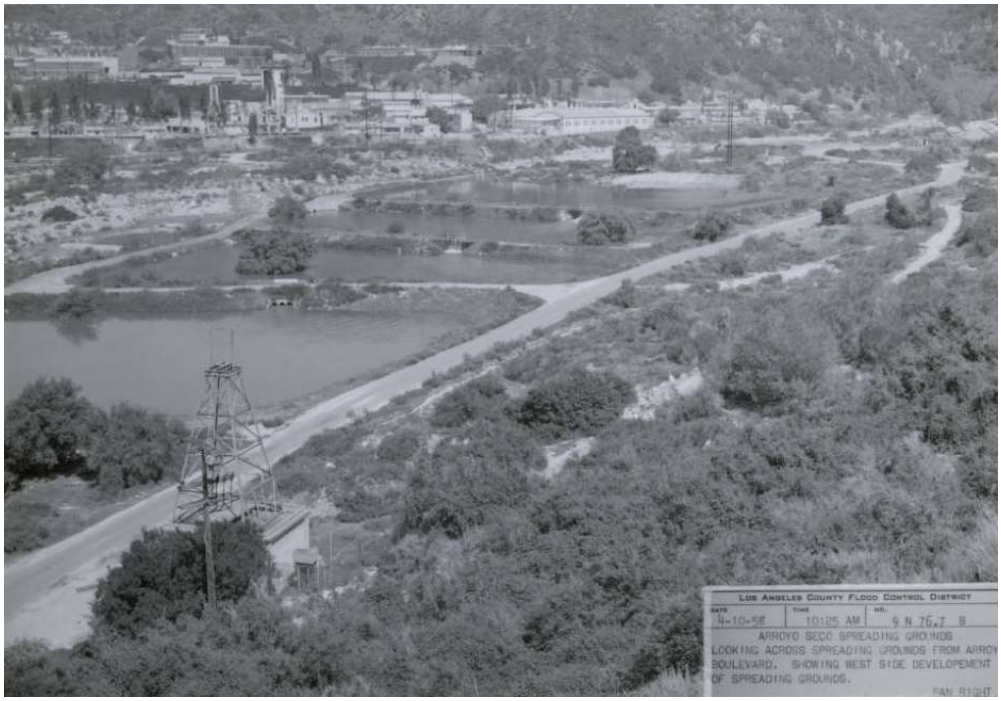


Figure 10. Arroyo Seco Spreading Basins, 1958 (Los Angeles County Flood Control District File Copy Prints Collection, Los Angeles County Library)

John L. Behner Water Treatment Plant (1971)

The John L. Behner Water Treatment Plant (WTP) was named after the first General Manager of the consolidated Pasadena Water and Power Department (PWP). Located in the Arroyo Seco Canyon east of JPL, the plant had a capacity of 5 million gallons per day. The project, which began as the result of a PWP feasibility study in 1967 decided on the current location. Originally, the Metropolitan Water District (MWD) identified the Upper Arroyo Seco as a location for their new MWD water treatment plant; however, they received backlash from Pasadena citizens using the area as a park. As a result, the City of Pasadena moved forward with their plan for a smaller water treatment plant facility, and a county regional park at the same time. The push was successful, and the PWP's plant was designed by Pasadena-based engineering firm James M. Montgomery, Consulting Engineers Inc. and constructed by the Margate Construction Company in 1970 and dedicated in 1971. However, new water treatment

regulations imposed as a result of the Surface Water Treatment Rule meant that the treatment plant was shut down in June 1993. Another feasibility study on the potential for upgrading the facility was conducted in 1995, but the Behner WTP remains offline to this day (City of Pasadena 2010, 2012; LAT 1968; PI 1971).

3.5 Architectural Styles

Only one resource within the Project site was designed in a clear architectural style: the Behner WTP, which exhibits numerous character-defining features of the Brutalist style.

Brutalism

The term "Brutalism" derives from the French *béton brut*, which translates as raw concrete, and describes concrete that displays the patterns, seams, and bug holes caused by formwork and concrete emplacement. The Brutalist architectural style is characterized by its use of raw building materials in a very direct and imposing way, emphasizing bulky forms and sharp angles with limited visible glass surfaces. A popular style between the 1950s and 1970s, Brutalism favored heavy, solid shapes cast with highly detailed and textured reinforced concrete. Often associated with High Modernism, a style emphasizing austere and abstract forms rooted in science and technology, the bold, unapologetic design and monumentality of Brutalism makes it an easy target for criticism, and it is thought to be one of the most divisive styles of architecture to emerge since the beginning of the twentieth century (Lowder 2013, McAlester 2013, Mindel 2016).

The best known early Brutalist architecture was that of Swiss architect Le Corbusier in the early 1950s. Brutalism gained popularity in the United Kingdom in the mid-century as war-torn communities actively sought inexpensive construction and design techniques in order to create affordable government buildings, housing, and shopping centers. However, Brutalism was also popular among those without budget constraints, as the style came to be artistically appreciated for its honest expression of materials, sculptural qualities, and anti-bourgeois aesthetic.

Brutalism was a popular style of architecture for educational buildings, particularly university buildings, but was relatively rare for corporate and single-family residential projects. It was also favored for civic projects, high-rise apartments, and shopping centers, as the style emulated strength, functionality, and an appreciation for material simplicity (Brutalism Online 2016).

Character-defining features of Brutalism include (City of San Diego 2007, HRG 2007):

- Exposed, expressive structural system
- Rough, unadorned concrete construction
- Monumental massing
- Heavy blockish shapes
- Angular and rectilinear forms
- Prefabricated concrete panels with exposed joinery
- Windows as voids in an otherwise solid volume
- Repetitive patterns
- Avoidance of traditional elements or ornament
- Raised plazas and base articulation

3.6 Engineer: James M. Montgomery, Consulting Engineers, Inc. (1945-1990)

The Behner WTP was designed by engineer James M. Montgomery (1896-1969). Montgomery was born in Ohio in 1896, and moved to Los Angeles California by 1910. He briefly served in the military during World War I, and was honorably discharged in October 1918. Montgomery returned to Newark, Ohio for a few years, but eventually moved back to Los Angeles Between 1935 and 1940. Montgomery launched his engineering firm in 1941, after having some success in helping design the F.E. Weymouth Memorial Water Softening and Filtration Plant in 1936 with MWD. This early connection with water infrastructure led to a career of consulting, studies, reports, and designing water infrastructure systems for Southern California and the greater West Coast of the United States for the next five decades. The firm was based in Pasadena for the first few decades. James Montgomery himself passed away in 1969, but his firm continued consulting work focused on water infrastructure. In 1990, the James M. Montgomery, Consulting Engineers, Inc. firm merged with Watson Hawksley, Ltd of the United Kingdom to become Montgomery-Watson. In 2001, Montgomery Watson merged with Harza Engineering and became Montgomery Watson Harza. This name was shortened to MWH Global in 2003. In 2016, MWH was acquired by Stantec Consulting, Inc. (Ancestry 2019).

Known works by Montgomery include:

- F.E. Weymouth Memorial Water Softening and Filtration Plant, Metropolitan Water District, City of La Verne, 1936-1941
- Arcadia Plant improvements, City of Santa Monica, 1958
- William B. Cater Filtration Plan, City of Santa Barbara, 1962
- Arcadia Plant improvements, City of Santa Monica, 1966
- Water Softening System, Alameda County Water District, 1966
- South San Diego Reservoir, City of San Diego, 1968
- Anaheim Lake Demonstration Desalination Plant, Orange County Water District, 1973
- Warner Ave Sewer Pump Station, City of Huntington Beach, 1986

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4 Field Survey

4.1 Methods

Built Environment Survey

Dudek Architectural Historian Kate Kaiser, MSHP and Nicole Frank, MSHP, conducted a pedestrian survey of the Project site for historic built environment resources on October 23, 2019. The survey entailed walking to each affected property in the Project area: the PWP spreading basins, the LACFCD flood control infrastructure, Southern California Edison (SCE) transmission line route, PWP Behner Wastewater Treatment Plant, the Arroyo Seco road bed within and between all proposed Project areas, the three bridge sites, the screen building, and the intake structure and weir. Dudek staff documented each building and structure with notes and photographs, specifically noting character-defining features, spatial relationships, observed alterations, and examining any historic landscape features in the proposed project area. Dudek documented the fieldwork using field notes, digital photography, close-scale field maps, and aerial photographs. Photographs of the subject property were taken with a digital camera. All field notes, photographs, and records related to the current study are on file at Dudek's Pasadena, California, office.

Archaeological Survey

An intensive-level archaeological survey of Project APE was completed by Samantha Murray, MA, Registered Professional Archaeologist (RPA) on April 23, 2019. The survey entailed opportunistically inspecting any portions of the APE with exposed sediment, including unpaved portions of the access road, Area 2, and Area 3. The northernmost portion of Area 2 that encompasses areas beyond the access road exhibited almost no ground surface visibility due to low-lying vegetation, including poison oak in the area beneath Bridge No. 3. Nearly all portions of Area 3 were surveyed with the exception of a few small areas with restricted access surrounding the flood control infrastructure. Ground visibility surrounding the flood control infrastructure was approximately 50% due to presence of dry grasses and shrubs. Much of the area surrounding the JPL parking is regularly disturbed by vehicles and has no potential for intact resources.

4.2 Results

Built Environment Survey

During the course of the pedestrian survey, Dudek identified six (6) built environment resources over 45 years old requiring recordation and evaluation for historical significance, including the Behner WTP, Screen Building Complex, Bridges No. 1, 2 and 3, spreading basins, and various flood control infrastructure. Section 5 (Significance Evaluations) provides a detailed physical description of each resource and associated significance evaluations under all applicable national, state, and local designation criteria and integrity requirements. DPRs for all evaluated resources are located in Appendix D.

Dudek also identified several features associated with the larger Arroyo Seco. These features include cobblestone and concrete retaining walls that date between 1938 and 1940. These walls vary in length and height, but were typically constructed of smooth, round river cobbles, in semi-coursed layers, with a thick Portland cement mortar:

- rock retaining wall on northeast side of Arroyo Seco Canyon roadbed (Figures 11 and 12);
- rock retaining wall supporting the east-most canyon wall (Figure 13);
- rock retaining wall near screen building (Figure 14);
- rock wall barrier on side of road near intake/weir structure (also Figure 14); and
- rock wall barrier on south side of Bridge No. 2 (Figure 15).

In addition to the above-mentioned resources, Dudek also identified two wooden H-frame structures associated with an SCE transmission line (the Seco 16 kV Circuit) that overlaps a portion of the Project APE (Figures 16 and 17), identified on maps as an SCE easement near the spreading basins. A third structure associated with this line was identified just outside the western boundary of the APE near JPL on the east side of Arroyo Road. Two other SCE lines (Gorge 16kV and Tola 16kV) also intersect the APE in roughly the same area. Records search results indicate that at least one of the Seco 16kV towers within the APE was previously recorded in 2002 as part of an archaeological survey report prepared for SCE for the Seco 16 kV Circuit Deteriorated Pole Replacement Project. This report indicates that the structure near the spreading basins was replaced and that the structure outside the western boundary of the APE was moved. The proposed Project will avoid the SCE infrastructure that intersect the APE and will result in no permanent physical changes to the SCE easement. As such, no SCE infrastructure within the Project site was evaluated for historical significance.



Figure 11. Rock retaining wall, NE side of Arroyo Seco Canyon road, view looking north (IMG_2737)



Figure 12. Rock retaining wall, NE side of Arroyo Seco Canyon road, view looking west (IMG_2745)



Figure 13. Rock retaining wall supporting the east-most canyon wall, view looking southeast (IMG_2727)



Figure 14. Rock retaining wall near screen building (right) and rock wall barrier on side of road near intake/weir structure (left), view looking northwest (IMG_2770)



Figure 15. Rock wall barrier on south side of Bridge No. 2 connected to balustrade, view looking east (IMG_2708)



Figure 16. Overview of SCE infrastructure in APE above Explorer Road, view looking southwest (IMG-2635)



Figure 17. Overview of SCE infrastructure in APE near spreading basins, view looking southwest (IMG_2613)

Archaeological Survey

No archaeological resources were identified within the Project site as a result of the intensive-level pedestrian survey.

5 Significance Evaluations

In order to determine if the proposed Project will impact historical resources under CEQA or historic properties under Section 106 of the NHPA, identified resources within the APE were evaluated for historical significance and integrity in consideration of NRHP, CRHR, and City of Pasadena designation criteria and integrity requirements. A detailed physical description of each resource and associated photographs are also provided.

5.1 John L. Behner Water Treatment Plant

Property Description

The John L. Behner Water Treatment Plant is a one-story Brutalist-style civic building, rectangular in shape, with a flat roof, designed by James M. Montgomery, Consulting Engineer, Inc. of Pasadena, and built in 1971. Exterior walls are exposed concrete with limited fenestration. The design emphasizes horizontality in form, but with strong vertical accents: simple, unadorned, rectangular concrete pilasters flank each narrow window/panel; broad concrete pilasters flank the entry door; and repetitive patterns of vertically-oriented rectilinear forms. A tall, monolithic concrete wall, with a broad band of vertically-oriented rectilinear forms creating a repetitive pattern, blocks view of the southern portion of external water treatment facilities to the east of and adjacent to the building. The external water treatment facilities comprise a series of open concrete tanks, with water flow controlled by a pair of wood flood gates, and a pair of moderately-sized, cylindrical above-ground tanks.

The main (northwest) elevation (Figure 18) presents as two sections: the left (northern) two-thirds consists of regularly-spaced narrow, vertical windows or panels, topped with louvered rectangular vents, and a double-leaf flush entry door with a flat panel inset above. The door is accessed by three broad, shallow concrete steps, bordered to the left (north) by a square integral concrete planter. Another narrower, shallower integral concrete planter runs along the base of the wall. The right (southern) third projects forward about three feet and is about two feet taller, with a repetitive pattern of vertically-oriented rectilinear forms. Three rows of patinated metal letters in a simple modern font are attached to the upper center of the wall and read “City of Pasadena John L. Behner Water Treatment Plant.”

The southwest elevation (Figure 19) presents as a monolithic wall with a repetitive pattern of vertically-oriented rectilinear forms. A near-full-height, flush, double-leaf loading door sits off-center, and a painted metal I-beam projects outwards from the top between the two leaves. The tall, monolithic concrete wall begins at the eastern end of this elevation, effectively continuing in line from the southeast elevation, and is pierce by a corrugated metal door.

The southeast elevation (Figure 20) presents as two sections: the left (southern) third is about two feet taller and predominantly exposed concrete masonry units (CMUs) laid in running bond, with a vertical and horizontal panel decorated in the repetitive pattern of vertically-oriented rectilinear forms; a half-lite painted metal door pierces the wall near the left edge. The right (northern) two-thirds of the elevation consists of exposed CMUs laid in running bond, with a vented half-lite door accessed via a concrete walkway and five evenly-spaced narrow, horizontally-oriented louvered vents located near the base of the wall.

The northeast elevation is monolithic concrete with four full-length rectangular concrete pilasters flanking a centered single-width roll-up garage door. Short portions of two rectangular concrete pilasters project above the door.



Figure 18. Behner Treatment Plant: Main (northwest) elevation, view looking northeast (DSC02296)



Figure 19. Behner Treatment Plant: southwest elevation, view looking northeast (IMG_2660)



Figure 20. Behner Treatment Plant: southeast elevation, view looking southwest (DSC02274)

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The subject property was completed in 1971, during a period of economic downturn that that began in the late 1960s, and taken offline in 1993 after passage of the Surface Water Treatment Rule. Although the property is generally representative of the City's mid-century growth, it has no direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The John L. Behner Water Treatment Plant is a good example of Brutalist civic architecture as expressed in the context of a utilitarian building designed for practicality. Designed by local Pasadena engineering firm James M. Montgomery, Consulting Engineer Inc. and built in 1971, the building displays several character-defining features of the Brutalist architectural style, including an exposed, expressive structural system; rough, unadorned concrete construction; monumental massing; heavy blockish shapes; angular and rectilinear forms; prefabricated concrete panels with exposed joinery; windows as voids in an otherwise solid volume; repetitive patterns; and avoidance of traditional elements or ornament. While smaller in scale than the more monumental, hulking Brutalist buildings often seen in civic centers and on college campuses, the building still conveys the essential character-defining features of the Brutalist design aesthetic and exhibits a high level of integrity. The designing engineering firm, James M. Montgomery, Consulting Engineer, Inc., is a local, Pasadena-based firm that regularly constructed water infrastructure projects for local cities and water districts, such as MWD, Santa Monica, and Huntington Beach. There are no known alterations to the exterior of the building. Although the engineer does not rise to the level of a "master," the building embodies the distinctive characteristics of the Brutalist architectural style and possesses artistic values of significance to the City or to the region. Consideration was also given to the fact that Brutalism is a relatively rare architectural style in Pasadena, with few noteworthy examples. The Pasadena CHRID lists only two eligible Brutalist properties: a public library and a private residence. According to the Los Angeles Conservancy, "The Lamanda Park Branch of the Pasadena Public Library is a rare Brutalist building in an area of modest suburban homes in east Pasadena." (LAC 2019) The same may be said of the Behner WTP, as it remains relatively hidden from view, tucked away behind a suburban neighborhood**. As such, the property appears eligible for the NRHP under Criterion C and CRHR under Criterion 3 at the local level of significance.**

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements. Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, **the subject property appears eligible as a landmark under local designation criteria 2c.**

Integrity Discussion

The John L. Behner Water Treatment Plant maintains integrity of location, as it remains in its original location. The building retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The building retains integrity of setting, as upon its construction, the Arroyo Seco Canyon area had already attained the majority of JPL-related development, residential suburban development, and undeveloped Forest Service and parkland observed today. The building maintains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The windows sport metal security screens, but the majority of the building's original

materials are extant. The building retains integrity of feeling and association, as the property retains the ability to express itself as a water treatment plant. In summary, the building retains the requisite integrity for designation, and appears eligible for listing under NRHP Criterion C, CRHR Criterion 3, and City of Pasadena Landmark criterion 2c at the local level of significance.

5.2 Screen Building Complex

Property Description

The Screen Building Complex (formerly known as the Chlorination Plant) consists of the screen building built c. 1932, a weir built c. 1938, and an intake structure built c. 1938. The screen building (Figure 21) is an L-shaped, flat-roofed concrete building of utilitarian design. A narrow drip edge runs along the walls below what appears to be a short parapet wall. Fenestration includes two flush single-leaf entry doors, a roll-up garage door, and five windows obscured by metal screens. A vertical metal ladder attached near one of the entry doors provides access to the roof. An elevated rectangular concrete open-air tank structure, with a large piece of mechanical equipment bolted over half of the structure and accessed by three metal steps, sits to the left of and slightly in front of the screen building. A rectangular arch constructed from metal I-beams, with the two uprights supported with angled I-beams on the front and back of the arch, is located in front of the garage door. The weir (Figure 22) is a combination of mortared stone and poured-in-place concrete with at least one wood sluice gate, although access was limited during survey due to vegetation and debris. A cobblestone wall rises from the original retaining wall on the right (east or cutbank) side of the weir and supports a concrete platform, the top deck of the intake structure, into which the original rectangular concrete platform is incorporated and expanded (Figure 23).



Figure 21. Screen building, view looking south (IMG_2767)



Figure 22. Weir, eastern end with wood sluice gate, view looking upstream (IMG_2797)



Figure 23. Weir detail, view looking upstream (IMG_2791)

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The complex was completed c. 1932, most likely by the CCC during their improvements campaign in the Arroyo Seco Canyon. The extant weir was replaced after a major flooding event in 1938, and a newer cobblestone wall rises from the original retaining wall on the right (east or cutbank) side of the weir. The cobblestone wall supports a concrete platform, into which the original rectangular concrete platform is incorporated, indicating extensive repairs and/or additional damage during later flood events. The Screen Building Complex is no longer visibly recognizable as dating to its original c. 1932 construction date due to the extensive damage and subsequent repairs. Further, it does not have a direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The Screen Building Complex comprises a screen building, a weir, and an intake structure. The individual components are modest utilitarian structures built with common materials using common techniques and with no artistic value. They do not embody the distinctive characteristics of a type, period, or method of construction, nor do they represent the work of a master, nor does the complex represent a significant and distinguishable entity whose components may lack individual distinction. Furthermore, the Screen Building Complex is no longer visibly recognizable as dating to its original c. 1932 construction date due to the extensive damage and subsequent repairs. For these reasons, the Screen Building Complex does not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property does not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

The Screen Building Complex retains integrity of location, as it remains in its original location. The Complex lacks integrity of design as it was subjected to large-scale exterior alterations since its original construction in 1932 and no longer maintains the essential features of form, plan, space, structure, and style. The Complex retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The Complex lacks integrity of materials and workmanship due to the extensive damage and subsequent repairs to the physical elements that date from its construction. The Complex retains integrity of feeling, as it is still nestled within the Arroyo Seco surrounded by a mixture of natural environment and water infrastructure. Finally, while the screen building still reads as a grouping of structures related to water infrastructure in Pasadena, this association is not significant. In summary, the Screen Building Complex does not retain the requisite integrity for designation, nor does it rise to the level of significance required for designation at the national, state or local levels.

5.3 Bridge No. 1

Property Description

Bridge No. 1 appears to be a two-span box culvert bridge, with the bridge supported on either end by a cobblestone abutment wall and in the middle by a cobblestone wall (Figure 24). The abutments and center wall may be concrete clad with mortared cobblestones, or built as load-bearing cobblestone masonry walls. The bridge deck appears to be supported by a metal plate(s) that rests upon the cobblestone walls (Figure 25). An approximately 18-inches-tall band of mortared cobblestone rests on the upstream and downstream edges of the metal plate(s), with the bridge deck coated in tarmac. A new temporary bridge with concrete access ramps passes across the deck of Bridge No.1. Aerial images indicate a bridge crossing over Millard Canyon existed at the same location prior to 1927. Archival research indicates that the original bridge was either damaged or destroyed by the 1938 floods, and replaced with the existing two-span box culvert bridge either during a CCC repair campaign in 1939 or as part of the 1941 Arroyo Seco Program. A previous report identified the bridge deck as being replaced with a "similar reinforced concrete span" in 1979, and that river rock was applied to both sides of the deck at the time to "visually integrate it with the existing river rock-clad bridge components" (Daly 2014). Comparison of photographs taken in 2019 during the site visit with those included in a 2015 report indicate that the bridge deck was coated with a layer of tarmac c. 2017, prior to installing the temporary bridge (TJC & Associates 2015). Two pipelines emerge from the ground near the southern end of Bridge No. 1 and run along the west side of the Arroyo Boulevard/Gabrielino Trail (Figure 26). The larger metal pipe is wrapped with what appears to be disintegrating asphalt rolled material, and continues underground near the southern end of Bridge No. 2. The smaller pipeline appears to be concrete and dives underground north of Bridge No. 2, just after a bolted metal pipe connection between two runs of concrete pipe (Figures 27 and 28).



Figure 24. Bridge No. 1 with temporary bridge in place, view looking south (DSC02332)



Figure 25. Bridge No. 1, detail of cobblestone edge and central supporting wall (DSC02336)



Figure 26. View of pipelines, near Bridge No. 1 (DSC02327)



Figure 27. View of pipelines, near Bridge No. 1 (DSC02323)



Figure 28. Pipeline near Bridge No. 2, view looking southeast (DSC02367)

NRHP/CRHR Statement of Significance

Bridge No. 1 does not meet any of the criteria for listing in the NRHP or CRHR, either individually or as part of an existing historic district.

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. Archival research indicates that the original bridge was either damaged or destroyed by the 1938 floods, and replaced with the existing two-span box culvert bridge either during a CCC repair campaign in 1939 or as part of the 1941 Arroyo Seco Program. Bridge No. 1 was completed c. 1940, replacing the original bridge, and is a simple utilitarian design. Even if the bridge was constructed as part of the CCC repair campaign in 1939, it does not maintain any significant physical features that convey this association. Further, evidence suggests that the bridge deck was replaced in 1979 (Daly 2014). It has no direct association with events that have made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that

individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Bridge No. 1 is a two-span box culvert bridge of simple utilitarian design completed c. 1940, replacing an older bridge damaged or destroyed by the 1938 floods. Although parts of it are cobblestone, the material was popular during the early 20th C. due to the influence of Greene and Greene and the Arts & Crafts style, and it was inexpensive and readily available from the Arroyo Seco stream bed. Additionally, a previous evaluation of the bridge (Daly 2014) indicates that the bridge deck was replaced in 1979 with reinforced concrete, and subsequently topped with at least one layer of tarmac (c. 2017). The bridge itself is not characteristic of a type, period, or method of construction, nor does it represent the work of a master, nor does it possess high artistic values, and it is not part of a significant and distinguishable entity whose components may lack individual distinction. For these reasons, Bridge No. 1 does not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property does not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

Bridge No. 1 maintains integrity of location, as it remains in its original location. The bridge does not retain integrity of design as its deck was replaced in 1979. The bridge retains diminished integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge also lacks integrity of materials and workmanship due to replacement of the bridge deck and other features. The bridge's simple design does not convey the feeling or association with a CCC-built bridge as it lacks major visible character-defining features and associated materials. In summary, Bridge No. 1 does not retain the requisite integrity for designation, nor does it rise to the level of significance required for designation at the national, state or local levels.

5.4 Bridge No. 2

Property Description

Bridge No. 2 is a board-formed concrete arch bridge, with board-formed concrete abutments and a subtle four-point arch, spanning the Arroyo Seco, constructed circa 1920 (Figure 29). Rectangular concrete railings border the upstream and downstream edges of the bridge deck, with openings between upper and lower rails sporting a row of classically shaped single balusters resembling the form of a flower bud from a pomegranate tree (Figure 30). The bridge deck is covered with tarmac.



Figure 29. Bridge No. 2, view looking downstream (IMG_2730)



Figure 30. Bridge No. 2, detail of deck and railing with balusters (DSC02361)

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. Bridge No. 2 was constructed c. 1920 as a necessary improvement along the Arroyo Boulevard/Gabrielino Trail, around the time Arroyo Boulevard was paved for use as a county highway. However, the road no longer functions as a county highway or a major thoroughfare, and has no direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, Bridge No.2 does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Built c. 1920, around the time Arroyo Boulevard was paved for use as a county highway, Bridge No. 2 exhibits classical design elements in the rows of classically shaped single balusters resembling the form of a flower bud from a pomegranate tree, as well as the subtle four-point shape of the arch. The bridge also displays the pattern of board-formed concrete, a method of construction popular for civil works during the early 20th Century. The designed structure successfully relied on massed reinforced concrete with a broad arched opening to withstand the destructive forces of periodic floods down Arroyo Seco. As such, the bridge embodies distinctive characteristics of a type, period, and method of construction. **Therefore, Bridge No. 2 appears eligible for listing under Criterion C of the NRHP and Criterion 3 of the CRHR at the local level of significance.**

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, **the subject property appears eligible as a landmark under local designation criterion 2c.**

Integrity Discussion

Bridge No. 2 maintains integrity of location, as it remains in its original location. The bridge retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The bridge retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge retains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The bridge no longer retains integrity of feeling and association, since Arroyo Boulevard/Gabrielino Trail no longer serves as an important thoroughfare. In summary, Bridge No. 2 retains the requisite integrity for designation, and appears eligible for listing under NRHP Criterion C, CRHR Criterion 3, and City of Pasadena Landmark criterion 2c.

5.5 Bridge No. 3

Property Description

Bridge No. 3 is a wooden kingpost truss bridge, with heavy timber supports braced by a vertical metal rod and angled wood beam braced on a cantilevered timber girder (Figure 31). Timber railings line both side of the bridge deck, and board-formed concrete retaining walls support either end of the bridge. A metal plaque attached to one end of the southern retaining wall indicates the wood bridge was erected in 1939 by "C.C.C. Company 903 – U.S.F.S. in cooperation with Pasadena Water Department." A temporary bridge deck is positioned directly above the original wood bridge. The temporary bridge was initially installed to accommodate the loading from heavy equipment

needed during construction of the Arroyo Seco Canyon Project that would be beyond the capacity of the original Bridge 3. However, as the condition of the original bridge has continued to deteriorate and is no longer safe for use, the temporary structure allows for continued passage into the canyon and access to the USFS compound by isolating traffic weight and movement from affecting the older wood bridge. The temporary bridge deck is built with anti-skid steel decking supported by steel I-beam girders, and is bolted through wood sill plates into the top of the original bridge's concrete retaining walls. Sloped, poured-in-place concrete ramps provide access to the temporary bridge deck at either end. Tubular metal railings line each side of the temporary bridge deck and concrete access ramps (Figure 32).



Figure 31. Bridge No. 3, view looking downstream (IMG_2761)



Figure 32. Bridge No. 3, view looking north-northwest (IMG_2749)

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research indicates that Bridge No. 3 was constructed in 1939 by the CCC, after the 1938 flood destroyed the original bridge. Local CCC Company 903 was assigned to the USFS in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great Depression. They planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems. As such, Bridge No. 3 was constructed by a group associated with events that made a significant contribution to the broad patterns of our history. **Therefore, Bridge No. 3 appears eligible under Criterion A of the NRHP and Criterion 1 of the CRHR.**

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be

associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Bridge No. 3 is a wooden kingpost truss bridge, with heavy timber supports braced by a vertical metal rod and angled wood beam braced on a cantilevered timber girder. Timber railings line both side of the bridge deck, and board-formed concrete retaining walls support either end of the bridge. The kingpost design harkens back to timber-framed roof construction in Roman buildings, and was common in medieval architecture. The kingpost made its way into timber bridge design via Palladio, the first known personage to promote timber trusses for bridge design, and is the oldest timber truss design used for bridges. The kingpost truss is comprised of a stringer, a kingpost (vertical beam), and two diagonal beams designed primarily for short spans of approximately 20 to 30 feet. As such, the bridge embodies the distinctive characteristics of a type and method of construction. **Therefore, Bridge No. 3 appears eligible under Criterion C of the NRHP and Criterion 3 of the CRHR.**

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, **the subject property appears eligible as a landmark under local designation criteria 2a and 2c.**

Integrity Discussion

Bridge No. 3 maintains integrity of location, as it remains in its original location. The bridge retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The bridge retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge retains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. Finally, the bridge retains the feeling of an early 20th century timber bridge constructed by the CCC and it maintains its essential character-defining features to convey its association with the CCC building campaign in the 1930s. In summary, Bridge No. 3 retains the requisite integrity for designation, and appears eligible for listing under NRHP Criteria A and C, CRHR Criteria 1 and 3, and City of Pasadena Landmark criteria 2a and 2c.

5.6 Flood Control Infrastructure

Property Description

Flood control infrastructure at the upstream end of the spreading basins consists of two LACFCD-owned sheds to either side of a County-owned concrete storm drain box structure, called the Altadena Storm Drain, with pulley operated components and a concrete and metal check dam. Each shed is a square plan gable fronted building, with horizontal wood board cladding, and rolled composition roofing, on a concrete slab foundation. The doors are both located on the south elevations and consist of vertical wood board doors, braced on the interior. Other fenestration consists of screened window openings and a louvered vent in the gable end. The two sheds are to either side of the storm drain box structure with three openings on the top side, and letting out via culvert into the Arroyo Seco (Figure 33).



Figure 33. Altadena Storm Drain structure, pulley mechanism, and west-most shed, View looking west (IMG_2606)

The PWP spreading basins consist of, two spreading basins (Pasadena Ponds 1 and 2) formerly used as sludge ponds during operation of the Behner WTP, and 14 additional spreading basins (originally developed by LACFCD) separated by check dams completed between 1948 and 1952. Spreading basin features are engineered earthen ponds separated by soil embankments and small wood and concrete flow control dams. Each basin varies in total size and depth (Figure 34). The Pasadena Ponds 1 and 2 also have buried concrete culverts between them and the Parshall Flume, as well as chain link fence surrounding them (Figure 35).



Figure 34. Overview to spreading basins; View looking south (IMG_2631)



Figure 35. Overview to PWP sludge basins, now Pasadena Ponds 1 and 2; View looking southwest (IMG_2608)

A flow control dam is located west of the westernmost shed. Situated in a naturalized channel, west of the Altadena Storm Drain, the flow control dam consists of two walls of wood cribbing, and a wood board dam in the center, with removable boards in a metal track in order to control flow in the narrow channel (Figure 36). The downstream side of the channel has had a gunite mixture applied to the channel walls. On the east side of the dam, is a concrete platform, stair and metal handrail. On the west side of the dam, are two corrugated metal canisters, one lidded with flat metal and the other with conical metal.



Figure 36. Dam, View looking northwest (IMG_2600)

Finally, downstream of the flow control dam, there is a culvert and vehicle bridge through which water is measured (via a Parshall Flume) before it flows into the spreading basins (Figure 37). The culvert has two 18-inch openings in the channel basin. The roadbed is filled with gravel, but the culvert is constructed of board-formed concrete, with metal lining, and metal guard rails on top for safety. There is also a corrugated galvanized steel tank with a conical lid placed on a concrete platform on the upstream side of the culvert. The tank is currently used to house the controls for the Parshall Flume's metering device.



Figure 37. Culvert and Vehicle bridge, looking southwest (IMG_2612)

Identified Alterations

The following alterations were observed during the field visit:

- windows removed from shed (date unknown)
- LACFCD signs added to both shed exteriors (date unknown)
- metal railing replacing older wood handrail on flow control dam structure (date unknown)

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The spreading basins were completed in 1948, and the Altadena Storm Drain, sheds, culverts, and check dams completed between 1948 and 1952. These date have no bearing on the industrial, commercial, and institutional growth of Pasadena nor is it directly related to a historical natural disaster such as a specific flood. The flood control infrastructure appears to have no direct association with events that have made a significant contribution to the history of the City of Pasadena, or Los Angeles County, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked on these structures are known to be historically significant figures at the national, state, or local level. The structures have been owned

by PWP or LACFCD since construction, and as such is not associated with the life of a specific person significant to the past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. The structures do not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The flood control structures, including spreading basins completed in 1948, and the Altadena Storm Drain, sheds, culverts and checkdams completed between 1948 and 1952, are utilitarian in construction and lack association to a specific architectural style or method of construction. They have no specific character-defining features, do not represent the work of a master engineer, do not possess high artistic value and are not significant as contributing features of an entity whose components may lack individual distinction. Therefore the structures do not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The structures are not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the flood control structures do not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

The spreading basins, Altadena Storm Drain, checkdams, culverts, and sheds, as a collective engineered structure retain integrity of location and have not been moved since their construction in 1948. They maintain integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, structure, and function. The structures retain integrity of setting, as they remain in the Arroyo Seco floodplain north of the Devil's Gate Dam, structures retain between a steep hillside and the campus of JPL. The structures retain integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The structures retain integrity of feeling and association, as they can still express their purpose as water and flood related infrastructure. In summary, while the structures retain the requisite integrity, it does not rise to the level of significance required for designation at the national, state or local levels.

5.7 Summary of Evaluation Findings

Table 4 provides a summary of all resources evaluated for historical significance within the Project site. Six (6) built environment resources were identified as a result of the background research and pedestrian survey. Of these, three resources (the Behner WTP, Bridge No. 2, and Bridge No. 3) were found eligible for NRHP, CRHR and local designation. The remaining three resources (the Screen Building Complex, Bridge No. 1, and the flood control and water conservation Infrastructure) were found not eligible under all designation criteria due to a lack of historical associations and integrity.

Table 4. Summary of Resource Evaluation Findings

Resource Name	Description	Built Date	Evaluation Findings
John L. Behner WTP	Brutalist-style water treatment plant building and related infrastructure	1971	Appears eligible under NRHP/CRHR Criteria C/3 at local level, and City Criterion 2c (3S/3CS/5S3)
Screen Building Complex	Complex consisting of screen building, a weir, and intake structure	c. 1932	Appears not eligible under all designation criteria (6Z)
Bridge No. 1	Two-span box culvert bridge spanning Millard Canyon tributary creek	c. 1938-1941	Appears not eligible under all designation criteria (6Z)
Bridge No. 2	Concrete arch bridge spanning the Arroyo Seco	c. 1920	Appears eligible under NRHP/CRHR Criteria C/3 at local level, and City Criterion 2c (3S/3CS/5S3)
Bridge No. 3	King truss bridge spanning the Arroyo Seco erected by the CCC	1939	Appears eligible under NRHP/CRHR Criteria A/1 and C/3, and City Criteria 2a and 2c (3S/3CS/5S3)
Flood Control Structures (PWP/LACFCD)	Complex of utilitarian sheds, Altadena Storm Drain, culvert, flow control dam, Parshall Flume, Pasadena Ponds 1 and 2, and 14 spreading basins	c. 1948-1952	Appears not eligible under all designation criteria (6Z)

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6 Impacts Analysis

6.1 Historical Resources Identified within the APE

The following historical resources/historic properties were identified within the Project APE as a result of the property significance evaluations (Section 5):

- John L. Behner Water Treatment Plant (3S/3CS/5S3)
- Bridge No. 2 (3S/3CS/5S3)
- Bridge No. 3 (3S/3CS/5S3)

Additionally, five (5) features were identified within the APE that are considered character-defining features of the larger Arroyo Seco, and should be avoided/protected as part of the current Project. The Arroyo Seco is considered "a unique environmental, recreational and cultural resource of the city surrounded by residential neighborhoods" and "must be preserved, protected and properly maintained." (Arroyo Seco Public Lands Ordinance 3.32.020). The arroyo stone walls and steps throughout the City of Pasadena and especially in the Arroyo Seco are considered an historical resource because many of them were built during the WPA years and in some locations designed by notable architects. Rehabilitation, including maintenance and repair, shall be focused on conservation of this historic resource (City of Pasadena 2003). Contributing design features of the Arroyo Seco identified in the Project APE include cobblestone and concrete retaining walls that date between 1938 and 1940:

- rock retaining wall for on northeast side of Arroyo Seco Canyon roadbed (Figures 11 and 12);
- rock retaining wall supporting the east-most canyon wall (Figure 13);
- rock retaining wall near screen building (Figure 14);
- rock wall barrier on side of road near intake/weir structure (also Figure 14);
- rock wall barrier on south side of Bridge No. 2 (Figure 15).

These walls vary in length and height, but are typically constructed of smooth, round river cobbles, in semi-coursed layers, with a thick Portland cement mortar. The use of semi-coursed, smooth river cobble in concrete mortar is a common feature seen throughout Pasadena and the Arroyo Seco. The Arroyo Seco Design Guidelines (Pasadena 2003a) document is one of four separate planning documents produced as part of The Arroyo Seco Master Plans. The design guidelines provide a unifying set of criteria for the site development improvements set forth in the Arroyo Seco Master Plan for on-going, long-range improvements for the Arroyo Seco. The purpose of these guidelines is to maintain a unified park design that reflects the heritage of the Arroyo Seco and its relationship to the tradition of the City of Pasadena. The Arroyo Seco Design Guidelines provide specific site design solutions that are consistent with the existing Arroyo Seco Ordinance and a vehicle by which practical inputs for ongoing improvements can take place (Pasadena 2003).

6.2 Analysis of Potential Project Impacts

Area 2 Diversion and Intake Replacement

Table 5 provides an analysis of all proposed Project activities associated with the Area 2 Diversion and Intake Replacement. No historical resources were identified in Area 2.

Table 5. Area 2 Impacts Analysis

Proposed Activity	Potential to Impact?	Recommendations to Reduce Impacts?	Level of Significance
Demolition and removal of the existing concrete weir and portions of the intake structure	No. The Screen Building Complex and related infrastructure (including the weir and intake structure) was found ineligible and is not an historical resource.	None required	Less than significant
Construction of a new diversion structure that would be operated to divert up to 25 cfs of creek flows into the existing conveyance system.	No. Construction of a new diversion structure would not directly impact or indirectly alter the setting or character of any adjacent resources.	None required	Less than significant
Remodel intake structure with new concrete walls and top deck to accommodate a new screen configuration.	No. The Screen Building Complex and related infrastructure (including the weir and intake structure) was found ineligible and is not an historical resource.	None required	Less than significant
Demolish an existing concrete slab that previously supported an equipment building located adjacent to the Gabrielino Trail/Access Road.	No. The Screen Building Complex and related infrastructure (including the existing concrete slab) was found ineligible and is not an historical resource.	None required	Less than significant

Table 5. Area 2 Impacts Analysis

Proposed Activity	Potential to Impact?	Recommendations to Reduce Impacts?	Level of Significance
Construct a new 106-square-foot intake service building to house the electrical and hydraulic controls for the diversion structure.	No. Construction of a new intake service building would not directly impact or indirectly alter the setting or character of any adjacent resources.	None required	Less than significant

Area 3 Spreading Basin Improvements

Table 6 provides an analysis of all proposed Project activities associated with the Area 3 Spreading Basin Improvements. No historical resources were identified in Area 3. Although the proposed Project's construction activities will intersect the existing SCE Easement, all associated SCE infrastructure (i.e., poles and wires) will be avoided by the Project and protected in coordination with SCE.

Table 6. Area 3 Impacts Analysis

Proposed Activity	Potential to Impact?	Recommendations to Reduce Impacts?	Level of Significance
Reconfiguration and expansion of the spreading basins.	No. All PWP/LACFCD flood control and water conservation infrastructure, including the spreading basins, were found ineligible and are not historical resources.	None required	Less than significant
Demolition of various facilities, including inlet/outlet structures, dry vaults, woodsheds, utility light pole, pipes and valves, chainlink fencing, corrugated metal pipes, and other small appurtenant structures, to allow for the reconstructed basins.	No. All PWP/LACFCD flood control and water conservation infrastructure was found ineligible and is not considered an historical resource.	None required	Less than significant

Table 6. Area 3 Impacts Analysis

Proposed Activity	Potential to Impact?	Recommendations to Reduce Impacts?	Level of Significance
Construction of proposed spreading basin improvements include new spreading Basins E, F, G, H, I and J. Each new basin would have an access ramp for maintenance. All basins would include inlets/outlets with 24-inch interconnection pipelines. Spillways, pipelines, culverts, and valves would be provided to connect the basins to each other.	No. All PWP/LACFCD flood control and water conservation infrastructure, including the spreading basins, were found ineligible and are not historical resources.	None required	Less than significant
Rock boulders would be placed along the western edge of Explorer Road to separate the roadway from the adjacent basins.	No. There are no historical resources that would be impacted by the placement of rock boulders along the western edge of Explorer Road, Further, the use of natural materials as a barrier is in conformance with the existing Arroyo Seco Design Guidelines: "Boulders are preferred in establishing perimeter barriers. Typically, they are placed to keep motorized vehicles out of an area." (City of Pasadena 2003:9-3)	It is recommended that boulder placement follow the Arroyo Seco Design Guidelines: "They should be randomly spaced…and slightly buried to look natural and prevent rolling." (City of Pasadena 2003:9-3)	Less than significant

Gabrielino Trail and Bridges 2 and 3

Table 7 provides an analysis of all proposed Project activities associated with the Gabrielino Trail and Bridge Crossings in consideration of the historical resources identified in and around this portion of the APE (Section 6.1), including: Bridge No. 2, Bridge No. 3, and the Arroyo Seco rock wall features.

Table 7. Gabrielino Trail and Bridge Impacts Analysis

Proposed Activity	Potential to Impact?	Recommendations to Reduce Impacts?	Level of Significance
During construction, the Gabrielino Trail/Access Road would provide for vehicular access to and from Area 2, and sometimes Area 3 (Explorer Road will be its primary access road).	**Yes.** Activity along the access road has the potential to impact the concrete railings of Bridge No. 2 and the adjacent Arroyo Seco stone wall features (as described in Section 6.1). These are design features of the larger Arroyo Seco and should be protected from inadvertent damage during construction activities.	**MM-CUL-1**	Less than significant with incorporation of **MM-CUL-1**
The structural overlay bridges spanning the entire length of Bridge Nos. 1 and 3 would remain in place throughout the duration of construction.	No. These structural overlays are already in-place and have been determine essential to safely support vehicles during construction. Bridge No. 1 is not an historical resource under CEQA. With regard to Bridge No. 3, an historical resources impact assessment was prepared for the temporary bridge overlays in conformance with the required 2015 MND mitigation. The analysis states that "although temporary protective measures would be installed for 1-2 years, these protective measures are removable and reversible." (Jerabek 2015)	None required	Less than significant
Upon completion of the proposed Project, the City intends to remove the Bridge No. 1 structure.	No. Bridge No. 1 is not an historical resource and removal of the temporary structure would not impact historical resources.	None required.	Less than significant

Upon completion of the proposed Project, the City intends to keep the Bridge No. 3 structure as-is, complete with additional structural overlay bridge spanning the entire length of Bridge No. 3, into the foreseeable future. To protect public safety, certain elements of the bridge may need to be removed.	**Yes.** Bridge No. 3 is an historical resource under CEQA/historic property under Section 106 of the NHPA. The structural overlay bridge installed in 2017 that spans the entire length of Bridge No. 3 is not in conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties in consideration of its proposed permanency. The overlay structure, characterized by a steel deck supported by steel I-beam girders, poured-in-place concrete ramps, and tubular metal railings, does not conform to the Secretary of the Interior's Standards for Rehabilitation of a 1930s timber bridge built by the CCC. Nor does the current bridge overlay conform to the City's Arroyo Seco Design Guidelines for Open Structures and Bridges. Now that the overlay is proposed to remain on Bridge No. 3 into the foreseeable future, the existing bridge overlay should be reviewed for conformance with the Arroyo Seco Design Guidelines. As a potentially permanent design feature, the continued presence of the overlay structure on Bridge No. 3 is considered a significant impact to historical resources, as the overlay detracts from nearly all of its important character-defining features and introduces incompatible, highly visible, modern materials. It is anticipated that Bridge No. 3 will continue to deteriorate, and as a result, PWP will need to remove dangerous elements of the bridge (damaged joists, for example) and even partially or fully demolish the bridge to protect public safety as it continues to deteriorate.	**MM-CUL-2** will lessen impacts but will not reduce impacts below a level of significance	Significant even with implementation of **MM-CUL-2**

Table 7. Gabrielino Trail and Bridge Impacts Analysis

Proposed Activity	Potential to Impact?	Recommendations to Reduce Impacts?	Level of Significance
	Whether and when reconstruction/replacement of Bridge No. 3 will take place is unknown, and it is unknown whether the new bridge would be constructed in such a manner that would allow for its preservation as a historical resource.		

Construction Staging Areas

Table 8 provides an analysis of all proposed Project construction staging areas in consideration of the historical resources identified in and around this portion of the APE (Section 6.1), including the Behner WTP.

Table 8. Construction Staging Impacts Analysis

Proposed Activity	Potential to Impact?	Recommendations to Reduce Impacts?	Level of Significance
During construction activities, the Screen Building adjacent to Area 2 would be used for temporary construction materials and equipment staging.	No. The Screen Building Complex and related infrastructure is not an historical resource.	None required	Less than significant
During construction activities, the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging.	**Yes**. The Behner WTP is considered an historical resource under CEQA/historic property under Section 106 of the NHPA and has the potential to be inadvertently damaged by construction equipment and materials.	**MM-CUL-3**	Less than significant with incorporation of **MM-CUL-3**

Project-wide Impacts

No archaeological resources were identified within the Project site as a result of the current study. Based on the results provided above, the potential of encountering and impacting unknown archaeological resources during Project implementation is low; however, it is always possible that unanticipated discoveries could be encountered during ground-disturbing activities associated with the proposed Project. If such unanticipated discoveries were encountered, impacts to encountered resources could be potentially significant. However, with implementation of MM-CUL-4, which requires that all construction work occurring within 100 feet of the find shall immediately stop until a qualified archaeologist, meeting the Secretary of the Interior's Professional Qualification Standards for Archaeology, can evaluate the significance of the find, potentially significant impacts to archaeological resources would be reduced to less-than-significant levels. With incorporation of **MM-CUL-4**, the Project's potential to cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5 would be reduced to a level less than significant.

6.3 Regulations and Mitigation Measures

Implementation of the following mitigation measures will reduce potential project-related impacts to historical and archaeological resources below a level of significance, and would result in no adverse effects to historic properties.

MM-CUL-1. Protection Measures for Bridge No. 2 and Arroyo Stone Features

Prior to the commencement of construction vehicle and truck traffic along the Gabrielino Trail/Access Road north of the JPL Bridge, the City shall ensure that Bridge No. 2 and all identified arroyo stone wall features along the affected portions of the Gabrielino Trail/Access Road are properly protected for the duration of construction activities, as follows: The City shall install temporary protective barriers in the form of concrete k-rails along the decorative railings of Bridge No. 2 on both sides of the road to protect the railings from further deterioration and damage from vehicles. The concrete k-rails shall be removed once the Project is completed leaving Bridge No. 2 intact. The concrete k-rails shall be installed parallel to the Bridge's existing baluster railings, with approximately 2 feet of separation between the k-rail and the resource. The k-rails shall be positioned to ensure that the Bridge railings are protected from daily construction traffic. The k-rails shall not be permanently attached to the bridge. All arroyo stone wall features adjacent to the access road shall be protected by concrete k-rails wherever feasible, however, in areas where k-rails would create an impassable situation for vehicles, the City shall utilize other reasonable protections, including cones and flagging, to ensure that the arroyo stone walls are not inadvertently damaged during construction. The plans for the temporary barriers shall be reviewed by a qualified architectural historian prior to project implementation. In order to ensure that the bridge and stone walls are adequately protected during Project activities, the City shall ensure completion of pre-construction and post-construction surveys by a qualified historic preservation consultant to ensure that adverse effects or significant impacts have not occurred to Bridge No. 2. The installation/construction methodology and post-construction survey shall be submitted to the City of Pasadena Department of Planning – Historic Preservation for review and approval.

MM-CUL-2. Bridge No. 3 Mitigation

Prior to project construction completion, the City shall ensure preparation of Historic American Engineering Record (HAER) documentation for Bridge No. 3 in accordance with the *Secretary of the Interior's Standards for Architectural and Engineering Documentation*. Documentation shall be completed by a qualified historic preservation professional who meets the Secretary of the Interior's Professional Qualifications Standards for architectural

history. The documentation shall capture the physical description of the existing bridge with: 1) existing as-builts/drawings (where/if available); 2) a written narrative that includes a detailed history and architectural description of the bridge and a discussion of its historical significance; 3) photographs of the bridge with large format negatives to demonstrate its current condition; and 4) provide other photographs of the bridge prior to installation of the current overlay. Upon approval of the final HAER package, the City shall offer one original copy of the final HAER package to the City of Pasadena Historic Preservation Program, the South Central Coastal Information Center at California State University, Fullerton, and the Angeles National Forest Administrative Office.

Prior to project construction completion, the City shall conduct a review of the bridge overlay design on Bridge No. 3 and construction materials used in the bridge overlay to determine improvements that can be made to conform with the City's Arroyo Seco Design Guidelines. Examples of potential improvements include, but are not limited to, evaluation of appropriate paint colors that reflect the natural character of the Arroyo Seco, and replacement of components with more natural materials (e.g. wood, concrete, brick, arroyo stone piers, unpainted weathering steel or other natural materials, such as copper and wrought iron). The proposed design improvements shall be submitted to the City of Pasadena Department of Planning – Historic Preservation for review and approval.

MM-CUL-3. Protect Behner WTP Building During Construction

Prior to commencement of Project construction activities that would require equipment staging at the Behner Water Treatment Plant (WTP), the City shall ensure that the exterior of the Behner Water Treatment Plant (WTP) building is adequately protected from equipment and vehicle staging activities. The northwest and southwest exterior elevations of the WTP shall, at a minimum, be protected by construction fencing and signage to ensure that none of the major exterior character-defining features of the building are inadvertently damaged. Fencing shall be placed at a minimum distance of five (5) feet from the exterior of the building, and crews working in the immediate vicinity should be alerted to the presence of an historical resource and instructed to avoid it. The City shall ensure that Project-related equipment and materials are not in contact with the exterior or the building, including absolute avoidance of leaning materials and equipment against exterior walls. The temporary fencing, signage, and barriers shall be removed at the conclusion of construction activities.

MM-CUL-4. Unanticipated Discovery of Cultural Resources

Prior to commencement of earthmoving activities, the City shall retain a qualified Archaeologist meeting the Secretary of the Interior's Professional Qualification Standards for Archaeology. The Archaeologist shall be present at the pre-grade conference; shall establish procedures for archaeological resource surveillance; and shall establish, in cooperation with the Contractor, procedures for temporarily halting or redirecting work to permit the sampling, identification, and evaluation of the artifacts, as appropriate. At a minimum, in the event archaeological resources are exposed during construction activities, all construction work occurring within 100 feet of the find shall immediately stop until a qualified archaeologist can evaluate the significance of the find and determine whether or not additional study is warranted. The Archaeologist shall first determine whether it is a "unique archaeological resource" pursuant to the California Environmental Quality Act (CEQA, i.e., Section 21083.2[g] of the California Public Resources Code) or a "historical resource" pursuant to Section 15064.5(a) of the State CEQA Guidelines. If the archaeological resource is determined to be a "unique archaeological resource" or a "historical resource", the Archaeologist shall formulate a mitigation plan in consultation with the City of Pasadena that satisfies the requirements of the above-referenced sections. The Archaeologist shall prepare a report of the results of any study prepared as part of a testing or mitigation plan, following guidelines of the California Office of Historic Preservation, and s/he shall record the site and submit the recordation form to the City of Pasadena and the

California Historic Resources Information System (CHRIS) at the South Central Coastal Information Center (SCCIC) at California State University, Fullerton. Work may proceed in other areas of the site, subject to the direction of the Archaeologist.

Regulatory Compliance: Unanticipated Discovery of Human Remains

The discovery of human remains would require handling in accordance with California Public Resources Code. In accordance with Section 7050.5 of the California Health and Safety Code, if human remains are found within the Project site, the County Coroner must be notified of the discovery within 24 hours. No further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains can occur until the County Coroner has determined, within two (2) working days of notification of the discovery, the appropriate treatment and disposition of the human remains. If the County Coroner determines that the remains are, or are believed to be, Native American, he or she must notify the NAHC in Sacramento within 24 hours. In accordance with California Public Resources Code, Section 5097.98, the NAHC must immediately notify those persons it believes to be the most likely descendant of the deceased Native American. The most likely descendant must complete his/her inspection within 48 hours of being granted access to the site. The designated most likely descendant would then determine, in consultation with the property owner, the disposition of the human remains.

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7 Findings and Conclusions

7.1 Summary of Findings

The following resources within the Project APE were identified as historical resources under CEQA and historic properties under Section 106 of the NHPA:

- John L. Behner Water Treatment Plant (3S/3CS/5S3)
- Bridge No. 2 (3S/3CS/5S3)
- Bridge No. 3 (3S/3CS/5S3)

Additionally, five (5) features were identified within the APE that are considered character-defining features of the larger Arroyo Seco, and should be avoided/protected as part of the current project, including:

- rock retaining wall for on northeast side of Arroyo Seco Canyon roadbed (Figures 11 and 12);
- rock retaining wall supporting the east-most canyon wall (Figure 13);
- rock retaining wall near screen building (Figure 14);
- rock wall barrier on side of road near intake/weir structure (also Figure 14);
- rock wall barrier on south side of Bridge No. 2 (Figure 15).

The remaining resources identified within the APE, including the Screen Building Complex, Bridge No. 1, and the LACFCD infrastructure do not appear eligible for NRHP, CRHR, or City designation due to a lack of significant historical associations and architectural merit. Therefore, these properties are not considered historical resources under CEQA or historic properties under Section 106 of the NHPA.

7.2 Conclusions

CEQA requires a lead agency to determine whether a project may have a significant effect on historical resources (PRC section 21084.1; CEQA Guidelines section 15064.5(b)). All historical resources identified within the APE have the potential to be impacted by the proposed project. Implementation of MM-CUL-1 through -5 (Section 6.3), will reduce impacts to the John L. Behner WTP, Bridge No. 2, and the Arroyo Seco stone wall features to a less than significant level. However, impacts will remain significant and unavoidable for Bridge No. 3 since the structural overlay bridge installed in 2017 is not in conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties or the Arroyo Seco Design Guidelines in consideration of its proposed permanency. The overlay structure, characterized by a steel deck supported by steel I-beam girders, poured-in-place concrete ramps, and tubular metal railings, does not conform to the Secretary of the Interior's Standards for Rehabilitation of a 1930s timber bridge built by the CCC. As a potentially permanent design feature, the continued presence of the overlay structure on Bridge No. 3 is considered a significant impact to historical resources, as the overlay detracts from nearly all of its important character-defining features and introduces incompatible, highly visible, modern materials.

It is anticipated that Bridge No. 3 will continue to deteriorate, and as a result, PWP will need to remove dangerous elements of the bridge (damaged joists, for example) and even partially or fully demolish the bridge to protect public safety as it continues to deteriorate. Whether and when ultimate reconstruction/replacement of Bridge No. 3 will be undertaken is unknown, and it is unknown whether the new bridge would be constructed in such a manner that would allow for its preservation as a historical resource. Therefore, impacts to historical resources under CEQA are considered significant and unavoidable, even with implementation of MM-CUL-2.

Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on historic properties, assess the effects, and seek ways to avoid, minimize, or mitigate any adverse effects on such properties (36 CFR 800.1[a]). In consideration of the discussion above for Bridge No. 3, the proposed project would result in adverse effects to historic properties that cannot be mitigated in a way that would eliminate or reduce effects.

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Appendix A

Preparers' Qualifications

Kara R. Dotter, MSHP, MS

Senior Historic Preservation Specialist, Architectural Historian

Kara R. Dotter, Senior Historic Preservation Specialist and Architectural Historian with Dudek, brings with her over 15 years of experience in historic preservation and architectural materials conservation. Initially based in Austin, Texas, where she worked for WJE Associates as an Historic Preservation Specialist, she worked overseas in Northern Ireland before moving to San Diego, where she worked for IS Architecture before joining Dudek. Her recent work as Project Lead concentrates on supporting NEPA and CEQA compliance for the Built Environment component of Construction Package 2-3 of the Fresno to Bakersfield project section of the California High-Speed Rail Project.

Education

Queen's University of Belfast
PhD Candidate (ABD)

University of Texas, Austin
MS, Geological Sciences, 2006
MS, Historic Preservation, 2004

University of Houston
BS, Geology, 1996

Certifications

CEQA Practice Certificate

Professional Affiliations

Association for Preservation Technology

Construction History Society of America

American Institute of Conservation

Society of Architectural Historians

Relevant Project Experience

Environmental Preconstruction Services for Construction Package 2 and 3, California High-Speed Rail Authority, Fresno to Bakersfield Section, California. Served as project lead for the Built Environment component of the environmental preconstruction services. The work involves conducting cultural resources assessments for a proposed 65-mile-long segment of the Fresno to Bakersfield high-speed rail alignment as directed by the California High-Speed Rail Authority and Federal Transit Administration (FTA) in order to comply with NEPA and CEQA regulations. Contributions include architectural history field surveys; documenting and updating the CRHR-designated 7,040-acre Washington Irrigated Colony Rural Historic Landscape; completion of over 150 California Department of Parks and Recreation (DPR) forms for the evaluation of built environment resources; conducting research for and producing HASRs and supplemental Findings of Effect (sFOEs); development of Protection and Stabilization Plans and Response Plans for Unanticipated Effects and Unintended Damage; managing structural and vibration engineering consultants; and overseeing vibration monitoring of sensitive historic resources.

Environmental Compliance Services for the Caltrain Modernization (Calmod) Peninsula Corridor Electrification Project (PCEP). Ms. Dotter is the project lead for the Built Environment component of the environmental compliance services. The work involves cultural resources documentation in order to comply with NEPA and CEQA regulations relating to the electrification and increased capacity of the Caltrain Corridor from San Francisco's 4th and King Caltrain Station to approximately the Tamien Caltrain Station. Ms. Dotter's contributions include architectural history field surveys; managing subconsultants; conducting research for and producing documentation to HABS level III standards; and reviewing design plans and equipment placement for conformance with the Secretary of the Interior Standards for Rehabilitation.

SDSU West Campus Project EIR, San Diego, California. Dudek was retained by the San Diego State University (SDSU) to conduct an Initial Study and EIR for the proposed West Campus expansion project located in San Diego, California. Part of the work included evaluating potential impacts to historical resources located on the project

site, which include the SDCCU Stadium, originally known as the San Diego Stadium. The historic resources technical memorandum provided the results of that evaluation, as well as an impacts analysis and recommended mitigation measures. Ms. Dotter conducted the site survey and archival research, and authored the memorandum.

Jacumba Valley Solar Project, San Diego County, California. The project proposes a 100 megawatt solar farm that included photovoltaic solar panels, a 1,500-volt DC underground collection system, a 34.5 kilovolt overhead and underground collection system, and a 20 megawatt energy storage facility. Served as architectural historian and lead author of the historical resources constraints analysis to comply with CEQA and of the resulting Historical Resources Technical Report conducted for the Environmental Impact Report. The constraints analysis identified one potential historical resource, the remains of an early 20th century dairy operation, for which a Historical Resources Technical Report and DPR forms was completed in compliance with CEQA.

Department of General Services Historical Resource Evaluation for the Normal Street Department of Motor Vehicles Site at 3960 Normal Street, San Diego, California. Dudek was retained by the State of California Department of General Services to complete a Historical Resources Technical Report for a project that proposes demolition and replacement of the Department of Motor Vehicles (DMV) building located at 3960 Normal Street in the City of San Diego. To comply with Public Resources Code Section 5024(b), DGS must submit to the State Historic Preservation Officer (SHPO) an inventory of all structures over 50 years of age under DGS's jurisdiction that are listed in or that may be eligible for inclusion in the National Register of Historic Places (NRHP), or that may be eligible for registration as a California Historical Landmark (CHL). The DMV was found not eligible. Authored the Historical Resources Technical Report, as well as recording and evaluating the Normal Street DMV building for Federal, State, and local level criteria and integrity considerations, completion of DPR forms, and responding to SHPO comments.

Historical Resources Evaluation of Public Utilities Department Reservoir Structures, City of San Diego, California. The project proposes upgrades to ten historic-era dams, an historic-era flume, and various attendant structures, within the San Diego water supply network. Serving as architectural historian and co-author of a multiple-property historical resources evaluation report. Project includes development of a network-wide historical context, as well as contexts for each contributor; multiple field surveys; archival research; consideration of potential impacts to historical resources under CEQA; appropriate mitigation measures; and review for conformance with the SOI's Standards for the Treatment of Historic Properties.

Municipal Waterways Maintenance Plan, City of San Diego, San Diego County, California. Dudek was retained by the City of San Diego and the Bureau of Reclamation to initiate the processing of a joint EIR and EIS. The proposed WMP is intended to establish an effective and streamlined program that allows for waterway facilities (channels, ditches, sumps) to be maintained, while minimizing impacts and potential adverse effects of maintenance. The proposed WMP will outline specific activities, maintenance methods, and procedures that will guide future maintenance and repair activities. Served as lead author of the Historical Resources Inventory and Analysis Report, conducting archival research; identifying potential historical resources; and analyzing the proposed WMP maintenance activities to determine their potential to impact historical resources.

North County Pure Water Project, City of San Diego, California. Served as architectural historian and lead author of the Historical Resource Technical Report for the proposed pipeline route as part of the EIR/EIS. Preparation of the report involved conducting building development and archival research on historic-era structures along the 56-mile-long route, development of historic contexts, historical significance evaluations for each historic-era structure in consideration of local, state, and national designation criteria requirements, and determining appropriate mitigation measures, in addition to responding to comments on the EIR/EIS from the public.

Kate Kaiser, MSHP

Architectural Historian

Kate Kaiser is an architectural historian with 8 years' professional experience as a cultural resource manager specializing in California Environmental Quality Act (CEQA) compliance, National Historic Preservation Act Section 106 compliance, reconnaissance and intensive level surveys, archival research, cultural landscapes, and GIS. Ms. Kaiser meets the Secretary of the Interior's Professional Qualification Standards for architectural history and archaeology.

Education

University of Oregon
MS, Historic Preservation, 2017
Boston University
BA, Archaeology, 2009

Professional Affiliations

Association for Preservation Technology – Southwest
California Preservation Foundation
Vernacular Architecture Forum
Society for California Archaeology

Relevant Dudek Project Experience

Gilroy City-wide Historic Resource Inventory, City of Gilroy, Santa Clara County, California. Served as architectural historian and co-author for the citywide historic context statement. Preparation of the historical context statement involved extensive archival research, coordination with the City of Gilroy and archival repositories, and developing the historical narrative and themes for the City. The project also involved creation and editing of a GIS database of over 3,400 properties in order to create the building records and State of California Department of Parks and Recreation Series 523 forms (DPR forms) for each property surveyed. Ms. Kaiser assisted in the creation, editing, and data management of the DPR forms produced for each building as well as historic districts.

Olympic Well Field Restoration and Arcadia Water Treatment Plant Expansion Project, City of Santa Monica, Los Angeles County, California. Served as architectural historian and author of the Historic Resources Technical Report. The report evaluated the Arcadia Water Treatment Plant and a well along Olympic Boulevard. The project proposed to demolish several underutilized buildings and structures as part of a multi-component project to add new wells to the Olympic Well Field, construct a new 16-inch pipeline connecting the Olympic Well Field to a new Olympic Advanced Water Treatment Facility, and expand the Arcadia water Treatment.

Modelo Project Environmental Impact Report, City of Commerce, Los Angeles County, California. Served as architectural historian and co-authorfor the Cultural Resources Technical Report and EIR cultural resources chapter. The report evaluated the Veterans Memorial Park located within the proposed Project area. The project proposed to demolish and redevelop the Project site to accommodate a mixed-use development and park.

Arroyo Seco Canyon Project, City of Pasadena, Los Angeles County, California. Served as architectural historian and co-author for the Cultural Resources Technical Report. The report evaluated six historic-aged engineering buildings and infrastructure systems within the proposed project area. Dudek recommended that all buildings and structures were ineligible for listing in the NRHP or CRHR with the exception of the Behner Water Treatment Plant, and provided impacts analysis for City of Pasadena Arroyo Seco Stone Wall design elements present in the proposed Project Area.

Silent Ranch Hillside Subdivision Project, City of Glendora, Los Angeles County, California. Served as architectural historian and author of the Historic Resources Technical Report. The report evaluated Charles Silent's Rancho Los Alisos property, Girl Scout Camp Aventura, Forest Service flood control dams, and a segment of the MWD Upper Feeder Pipeline. The project proposed indirect impacts to the setting of the pipeline and provided for protection against damage or overloading as the pipeline is an MWD public utility.

City of Irwindale Speculative Concrete Tilt-Up Building Project. Irwindale, Los Angeles County, California. Kaiser served as architectural historian and author of the Cultural Resources Technical Report. The report evaluated a hollow-core concrete panel manufacturing plant in southeast Irwindale. The project proposed to demolish all buildings and structures in the project site and construct a 528 710 s.f., tilt-up concrete warehouse on the parcel.

LADWP Valley Generating Station Project, Los Angeles Department of Water and Power, California. Served as architectural historian and author of the Cultural Resources Technical Report for the Valley Generating Station Project. The report evaluated the historical significance for each building and structure in the study area. The project proposed to remove the 1953 steam generating plant, as well as the four stacks, SPRR rail spur, and underground fuel tanks.

Judicial Council of California Historical Resource Evaluation Report for the Stanley Mosk Courthouse, City of Los Angeles, Los Angeles County, California. Served as architectural historian and author of the Historical Resource Evaluation Report. Dudek was retained by the Judicial Council of California (JCC) to prepare an evaluation of the Stanley Mosk Los Angeles County Courthouse building, located at 111 N. Hill Street in the City of Los Angeles, California, in order to comply with Public Resources Code Section 5024(b). The report concluded the Stanley Mosk Courthouse was eligible for designation as a historic property in the NRHP, CHL, CRHR, and Los Angeles Historic Cultural Monument list under Criterion A/1 and C/3.

Phillips 66 and Kinder Morgan Relocation Project, Berths 150-151, Marine Oil Terminal Engineering and Maintenance Standards (MOTEMS), Port of Los Angeles, California. Served as architectural historian and co-author of the Updated Historical Resources Evaluation. Preparation of the report involved reviewing previous evaluations for Union Oil Terminal Berths 150-151 and writing an updated significance evaluation. The project proposed to remove and replace the original wharfs with new concrete loading platform, mooring and breasting dolphins, access ramps, catwalks, and an underwater bulkhead.

Globemaster Corridor Specific Plan, City of Long Beach, Los Angeles County, California. Served as architectural historian and author of the Draft EIR-EIS Cultural Resources Chapter. The project includes rezoning portions of the GCSP area, and a mobility plan that implements new streets and pedestrian connectors. Since the GCSP does not directly propose changes to the buildings or structures in the Plan area, the cultural resources report takes a programmatic overview and offers potential impacts analysis and mitigation measures for future development.

LADWP De Soto Tanks Project, Los Angeles Department of Water and Power, California. Served as architectural historian and author of the Historic Properties Identification Report. The report evaluated a 1941 reservoir and associated buildings. The project proposed to replace them with modern underground storage tanks, as well as connections to other trunk lines. The project also analyzed the potential project impacts to the Chatsworth Momonga/Mission Trail, a City of Los Angeles Historic-Cultural Monument (HCM) adjacent to the Project area.

Campus-wide Historic Context Statement for California State University Long Beach, City of Long Beach, Los Angeles County, California. Served as architectural historian and co-author of the historic context statement analyzing the effect of master architect Edward Killingsworth on the development of the campus. Preparation of the historic context statement involved extensive archival research, in-person interviews of architects who worked on-campus, review of CSU Long Beach building and landscape records, and coordination with local heritage groups.

Kaiser Permanente Los Angeles Medical Center Project, Los Angeles, Los Angeles County, California. Served as architectural historian and co-author of the Draft EIR Cultural Resources Chapter and the author of the cultural resources technical report. The report evaluated six buildings greater than 45 years in age that are proposed for demolition as part of the multiphase project. The DEIR chapter also analyzed potential indirect impacts on two other National Register listed or eligible sites: the Aline Barnsdall Complex and the Hollywood Presbyterian Medical Center.

Samantha Murray, MA

Historic Built Environment Lead / Senior Architectural Historian

Samantha Murray is a senior architectural historian with 14 years' professional experience in in all elements of cultural resources management, including project management, intensive-level field investigations, architectural history studies, and historical significance evaluations in consideration of the California Register of Historical Resources (CRHR), the National Register of Historic Places (NRHP), and local-level evaluation criteria. She meets the Secretary of the Interior's Professional Qualification Standards for both Architectural History and Archaeology.

Education

California State University, Los Angeles
MA, Anthropology, 2013

California State University, Northridge
BA, Anthropology, 2003

Professional Affiliations

California Preservation Foundation

Society of Architectural Historians

National Trust for Historic Preservation

Registered Professional Archaeologist

Ms. Murray is skilled in the recordation, evaluation, and mitigation of adverse effects to historic water resource infrastructure throughout California, including dams, reservoirs, pumping stations, channels, and culverts. Understanding the scale and complexity of this unique resource type, Ms. Murray has guided architects and engineers through the process of adjusting plans to conform with the Secretary of the Interior's Standards for Rehabilitation, and understands the need to strike a balance between preservation and functionality. In addition to her expertise with water resource infrastructure, she has prepared hundreds of historical resource evaluations and developed detailed historic context statements for a multitude of property types and architectural styles, including private residential, commercial, industrial, educational, medical, ranching, mining, airport, and cemetery properties. Ms. Murray also has a strong understanding of consultation with the State Historic Preservation Officer (SHPO), and regularly receives SHPO concurrence with no comments. She has also provided expertise on numerous projects requiring conformance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Finally, Ms. Murray has extensive experience preparing environmental compliance documentation in support of projects that fall under the California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA), and Sections 106 and 110 of the National Historic Preservation Act (NHPA). She also regularly works with local governments and historic preservation ordinance requirements. Ms. Murray has also served as a third-party reviewer and expert witness in court proceedings concerning interpretation and treatment of historical resources under CEQA and local municipal code.

Select Water Infrastructure Project Experience

San Diego PUD Citywide Historic Context Statement and Evaluation of Dam Infrastructure (in progress). Dudek is currently in the process of preparing a citywide historic context statement and significance evaluation of all dam and reservoir infrastructure owned/operated by the City's Public Utilities Department. Dudek is also preparing detailed impacts assessments for proposed modification to dams, as required by DSOD. The project involves evaluation of 10 dams and a flume for historical significance in consideration of NRHP, CRHR, and City designation criteria and integrity requirements, and requires extensive archival research and pedestrian survey. Upon completion of the project, the City will have a streamlined document for the management of their historic dam

and reservoir infrastructure. To date, Dudek has completed a draft historic context statement and multiple dam historical significance evaluations.

City of Santa Cruz Newell Creek Dam Inlet Outlet Replacement Project (2019). Dudek worked with the City of Santa Cruz. The Newell Creek Dam is an earthen dam approximately 195 feet high with a crest length of about 750 feet. Built in 1961, the dam forms Loch Lomond Reservoir (Reservoir), which has a maximum storage capacity of approximately 8,646 acre-feet. The proposed Project would consist of replacement of the existing aging inlet/outlet works in new locations at the Reservoir and other associated improvements. Dudek completed an historical resource evaluation of the dam and associated infrastructure in consideration of NRHP, CRHR, and City designation criteria and integrity requirements and prepare a detailed impacts assessment. Ms. Murray oversaw completion of the dam site evaluation and technical report.

Floriston Springs Filtration Project, Floriston, Nevada County, California (2018). Kennedy/Jenks Consultants Inc. retained Dudek to complete a cultural resources study. The Floriston Property Owners Association seeks to renovate the Floriston Water Treatment Plant and pipeline, as the existing facilities do not meet the water supply, water treatment conditions, and water pressure demand of Floriston. Dudek's cultural resources study included a pedestrian survey of the project site for cultural resources, building development and archival research, recordation and evaluation of several buildings on the project site over 45 years of age, and an assessment of project-related impacts to historical resources in conformance with the CEQA and all applicable local municipal code and planning documents. The Floriston Schoolhouse, constructed circa 1900, was found not eligible under all NRHP and CRHR designation criteria. Ms. Murray oversaw the built environment components of the final cultural resources report.

Morena Reservoir Outlet Tower Replacement Project, City of San Diego, California (2016). Ms. Murray evaluated the 1912 Morena Dam and Outlet Tower for NRHP, CRHR, and local level eligibility and integrity requirements. The project entailed conducting extensive archival research and development research at City archives, libraries, and historical societies, and preparation of a detailed historic context statement on the history of water development in San Diego County.

Los Angeles Department of Water and Power (LADWP) As-Needed Environmental Compliance Services (2016-ongoing). Dudek provides on-call environmental services to the LADWP. As part of this contract, Dudek has prepared CEQA+ documentation (CEQA and Section 106 of the NHPA) for a range of infrastructure projects, including groundwater treatment facilities, power plants, electrical transmission and distribution facilities, reservoirs, pipelines, roadways, and other related infrastructure. This documentation typically includes completion of a California Historical Resources Information System records search, Native American consultation, intensive pedestrian survey, identification of historical resources/historic properties, and an assessment of project-related impacts/effects. Some of Dudek's recent task orders that required cultural resources technical reports include:

- City Trunk Line Project
- Western Trunk Line Project
- De Soto Trunk Line Project
- Coronado Trunk Line Project
- West Los Angeles District Yard Project
- Haynes Generating Station Units 3-6 Demolition Project
- Tujunga Spreading Grounds Enhancement Project
- Upper Stone Canyon Reservoir Water Quality Improvement Project
- Power Plant (PP) 1 and 2 Transmission Line Conversion Project

Adriane Dorrler

As-Needed Archaeologist

Adriane Dorrler is a field archaeologist with more than 14 years' experience in cultural resource management specializing in cultural resource studies with private, state, and federal regulatory agencies including National Historic Preservation Act (NHPA) Sections 106 and 110 and California Environmental Quality Act (CEQA) compliance extending primarily throughout Southern California. Ms. Dorrler has worked directly with Bureau of Land Management, the California Public Utilities Commission, California State Parks, and various military installations including the Marine Corps Air Ground Combat Center at Twentynine Palms, Marine Corps Base (MCB) Camp Pendleton, Naval Base Coronado, and Navy Installation San Clemente Island. She has experience in all aspects of project development from initial research, planning, and development to interpreting and synthesizing data in technical reports. Ms. Dorrler has acted as project manager and field director on complex data recovery programs, managed multiple archaeology laboratories, worked as liaison between Native American tribes and clients, and engaged in education and public outreach programs. In addition to Southern California, Ms. Dorrler has worked as a consulting archaeologist in the southwestern United States, the Mid-Atlantic region, and New England.

Education

University of Oklahoma

BS, Nursing, 2011

Catholic University of America

BA, Anthropology, 2001

Certifications

City of San Diego Certified Archaeology and Paleontology Monitor

City of San Diego Certified Archaeology Crew Chief

Range Safety Training, Camp Pendleton, California

Trimble GPS Mapping System TerraSync Certification

Occupational Safety and Health Administration (OSHA) 10-Hour Construction Safety Training

OSHA 40-Hour Hazardous Waste Operations Worker (HAZWOPER) training

Railroad Safety and Security Training

Project Experience

Development

Cannon Road, Caruso Affiliated, City of Carlsbad, San Diego County, California. Served as field director for a cultural resources constraints study of a 203-acre property for a proposed commercial retail center and open space easement in the City of Carlsbad. Conducted an intensive-level cultural resources survey.

Solana Highlands Revitalization, City of Solana Beach, San Diego County, California. Served as staff archaeologist during the preparation of an Environmental Impact Report (EIR) for a proposed 13.4-acre multifamily residential development with usable open space in Solana Beach. Authored Tribal Information Request letters in accordance with CEQA guidelines.

Murrieta 180, City of Murrieta, California. Served as field director for archaeological survey of a 10.9-acre property for a proposed multifamily residential development in Murrieta. Conducted a Phase I cultural resources inventory including a pedestrian survey and records search review of the California Historical Resources Information System.

Homestead South Cultural Resources, Newhall Land and Farming Company, Unincorporated Los Angeles County, California. Served as field director for archaeological survey of approximately 4,000-acre subdivision directly adjacent to the City of Santa Clarita. Conducted an intensive-level cultural resources survey.

Sand Canyon Plaza, JSB Development, City of Santa Clarita, California. Served as staff archaeologist during a Phase I cultural resources inventory for a proposed commercial and residential planning development in Santa Clarita. Performed a records search review of the California Historical Resources Information System.

Newland Sierra, Newland Land Co., San Diego, California. Served as staff archaeologist for the Phase I cultural resources inventory and Phase II significance evaluation of 1,983 acres of a proposed residential development within the North County Metro Subregion. Conducted a pedestrian survey, performed a records search review of the California Historical Resources Information System, and was a contributing author in the technical report.

As-Needed Environmental Planning Consultant Support Services, City of San Diego, California. Served as archaeological and paleontological monitor for underground conduit system installation in the neighborhood of Encanto. Tasks include environmental compliance monitoring.

Cultural Resources Evaluation for Rancho Jamul Estates, Rancho Jamul Estates, San Diego County, California. Served as archaeologist responsible for surveying and testing for 20 historic and prehistoric resources for an approximately 400-acre development project in Jamul, California. Recorded and tested prehistoric and historic resources for significance and eligibility to local and state registers. Assisted in preparation and data analysis of technical report.

Cultural Resource Mitigation for Robertson Ranch, San Diego County, California. Served as archaeologist responsible for data recovery, controlled grading, and mass grading phases for an approximately 400-acre development project in Carlsbad, California. Assisted in preparation and data analysis of technical report.

Centre City Development Corporation Downtown San Diego Mitigation and Monitoring Reporting Program, Centre City Development Corporation, San Diego, California. Served as field director/archaeology and paleontology monitor for numerous commercial projects in downtown San Diego subject to the Centre City Development Corporation mitigation measures and mitigation monitoring requirements. Examples of projects include:

- The Q Project
- Lofts @ 707 10th Avenue Project
- South Block Lofts Project
- Vista Colina Project
- 6th and Market Project
- Carnation Building/Icon LLC Project
- Electra Project
- Park Terrace Project
- Pointe of View Project
- Vantage Pointe Project
- West Park Project
- Q Street Lofts Project
- The Mark

Cultural and Paleontological Resource Monitoring for the Towne Center Industrial Plaza Project, Imperial County, California. Served as archaeological and paleontological monitor for the mass grading and utility trenching of 125 acres of commercial/industrial land in Calexico, California.

Cultural Resource Survey for the Ketchum Ranch Project, San Diego County, California. Served as archaeologist responsible for field survey and eligibility review for prehistoric and historic sites for an approximately 208-acre development project in Jacumba, California.

Cultural Resource Survey for the Yuma Sector Project, BLM, Yuma County, Arizona. Served as archaeology crew chief responsible for in field survey and National Register eligibility review for ten prehistoric sites and three historic objects.

Cultural Resource Survey and Evaluation for the Otay Business Park Project, San Diego County, California. Served as archaeologist responsible for surveying and testing programs for an approximately 160-acre development

Linda Kry

Archaeologist

Linda Kry is an archaeologist with 13 years' experience in cultural resource management specializing in various aspects of cultural resources investigations within Los Angeles County, Orange County, San Bernardino County, Kern County, Imperial County, Inyo County, Riverside County, and the Mojave Desert. Ms. Kry's experience includes archival research, reconnaissance surveys, artifact analysis, assisting CEQA lead agencies with AB-52 notification and consultation process, and authoring technical reports pursuant to CEQA and Section 106 of the NHPA. Ms. Kry's extensive experience includes the management of cultural resources specialists in support of various aspects of cultural resources compliance, construction monitoring, Native American consultation, archaeological testing and treatment, and prehistoric and historical resource significance evaluations.

Education

University of California, Los Angeles
BA, Anthropology, 2006
Cerritos College
AA, Anthropology, 2004

Project Experience

De Soto Trunk Line Project, Los Angeles Department of Water and Power, Los Angeles, California. Archaeological lead for a cultural resources study pursuant to CEQA and Section 106 of the National Historic Preservation Act (NHPA). Los Angeles Department of Water and Power LADWP is proposing to replace the portions of the De Soto Trunk Line located in West San Fernando Valley. The proposed project would increase the safety, capacity and reliability of LADWP's water system in the western San Fernando Valley.

Haynes Generating Station Demolition Project, Los Angeles County Department of Public Works, Malibu, California. Archaeological lead and monitoring coordinator. The project included the demolition of Units 3, 4, 5, and 6 at the Haynes Generating Station (HnGS), which were originally constructed more than five decades ago, to minimize health and safety risks and reduce future maintenance.

Old Topanga Road Over Old Topanga Creek Bridge Maintenance Repair Project, Los Angeles County Department of Public Works, Val Verde Area of Unincorporated Los Angeles County, California. Archaeological lead for a cultural resources study pursuant to CEQA in support of a Mitigated Negative Declaration. Tasks include Assembly Bill (AB) 52 consultation support to identify known tribal cultural resources within the project's proposed Area of Potential Effect (APE) to analyze the potential impacts to cultural resources and provide mitigation to a less than significant level.

Compton Boulevard over Compton Creek and Wilmington Avenue over Compton Creek Bridge Replacement Projects, Compton, California. Archaeological lead for a cultural resources study pursuant to CEQA and Section 106 of the NHPA and in conformance with Caltrans requirements. As archaeological lead, tasks include coordination for a cultural resources study, including AB 52 consultation support, and preparation of Archaeological Survey Reports (ASRs) for each proposed project.

City Trunk Line South Project, Los Angeles Department of Water and Power, Los Angeles, California. Archaeological lead for a cultural resources study pursuant to CEQA and Section 106 of the NHPA. Los Angeles Department of Water and Power LADWP is proposing to replace an old and deteriorating trunk line that was built in 1914 and has a history of leaks and breaks. The proposed trunk link will improve capacity, reliability, and flexibility in the water system.

February 2019 Storm Repair Project, Los Angeles County Department of Public Works, Malibu, California. Archaeological lead responsible for managing the cultural resources inventory and assessment of cultural resources

within the project area in support of emergency guardrail replacement work in the Woolsey Fire burn area. Responsibilities also include coordinating Native American monitoring needs for the project.

FLOR 401 E 7th Street Construction Monitoring, Skid Row Housing Trust, Los Angeles, California. Project manager for construction monitoring for the development of 99 units of permanent supportive housing for homeless veterans and/or special needs populations, and affordable housing for low-income individuals in Downtown Los Angeles.

Woolsey Fire Guardrails Replacement Project, Los Angeles County Department of Public Works, Malibu, California. Archaeological lead responsible for managing the cultural resources inventory and assessment of cultural resources within the project area in support of emergency guardrail replacement work in the Woolsey Fire burn area. Responsibilities also include coordinating Native American monitoring needs for the project.

Coronado Trunk Line Project, Los Angeles Department of Water and Power, Los Angeles, California. Archaeological lead for a Phase I cultural resources study pursuant to CEQA and Section 106 of the NHPA. Los Angeles Department of Water and Power is proposing to construct a new 30-inch diameter welded steel pipe, approximately 7,200 feet in length, along with a regulating and relief station vault and flow master vault. The proposed trunk line would add reliability and redundancy to the system.

River Supply Conduit Unit 7 Project, Los Angeles Department of Water and Power, Los Angeles and Burbank, California. Archaeological lead and monitoring coordinator for archaeological and paleontological services in support of the River Supply Conduit (RSC) Unit 7 Project. The existing River Supply Conduit (RSC) is a major transmission pipeline in the LADWP water distribution system. The Project is critical to meet safety of water supplies, reliability of water infrastructure, and sustainability of water supply.

8th, Grand and Hope Project, Eyestone Environmental, Los Angeles, California. Archaeological lead providing management oversight and reporting for tribal cultural resources (TCRs) and archaeological studies in support of a proposed 45-story mixed-use project in Downtown Los Angeles.

Bellwood Avenue Project, Eyestone Environmental, Los Angeles, California. Archaeological lead providing management oversight and reporting for a TCR study for a project that proposes to develop a new eldercare facility on a 2.22-acre site in the West Los Angeles Community Plan are of the City of Los Angeles.

313-333 San Vicente Boulevard Project, Eyestone Environmental, Los Angeles, California. Archaeological lead providing management oversight and reporting for a TCR study for a project that proposes to develop a 19-story, multi-family residential building and the deconstruction, reassembly, rehabilitation and limited alteration of the existing cathedral of Our Lady of Mount Lebanon – Saint Maronite Catholic Cathedral.

Relevant Previous Experience

Los Angeles International Airport (LAX) Midfield Satellite Concourse, Los Angeles, California. Served as field director for archaeological and paleontological monitoring project associated with the creation of a new aircraft passenger concourse and associated elements at LAX. Responsibilities included coordinating with company personnel and project contractors, scheduling, and recordation and collection of field data.

Los Angeles Metropolitan Transportation Authority Compliance Monitoring, Los Angeles, California. Served as archaeological and paleontological monitoring coordinator for the multiyear and multisite project within the greater Los Angeles area, including the Crenshaw rail transit corridor and the 1.9-mile Regional Connector subway. Responsibilities included coordinating and scheduling various contractors and archaeologists; developing and providing cultural resources training for new contractors and archaeologists; monthly project updates to client; invoice and budget reviews; lab analysis of all resources collected and preparation of those resources for curation.

Heather McDaniel McDevitt, RPA

Archaeologist and Human Osteologist

Heather McDaniel McDevitt is an archaeologist and Cultural Resources Lead for Dudek's Santa Barbara office with over 13 years of cultural resource management (CRM) experience throughout California and Baja California. Ms. McDaniel McDevitt also serves as Dudek Lead Human Osteologist providing on-call osteological services corporate-wide. Ms. McDaniel McDevitt has served as a field supervisor, lab director, principal investigator and project manager on Phase I, Extended Phase I, Phase II, and Phase III projects conducting surveys, testing, site significance evaluations and recordation, data recovery and laboratory analysis. Her education encompasses archaeology, biological anthropology, and GIS. As a bioarchaeologist, Ms. McDaniel McDevitt combines physical anthropology and archaeology in the study of faunal and human remains to reveal ancient lifeways. Her specific area of GIS research is the use of predictive modeling and remote sensing to better understand settlement and subsistence patterns, which can be used to forecast areas of potential impacts and assist in mitigating damage to cultural resources more efficiently.

Ms. McDaniel McDevitt has worked on projects for the National Park Service, U.S. Environmental Protection Agency (EPA), National Aeronautics and Space Administration, U.S. Bureau of Land Management, the Smithsonian Institute, California State Parks, California Department of Transportation, and various private CRM and environmental firms. Ms. McDaniel McDevitt's professional experience in CRM provides significant knowledge and practical experience with state and federal regulations such as the National Environmental Policy Act (NEPA), Section 106 of the National Hictoric Preservation Act, and the California Environmental Quality Act (CEQA). Ms. McDaniel McDevitt has also served as an adjunct professor at community and state institutions for courses in physical and cultural anthropology, archaeology, and GIS.

Education

California State University, Northridge

MA, Public Archaeology

MA, Geographical Information Systems, ABT

BA, Anthropology

Certifications

Registered Professional Archaeologist (RPA)

CEQA Training through Advanced, Association of Environmental Professionals

GIS Professional Certificate

HAZWOPER Training, Hydrogeologic

Professional Affiliations

American Anthropological Association

American Institute of Archaeology

California Geographical Society

Pacific Coast Archaeological Association

Register of Professional Archaeologists

Simi Valley Historical Society

Society for American Archaeology

Society for California Archaeology

Ventura County Archaeological Association

Selected Project Experience

Chatsworth Reservoir Mitigation Feasibility Study, Chatsworth, Los Angeles County. Provided senior review and support for LADWP on-call contract task order for potential compensatory mitigation projects on LADWP property and facilities located within the Chatsworth Reservoir, previously nominated as a Historic-Cultural Monument with the City of Los Angeles. Efforts included constraints analysis considering archaeological, historic built resources and paleontological resources both unknown and previously identified through literature review, NAHC Sacred Land

Files records search, paleontological records search. Results were summarized in a report memo in including a discussion of the potential constraints and mitigation measures necessary should the project proceed.

Agoura Village East Multi-Use Complex Cultural Resource Studies, Agoura Hills, Los Angeles County. As Principal Investigator designed and implemented research design involving previously recorded archaeological site CA-LAN-41. Supervised and conducted excavations intended to delineate horizontal and vertical extent of the site, site significance, and analysis on recovered remains, Native American consultation and preparation of final reports including avoidance/mitigation strategies. Currently devising research design and methodology for data recovery of unavoidable impacts to site and supporting Native American consultation efforts for City of Agoura Hills.

1225 Cliff Drive Archaeological and Paleontological Study, Laguna Beach, Los Angeles County. Provided senior review and support for archaeological and paleontological resources studies for a private development. Tasks to determine sensitivity of project site included Paleontological and archaeological records searches and literature reviews, NAHC Sacred Land Files search and coordination of informal tribal outreach, pedestrian survey and report preparation.

February 2019 Storm Repair Project, Los Angeles County Department of Public Works, Malibu, California. Provided senior review and support for LADPW on-call contract task order to provide cultural resources services in for construction activities of storm repair project located in Santa Monica Coastal Zone. Involves cultural resource survey of project impact areas, management of monitoring staff, providing recommendations to construction and project management staff, assisting with implementing mitigation plan, providing field visit verification reports and assisting in Native American consultation efforts.

Pacific Palisades Village Initial Study/Mitigated Negative Declaration, Los Angeles, California. As project archaeologist, conducted Phase 1 Archaeological Investigation, prepared technical report and portions of the MND including a Cultural Landscape Study and Construction Mitigation and Monitoring Treatment Plan. As field director, duties included project management, facilitation of Pre-Construction Meeting, coordination and supervision of archaeological and paleontological technician crew, as well as document preparation.

Regulatory Compliance for Proposed Development within NRHP Archaeological Site CA-LAN-41, Agoura Hills, Los Angeles County, California. As project manager, Principal Investigator and Field Director, design and implement all necessary regulatory compliance and treatment of the archaeological site CA-LAN-41, in accordance with CEQA and local agency regulations. Serve as lead project analyst and on-call human osteologist, developing methodology for research design, crew supervision of all aspects of the investigative efforts. Project is on-going.

Palmdale CalVet REN Project, Los Angeles County, Californa. (11150) Provided senior review and support for archaeological resources study for a private development. Project proposes to build 56 duplex condominiums on a 9.9-acre site, to provide permanent, affordable housing to veterans (Condominium Project or project).

5-Year On-Call Archaeological Services, City of Ventura, California. As project Manager, currently manages Dudek's contract for the City of Ventura on-call archaeological services including archaeological, historical, and Native American services, including but not limited to monitoring, archaeological record searches, historical research, architectural history, surveys for both prehistoric and historical resources, extended Phase I surveys, test excavations, data recovery, Native American coordination, coordination with the Native American Heritage Commission, AB-52 support, treatment protocols, feasibility/concept plan studies and recommendations, hiring and managing applicable sub consultants and specialty disciplines as required, preparation of management plans, design and implementation of mitigation methods. Potential projects include municipal infrastructure improvements such as domestic water distribution system, sanitary sewer collection system, storm drainage collection system and other undertakings as determined.

Appendix B

Confidential Records Search Results

Appendix C

Native American Coordination

Linda Kry

From: Adriane Dorrler
Sent: Monday, September 16, 2019 3:32 PM
To: nahc@nahc.ca.gov
Cc: Linda Kry
Subject: Request for a Sacred Lands File Search_Dudek (#11884)
Attachments: 11884_NAHC SLF_Request_PDF.pdf; Fig_records_search.pdf

Dear NAHC,

Please find attached the NAHC Sacred Lands File Search request and project location map for the proposed Arroyo Seco Canyon Project (Dudek #11884). Dudek is requesting a NAHC search for any sacred sites, tribal cultural resources, or other places of Native American community value that may fall within a one-mile radius of the proposed Project site.

Please let me know if you have any questions regarding this project. You can email the results to me at adorrler@dudek.com.

Thank you in advance,

Adriane Gusick
Associate Archaeologist

DUDEK
mobile: (760) 840-7556
www.dudek.com / www.facebook.com/dudeknews

Sacred Lands File & Native American Contacts List Request

NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd, Suite 100
West Sacramento, CA 95501
(916) 373-3710
(916) 373-5471 – Fax
nahc@nahc.ca.gov

Information Below is Required for a Sacred Lands File Search

Project: Arroyo Seco Canyon Project (Dudek #11884)
County: Los Angeles

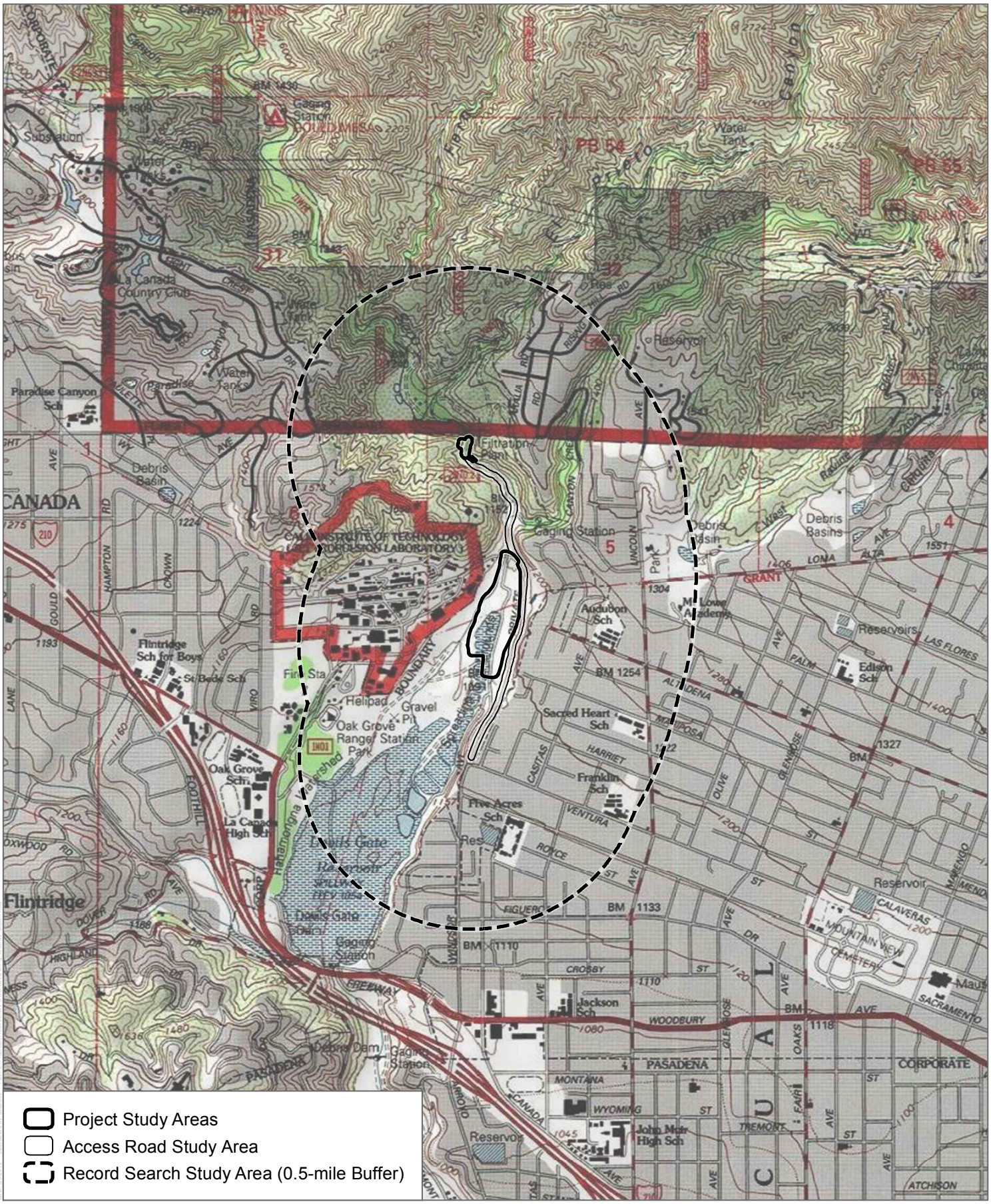
USGS Quadrangle
Name: Pasadena
Township: 1N Range: 12W Section(s): 5

Company/Firm/Agency:
Dudek
Contact Person: Adriane Gusick
Street Address: 38 N Marengo Avenue
City: Pasadena Zip: 91101
Phone: (760) 840-7556 Extension:
Fax: (760) 632-0164
Email: adorrler@dudek.com

Project Description:
The City of Pasadena (City) owns the right to divert up to 25 cubic feet per second of surface water from the Arroyo Seco into their spreading basins for pumping credits in the Raymond Basin. In the two storm seasons following the 2009 Station Fire, excessive amounts of sediment washed down from the watershed. The debris flows damaged City structures, greatly reducing the City's capacity to divert water for spreading. As a result, the City of Pasadena Department of Water and Power proposes to repair and replace damaged facilities in the Upper Arroyo Seco Canyon as a part of the proposed Project. The improvements would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this important local water resource.

The proposed Project consists of three primary areas, including Area 1, Headworks Removal; Area 2, Diversion and Intake Replacement; and Area 3, Spreading Basin Improvements. These areas are connected by the Gabrielino Trail/Access Road. The proposed Project would involve construction activity and facility improvements in all three areas, as well as along portions of the Gabrielino Trail/Access Road. Additionally, portions of the 30-inch hume line, which is a pipeline that conveys water from the diversion weir to the spreading basins, may also be improved/replaced.

☑ Project Location Map is attached



SOURCE: USGS Topo 7.5 Minute Series Pasadena Quadrangle
Township 1N / Range 12W / Section 05

DUDEK

0 1,000 2,000 Feet
0 285 570 Meters
1:24,000

Records Search Map

Arroyo Seco Canyon Project

NATIVE AMERICAN HERITAGE COMMISSION
Cultural and Environmental Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone: (916) 373-3710
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

October 7, 2019

Adriane Gusick
Dudek

VIA Email to: adorrler@dudek.com

RE: Arroyo Seco Canyon Project, Los Angeles County

Dear Ms. Gusick:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were positive. Please contact the Gabrieleno Band of Mission Indians - Kizh Nation on the attached list for more information. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify the NAHC. With your assistance, we can assure that our lists contain current information. If you have any questions or need additional information, please contact me at my email address: steven.quinn@nahc.ca.gov.

Sincerely,

Steven Quinn
Associate Governmental Program Analyst

Attachment

Native American Heritage Commission
Native American Contact List
Los Angeles County
10/7/2019

Gabrieleno Band of Mission Indians - Kizh Nation
Andrew Salas, Chairperson
P.O. Box 393 Gabrieleno
Covina, CA, 91723
Phone: (626) 926 - 4131
admin@gabrielenoindians.org

Gabrieleno/Tongva San Gabriel Band of Mission Indians
Anthony Morales, Chairperson
P.O. Box 693 Gabrieleno
San Gabriel, CA, 91778
Phone: (626) 483 - 3564
Fax: (626) 286-1262
GTTribalcouncil@aol.com

Gabrielino /Tongva Nation
Sandonne Goad, Chairperson
106 1/2 Judge John Aiso St., #231 Gabrielino
Los Angeles, CA, 90012
Phone: (951) 807 - 0479
sgoad@gabrielino-tongva.com

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Robert Dorame, Chairperson
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This list is current only as of the date of this document. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Arroyo Seco Canyon Project, Los Angeles County.

Appendix D

DPR Series 523 Forms

State of California ♿ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3S, 3CS

Other Listings
Review Code Reviewer Date

Page 1 **of** 10 ***Resource Name or #:** (Assigned by recorder) John L. Behner Water Treatment Plant
P1. Other Identifier:

*__P2.__ **Location:** ☐ **Not for Publication** ■ **Unrestricted**

***a. County** Los Angeles **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Pasadena **Date** 2018 **T** 1N; **R** 12W; ___ ☐ **of** ___ ☐ **of Sec** 5 ; San Bernardino **B.M.**

c. Address Arroyo Seco Canyon, near Explorer Road City Pasadena Zip 91011

d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 392676 mE/ 3785075 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)

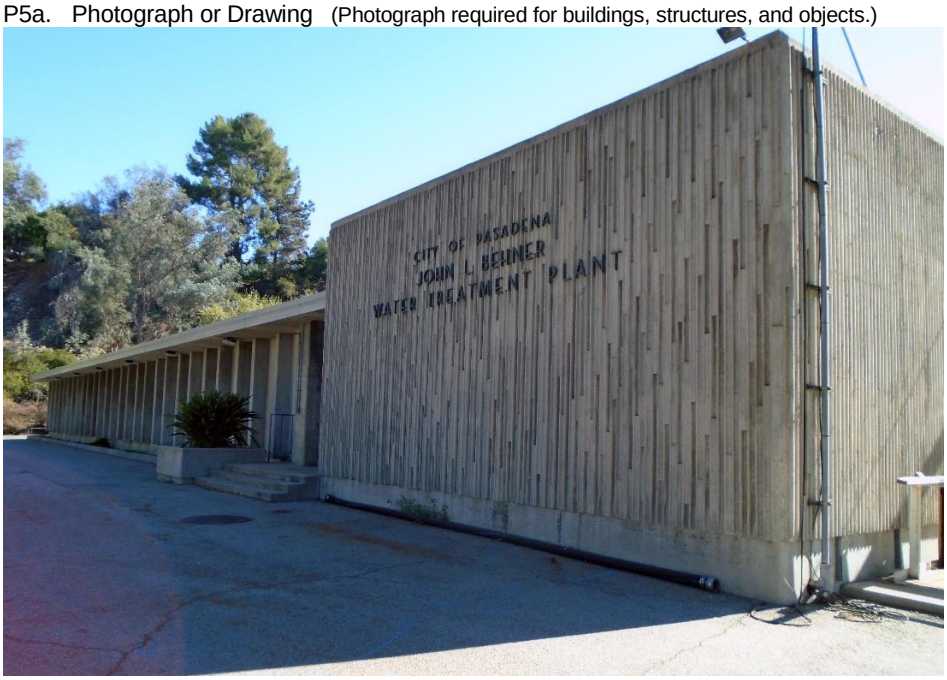
Latitude, Longitude: 34.201171, -118.164889

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The John L. Behner Water Treatment Plant is a one-story Brutalist-style civic building, rectangular in shape, with a flat roof, designed by James M. Montgomery, Consulting Engineer, Inc. of Pasadena, and built in 1971. Exterior walls are exposed concrete with limited fenestration. The design emphasizes horizontality in form, but with strong vertical accents: simple, unadorned, rectangular concrete pilasters flank each narrow window/panel; broad concrete pilasters flank the entry door; and repetitive patterns of vertically-oriented rectilinear forms. (*see continuation sheet*)

***P3b. Resource Attributes:** (List attributes and codes) HP9 Public utility building

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



***P4. Resources Present:** ■ Building ☐ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5b. Description of Photo: (view, date, accession #) main facade, view NE 10/22/2019 (DSC02296)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
1971 (PI 1971)

***P7. Owner and Address:**
City of Pasadena, Water and Power Department
150 S. Robles Avenue, #300
Pasadena, CA 91101

***P8. Recorded by:** (Name, affiliation, and address) Kara R. Dotter, MSHP. Dudek
38 N. Marengo Avenue
Pasadena, CA 91101

***P9. Date Recorded:** 12/27/2019

***P10. Survey Type:** (Describe)
pedestrian

***P11. Report Citation**: (Cite survey report and other sources, or enter "none.") Kaiser, K., K.R. Dotter, A. Dorrler, L. Kry, H. McDaniel McDevitt, and S. Murray. 2020. *Cultural Resources Technical Report for the Arroyo Seco Canyon Project, Areas 2 and 3, Pasadena, California*. Prepared for City of Pasadena Water and Power Department. Prepared by Dudek. June 2020.

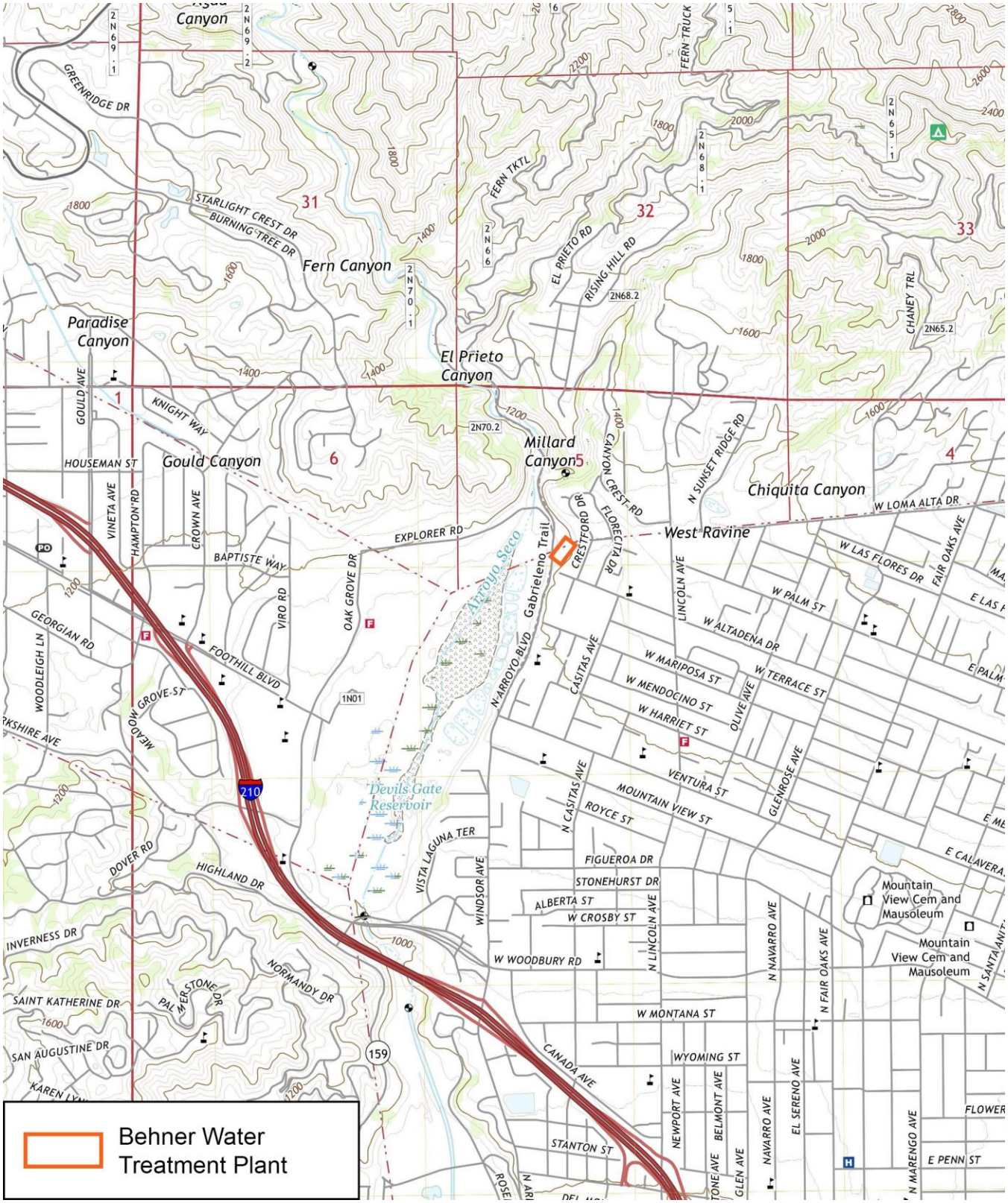
***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List): ___

State of California ◆ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 10 ***Resource Name or #** (Assigned by recorder) John L. Behner Water Treatment Plant
***Map Name:** Pasadena USGS 7.5' Quadrangle ***Scale:** 1:24,000 ***Date of map:** 2018



State of California ♉ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) John L. Behner Water Treatment Plant ***NRHP Status Code** 3S, 3CS
Page 3 **of** 10

B1. Historic Name: John L. Behner Water Treatment Plant
B2. Common Name: John L. Behner Water Treatment Plant
B3. Original Use: water treatment facility B4. Present Use: not in use
***B5. Architectural Style:** Brutalist
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Built 1970. No alterations visible.

***B7. Moved?** ■No □Yes □Unknown **Date:** _____ **Original Location:** _____
***B8. Related Features:**

B9a. Architect: James M. Montgomery, Consulting Engineers, Inc. b. Builder: Margate Const. Co.
***B10. Significance: Theme** water control infrastructure **Area** Pasadena, CA

Period of Significance 1971 **Property Type** _____ **Applicable Criteria** NRHP C, CRHR 3, City of Pasadena 2c
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The John L. Behner Water Treatment Plant (WTP), named after the first General Manager of the consolidated Pasadena Water and Power Department (PWP). Located in the Arroyo Seco Canyon east of JPL, the plant had a capacity of 5 million gallons per day. The project, which began as the result of a PWP feasibility study in 1967 decided on the current location. Originally, the Metropolitan Water District (MWD) identified the Upper Arroyo Seco as a location for their new MWD water treatment plant, however they received backlash from Pasadena citizens using the area as a park. As a result, the City of Pasadena moved forward with their plan for a smaller water treatment plant facility, and a county regional park at the same time. The push was successful, and the PWP's plant was designed by Pasadena-based engineering firm James M. Montgomery, Consulting Engineers Inc. and constructed by the Margate Construction Company in 1970 and dedicated 1971. (*see continuation sheet*)

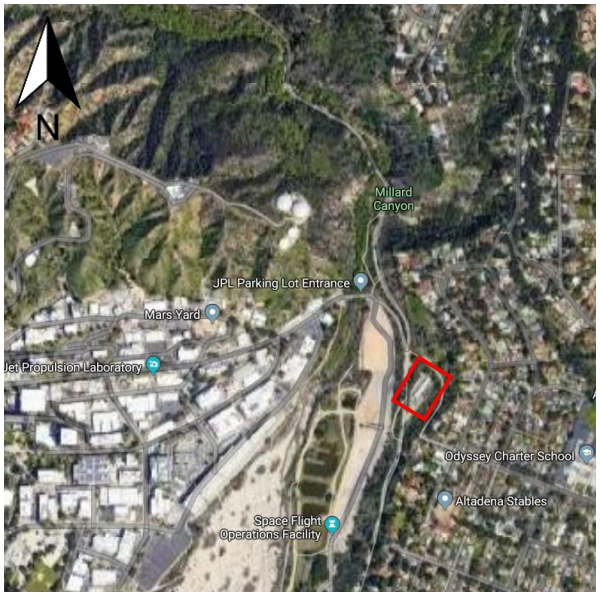
B11. Additional Resource Attributes: (List attributes and codes) _____
***B12. References:**

(*see continuation sheet*)

B13. Remarks:

***B14. Evaluator:** Kara R. Dotter, MSHP
***Date of Evaluation:** December 27, 2019

(This space reserved for official comments.)



***P3a. Description: (continued)**

A tall, monolithic concrete wall, with a broad band of vertically-oriented rectilinear forms creating a repetitive pattern, blocks view of the southern portion of external water treatment facilities to the east of and adjacent to the building. The external water treatment facilities comprise a series of open concrete tanks, with water flow controlled by a pair of wood flood gates, and a pair of moderately-sized, cylindrical above-ground tanks.

The main (northwest) elevation presents as two sections: the left (northern) two-thirds consists of regularly-spaced narrow, vertical windows or panels, topped with louvered rectangular vents, and a double-leaf flush entry door with a flat panel inset above. The door is accessed by three broad, shallow concrete steps, bordered to the left (north) by a square integral concrete planter. Another narrower, shallower integral concrete planter runs along the base of the wall. The right (southern) third projects forward about three feet and is about two feet taller, with a repetitive pattern of vertically-oriented rectilinear forms. Three rows of patinated metal letters in a simple modern font are attached to the upper center of the wall and read “City of Pasadena John L. Behner Water Treatment Plant.”

The southwest elevation presents as a monolithic wall with a repetitive pattern of vertically-oriented rectilinear forms. A near-full-height, flush, double-leaf loading door sits off-center, and a painted metal I-beam projects outwards from the top between the two leaves. The tall, monolithic concrete wall begins at the eastern end of this elevation, effectively continuing in line from the southeast elevation, and is pierce by a corrugated metal door.

The southeast elevation presents as two sections: the left (southern) third is about two feet taller and predominantly exposed concrete masonry units (CMUs) laid in running bond, with a vertical and horizontal panel decorated in the repetitive pattern of vertically-oriented rectilinear forms; a half-lite painted metal door pierces the wall near the left edge. The right (northern) two-thirds of the elevation consists of exposed CMUs laid in running bond, with a vented half-lite door accessed via a concrete walkway and five evenly-spaced narrow, horizontally-oriented louvered vents located near the base of the wall.

The northeast elevation is monolithic concrete with four full-length rectangular concrete pilasters flanking a centered single-width roll-up garage door. Short portions of two rectangular concrete pilasters project above the door.



Figure 1. Behner Treatment Plant: southwest elevation, view looking northeast (IMG_2660)



Figure 2. Behner Treatment Plant: southeast elevation, view looking southwest (DSC02274)

***B10. Significance: (continued)**

John L. Behner Water Treatment Plant (1971)

The John L. Behner Water Treatment Plant (WTP) was named after the first General Manager of the consolidated Pasadena Water and Power Department (PWP). Located in the Arroyo Seco Canyon east of JPL, the plant had a capacity of 5 million gallons per day. The project, which began as the result of a PWP feasibility study in 1967 decided on the current location. Originally, the Metropolitan Water District (MWD) identified the Upper Arroyo Seco as a location for their new MWD water treatment plant; however, they received backlash from Pasadena citizens using the area as a park. As a result, the City of Pasadena moved forward with their plan for a smaller water treatment plant facility, and a county regional park at the same time. The push was successful, and the PWP's plant was designed by Pasadena-based engineering firm James M. Montgomery, Consulting Engineers Inc. and constructed by the Margate Construction Company in 1970 and dedicated in 1971. However, new water treatment regulations imposed as a result of the Surface Water Treatment Rule meant that the treatment plant was shut down in June 1993. Another feasibility study on the potential for upgrading the facility was conducted in 1995, but the Behner WTP remains offline to this day (City of Pasadena 2010, 2012; LAT 1968; PI 1971).

Architectural style: Brutalism

The term "Brutalism" derives from the French béton brut, which translates as raw concrete, and describes concrete that displays the patterns, seams, and bug holes caused by formwork and concrete emplacement. The Brutalist architectural style is characterized by its use of raw building materials in a very direct and imposing way, emphasizing bulky forms and sharp angles with limited visible glass surfaces. A popular style between the 1950s and 1970s, Brutalism favored heavy, solid shapes cast with highly detailed and textured reinforced concrete. Often associated with High Modernism, a style emphasizing austere and abstract forms rooted in science and technology, the bold, unapologetic design and monumentality of Brutalism makes it an easy target for criticism, and it is thought to be one of the most divisive styles of architecture to emerge since the beginning of the twentieth century (Lowder 2013, McAlester 2013, Mindel 2016).

The best known early Brutalist architecture was that of Swiss architect Le Corbusier in the early 1950s. Brutalism gained popularity in the United Kingdom in the mid-century as war-torn communities actively sought inexpensive construction and design techniques in order to create affordable government buildings, housing, and shopping centers. However, Brutalism was also popular among those without budget constraints, as the style came to be artistically appreciated for its honest expression of materials, sculptural qualities, and anti-bourgeois aesthetic.

Brutalism was a popular style of architecture for educational buildings, particularly university buildings, but was relatively rare for corporate and single-family residential projects. It was also favored for civic projects, high-rise apartments, and shopping centers, as the style emulated strength, functionality, and an appreciation for material simplicity (Brutalism Online 2016).

Character-defining features of Brutalism include (City of San Diego 2007, HRG 2007):

- Exposed, expressive structural system
- Rough, unadorned concrete construction
- Monumental massing
- Heavy blockish shapes
- Angular and rectilinear forms
- Prefabricated concrete panels with exposed joinery
- Windows as voids in an otherwise solid volume

- Repetitive patterns
- Avoidance of traditional elements or ornament
- Raised plazas and base articulation

Engineer: James M. Montgomery, Consulting Engineers, Inc. (1945-1990)

The Behner WTP was designed by engineer James M. Montgomery (1896-1969). Montgomery was born in Ohio in 1896, and moved to Los Angeles California by 1910. He briefly served in the military during World War I, and was honorably discharged in October 1918. Montgomery returned to Newark, Ohio for a few years, but eventually moved back to Los Angeles Between 1935 and 1940. Montgomery launched his engineering firm in 1941, after having some success in helping design the F.E. Weymouth Memorial Water Softening and Filtration Plant in 1936 with MWD. This early connection with water infrastructure led to a career of consulting, studies, reports, and designing water infrastructure systems for Southern California and the greater West Coast of the United States for the next five decades. The firm was based in Pasadena for the first few decades. James Montgomery himself passed away in 1969, but his firm continued consulting work focused on water infrastructure. In 1990, the James M. Montgomery, Consulting Engineers, Inc. firm merged with Watson Hawksley, Ltd of the United Kingdom to become Montgomery-Watson. In 2001, Montgomery Watson merged with Harza Engineering and became Montgomery Watson Harza. This name was shortened to MWH Global in 2003. In 2016, MWH was acquired by Stantec Consulting, Inc. (Ancestry 2019).

Known works by Montgomery include:

- F.E. Weymouth Memorial Water Softening and Filtration Plant, Metropolitan Water District, City of La Verne, 1936-1941
- Arcadia Plant improvements, City of Santa Monica, 1958
- William B. Cater Filtration Plan, City of Santa Barbara, 1962
- Arcadia Plant improvements, City of Santa Monica, 1966
- Water Softening System, Alameda County Water District, 1966
- South San Diego Reservoir, City of San Diego, 1968
- Anaheim Lake Demonstration Desalination Plant, Orange County Water District, 1973
- Warner Ave Sewer Pump Station, City of Huntington Beach, 1986

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The subject property was completed in 1971, during a period of economic downturn that that began in the late 1960s, and taken offline in 1993 after passage of the Surface Water Treatment Rule. Although the property is generally representative of the City's mid-century growth, it has no direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and

the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The John L. Behner Water Treatment Plant is a good example of Brutalist civic architecture as expressed in the context of a utilitarian building designed for practicality. Designed by local Pasadena engineering firm James M. Montgomery, Consulting Engineer Inc. and built in 1971, the building displays several character-defining features of the Brutalist architectural style, including an exposed, expressive structural system; rough, unadorned concrete construction; monumental massing; heavy blockish shapes; angular and rectilinear forms; prefabricated concrete panels with exposed joinery; windows as voids in an otherwise solid volume; repetitive patterns; and avoidance of traditional elements or ornament. While smaller in scale than the more monumental, hulking Brutalist buildings often seen in civic centers and on college campuses, the building still conveys the essential character-defining features of the Brutalist design aesthetic and exhibits a high level of integrity. The designing engineering firm, James M. Montgomery, Consulting Engineer, Inc., is a local, Pasadena-based firm that regularly constructed water infrastructure projects for local cities and water districts, such as MWD, Santa Monica, and Huntington Beach. There are no known alterations to the exterior of the building. Although the engineer does not rise to the level of a "master," the building embodies the distinctive characteristics of the Brutalist architectural style and possesses artistic values of significance to the City or to the region. Consideration was also given to the fact that Brutalism is a relatively rare architectural style in Pasadena, with few noteworthy examples. The Pasadena CHRID lists only two eligible Brutalist properties: a public library and a private residence. According to the Los Angeles Conservancy, "The Lamanda Park Branch of the Pasadena Public Library is a rare Brutalist building in an area of modest suburban homes in east Pasadena." (LAC 2019) The same may be said of the Behner WTP, as it remains relatively hidden from view, tucked away behind a suburban neighborhood. ***As such, the property appears eligible for the NRHP under Criterion C and CRHR under Criterion 3 at the local level of significance.***

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements. Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, ***the subject property appears eligible as a landmark under local designation criteria 2c.***

Integrity Discussion

Integrity Discussion
The John L. Behner Water Treatment Plant maintains integrity of location, as it remains in its original location. The building retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The building retains integrity of setting, as upon its construction, the Arroyo Seco Canyon area had already attained the majority of JPL-related development, residential suburban development, and undeveloped Forest Service and parkland observed today. The building maintains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The windows sport metal security screens, but the majority of the building's original materials are extant. The building retains integrity of feeling and association, as the property retains the ability to express itself as a water treatment plant. In summary, the building retains the requisite integrity for designation, and appears eligible for listing under NRHP Criterion C, CRHR Criterion 3, and City of Pasadena Landmark criterion 2c at the local level of significance.

***B12. References:**

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Mindel, L.F. 2016. "10 Buildings People Love to Hate but Shouldn't: Reconsidering Brutalism, Architecture's Most Argued-Over Style." Architectural Digest. January 28, 2016. Accessed November 25, 2019. https://www.architecturaldigest.com/story/brutalist-architecture-masterpieces

PI. 1971. "Water Plant Dedication Scheduled" Newspapers.com: *Pasadena Independent* (Pasadena, California). November 03, 1971, pg. 1.

State of California The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 6Z

Other Listings
Review Code Reviewer Date

Page 1 **of** 8 ***Resource Name or #:** (Assigned by recorder) Screen Building Complex
P1. Other Identifier:

*__P2. Location:__ ☐ **Not for Publication** ■ **Unrestricted**

***a. County** Los Angeles **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Pasadena **Date** 2018 **T** 1N; **R** 12W; ___ ☐ **of** ___ ☐ **of Sec** 5 ; San Bernardino **B.M.**

c. Address Arroyo Seco Canyon, north of Explorer Road City Pasadena Zip 91011

d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 392378 mE/ 3785770 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)

Latitude, Longitude for components: Screen Building: 34.207086, -118.167910; Weir and Intake Structure: 34.207765, -118.168221

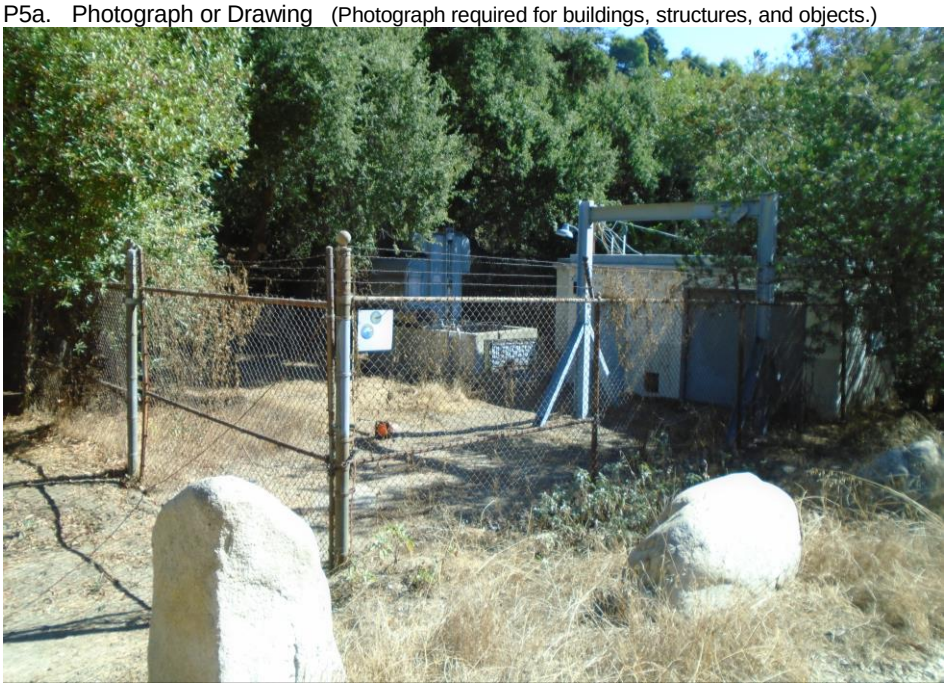
***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The Screen Building Complex (formerly known as the Chlorination Plant) consists of the screen building built c. 1932, a weir built c. 1938, and an intake structure built c. 1938. The screen building is an L-shaped, flat-roofed concrete building of utilitarian design. A narrow drip edge runs along the walls below what appears to be a short parapet wall. Fenestration includes two flush single-leaf entry doors, a roll-up garage door, and five windows obscured by metal screens. (*see continuation sheet*)

***P3b. Resource Attributes:** (List attributes and codes) HP9 Public utility building; HP11 Engineering structure; HP35 CCC/WPA property

***P4. Resources Present:** ■ Building ■ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



P5b. Description of Photo: (view, date, accession #) Screen building, view to east (IMG_2423)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
c.1932 (aerial photos)

***P7. Owner and Address:**
City of Pasadena, Water and Power Department
150 S. Robles Avenue, #300
Pasadena, CA 91101

***P8. Recorded by:** (Name, affiliation, and address) Kara R. Dotter, MSHP. Dudek
38 N. Marengo Avenue
Pasadena, CA 91101

***P9. Date Recorded:** 12/27/2019

***P10. Survey Type:** (Describe)
pedestrian

***P11. Report Citation**: (Cite survey report and other sources, or enter "none.")
Kaiser, K., K.R. Dotter, A. Dorrler, L. Kry, H. McDaniel McDevitt, and S. Murray. 2020. Cultural Resources Technical Report for the Arroyo Seco Canyon Project, Areas 2 and 3, Pasadena, California. Prepared for City of Pasadena Water and Power Department. Prepared by Dudek. June 2020.

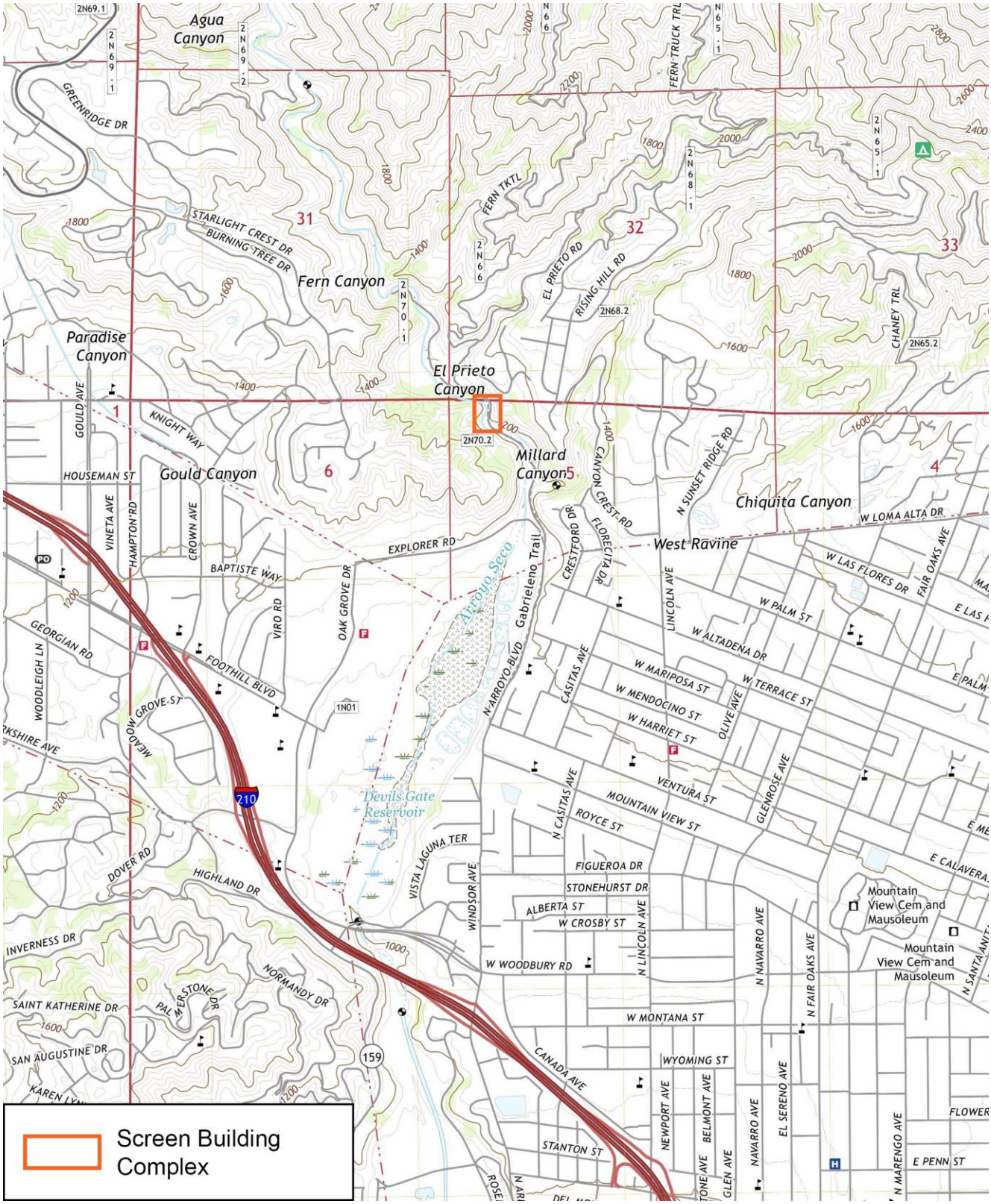
***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List): ___

State of California ◆ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 8 ***Resource Name or #** (Assigned by recorder) Screen Building Complex
***Map Name:** Pasadena USGS 7.5′ Quadrangle ***Scale:** 1:24,000 ***Date of map:** 2018



BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Screen Building Complex ***NRHP Status Code** 6Z
Page 3 **of** 8

B1. Historic Name:
B2. Common Name:
B3. Original Use: water control infrastructure B4. Present Use: water control infrastructure
***B5. Architectural Style:** utilitarian
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Built c.1927-1944 (aerial photos)

***B7. Moved?** ■**No** □**Yes** □**Unknown** **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: unknown b. Builder: unknown
***B10. Significance: Theme** water control infrastructure **Area** Pasadena, CA
Period of Significance N/A **Property Type** N/A **Applicable Criteria** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The Screen Building Complex consists of the screen building (formerly known as the Chlorine Plant, per as-built drawings), intake structure, and a flashboard dam/weir. The screen building is identified on 1932 as-built plans for the Arroyo Seco Headworks (Work Order 2802, Pasadena Water Department 1932), indicating that it was constructed around this time. As such, it is likely that these components were constructed by the CCC during their Arroyo Seco improvements campaign in the 1930s. A flashboard dam/weir was also part of this as-built drawing set, and was constructed at this location in 1932. It is possible that an earlier weir, dam, or pipeline preceded its construction, but this could not be verified in archival research, including aerial photographs or historical maps. An image of the weir from March 5, 1937, shows that there was a modest concrete structure with angled buttresses and a paved horizontal surface downstream, leading to a short drop off to the natural streambed. The drop off aligns with retaining walls on either end. (*see continuation sheet*)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**

(*see continuation sheet*)

B13. Remarks:

***B14. Evaluator:** Kara R. Dotter, MSHP
***Date of Evaluation:** December 27, 2019

(This space reserved for official comments.)



***P3a. Description: (continued)**

A vertical metal ladder attached near one of the entry doors provides access to the roof. An elevated rectangular concrete open-air tank structure, with a large piece of mechanical equipment bolted over half of the structure and accessed by three metal steps, sits to the left of and slightly in front of the screen building. A rectangular arch constructed from metal I-beams, with the two uprights supported with angled I-beams on the front and back of the arch, is located in front of the garage door. The weir is a combination of mortared stone and poured-in-place concrete with at least one wood sluice gate, although access was limited during survey due to vegetation and debris. A cobblestone wall rises from the original retaining wall on the right (east or cutbank) side of the weir and supports a concrete platform, the top deck of the intake structure, into which the original rectangular concrete platform is incorporated and expanded.



Figure 1. Screen building, view looking south (IMG_2767)



Figure 2. Weir, eastern end with wood sluice gate, view looking upstream (IMG_2797)



Figure 3. Weir detail, view looking upstream (IMG_2791)

***B10.Significance: (continued)**

A concrete wing wall lines the cut bank side of the stream where the weir meets it, and a small concrete platform (the top deck of the intake structure) rests adjacent to the wing wall on mounded soil. The 1938 historic aerial image shows the devastation wrought by flooding that year; the screen building is visible, but the c. 1932 weir appears to have been destroyed. In the next 1944 historic aerial image clearly shows the screen building, intake structure, and a new weir. The new weir, visible in the 1944 aerial photograph, is of a different design than the 1932 weir, and a cobblestone wall is visible rising from the original retaining wall on the right (east or cutbank) side of the weir. The cobblestone wall supports a concrete platform, of which the original rectangular concrete platform is incorporated, indicating extensive repairs and/or additional damage during later flood events.

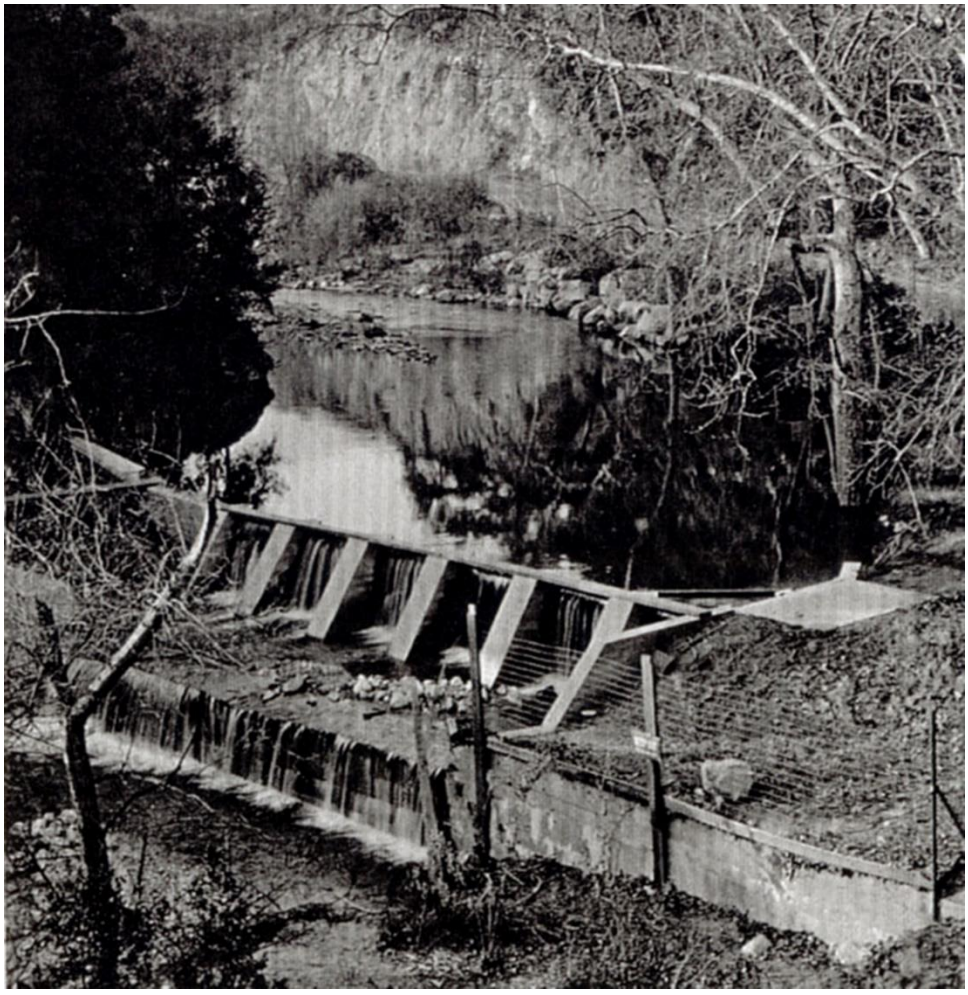


Figure 4. Weir and intake structure, dated March 5, 1937, view looking upstream (ASF 2019)

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The complex was completed c. 1932, most likely by the CCC during their improvements campaign in the Arroyo Seco Canyon. The extant weir was replaced after a major flooding event in 1938, and a newer cobblestone wall rises from the original retaining wall on the right (east or cutbank) side of the weir. The cobblestone wall supports a concrete platform, into which the original rectangular concrete platform is incorporated, indicating extensive repairs and/or additional damage during later flood events. The Screen Building Complex is no longer visibly recognizable as dating to its original c. 1932 construction date due to the extensive damage and subsequent repairs. Further, it does not have a direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The Screen Building Complex comprises a screen building, a weir, and an intake structure. The individual components are modest utilitarian structures built with common materials using common techniques and with no artistic value. They do not embody the distinctive characteristics of a type, period, or method of construction, nor do they represent the work of a master, nor does the complex represent a significant and distinguishable entity whose components may lack individual distinction. Furthermore, the Screen Building Complex is no longer visibly recognizable as dating to its original c. 1932 construction date due to the extensive damage and subsequent repairs. For these reasons, the Screen Building Complex does not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear

likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property does not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

The Screen Building Complex retains integrity of location, as it remains in its original location. The Complex lacks integrity of design as it was subjected to large-scale exterior alterations since its original construction in 1932 and no longer maintains the essential features of form, plan, space, structure, and style. The Complex retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The Complex lacks integrity of materials and workmanship due to the extensive damage and subsequent repairs to the physical elements that date from its construction. The Complex retains integrity of feeling, as it is still nestled within the Arroyo Seco surrounded by a mixture of natural environment and water infrastructure. Finally, while the screen building still reads as a grouping of structures related to water infrastructure in Pasadena, this association is not significant. In summary, the Screen Building Complex does not retain the requisite integrity for designation, nor does it rise to the level of significance required for designation at the national, state or local levels.

***B12. References:**

Andrus, Patrick W. and Rebecca H. Shrimpton. 2002. "How to Apply the National Register Criteria for Evaluation." National Register Bulletin 15. Accessed November 14, 2019. https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf

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State of California ♘ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 6Z

Other Listings
Review Code Reviewer Date

Page 1 **of** 10 ***Resource Name or #:** (Assigned by recorder) Bridge 1
P1. Other Identifier:

*__P2. Location:__ ☐ **Not for Publication** ■ **Unrestricted**

***a. County** Los Angeles **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Pasadena **Date** 2018 **T** 1N; **R** 12W; ___ ☐ **of** ___ ☐ **of Sec** 5 ; San Bernardino **B.M.**

c. Address Arroyo Seco Canyon, north of Explorer Road City Pasadena Zip 91011

d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 392599 mE/ 3785482 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)

Latitude, Longitude: 34.204837, -118.165777

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Bridge No. 1 appears to be a two-span box culvert bridge, with the bridge supported on either end by a cobblestone abutment wall and in the middle by a cobblestone wall. The abutments and center wall may be concrete clad with mortared cobblestones, or built as load-bearing cobblestone masonry walls. The bridge deck appears to be supported by a metal plate(s) that rests upon the cobblestone walls. An approximately 18-inches-tall band of mortared cobblestone rests on the upstream and downstream edges of the metal plate(s), with the bridge deck coated in tarmac. (*see continuation sheet*)

***P3b. Resource Attributes:** (List attributes and codes) HP19 Bridge

***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



P5b. Description of Photo: (view, date, accession #) view looking south 10/22/2019 (IMG 2688)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both c.1941 (newspapers, aerials)

***P7. Owner and Address:**
City of Pasadena, Water and Power Department
150 S. Robles Avenue, #300
Pasadena, CA 91101

***P8. Recorded by:** (Name, affiliation, and address) Kara R. Dotter, MSHP. Dudek
38 N. Marengo Avenue
Pasadena, CA 91101

***P9. Date Recorded:** 12/27/2019

***P10. Survey Type:** (Describe) pedestrian

***P11. Report Citation**: (Cite survey report and other sources, or enter "none.")
Kaiser, K., K.R. Dotter, A. Dorrler, L. Kry, H. McDaniel McDevitt, and S. Murray. 2020. *Cultural Resources Technical Report for the Arroyo Seco Canyon Project, Areas 2 and 3, Pasadena, California*. Prepared for City of Pasadena Water and Power Department. Prepared by Dudek. June 2020.

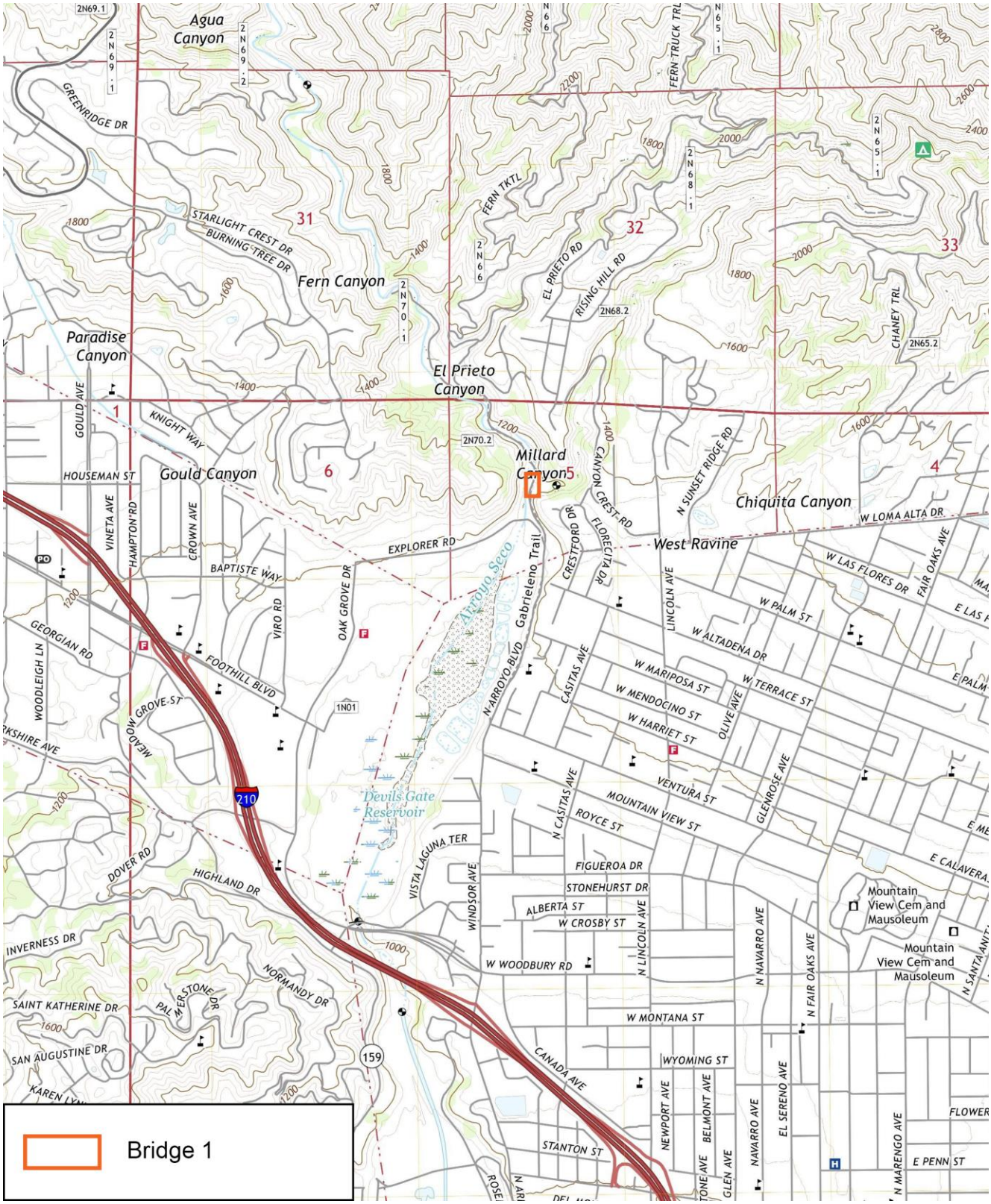
***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ◆ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 10 ***Resource Name or #** (Assigned by recorder) Bridge 1
***Map Name:** Pasadena USGS 7.5′ Quadrangle ***Scale:** 1:24,000 ***Date of map:** 2018



State of California ♄ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Bridge 1 ***NRHP Status Code** 6Z
Page 3 **of** 10

B1. Historic Name: unknown
B2. Common Name: Bridge No. 1
B3. Original Use: bridge B4. Present Use: bridge
***B5. Architectural Style:** N/A
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Built c.1941.

***B7. Moved?** ■**No** □**Yes** □**Unknown** **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: unknown b. Builder: unknown
***B10. Significance: Theme** water control infrastructure, transportation **Area** Pasadena, CA

Period of Significance N/A **Property Type** N/A **Applicable Criteria** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Arroyo Seco Canyon Developments (1887-present)

The Project site is located within the Hahamongna Watershed Master Plan Area, within the larger Arroyo Seco which also includes the Central and Lower Arroyo Seco Master Plan Areas. Arroyo Seco Canyon is an important watershed which begins in the San Gabriel Mountains at Mount Wilson, continues west of the cities of Pasadena and Altadena, and extends south to join the Los Angeles River. The canyon was used as a prehistoric through-route for the Hahamong'nas (a band of native Tongva people), connecting the area that is now Hahamongna Watershed Park to trade partners to the north. The canyon continued to be a source of water, recreation, and travel route well into the nineteenth century. As early as 1887, the City of Pasadena and citizens were recognizing the Arroyo Seco as a whole for its benefits as a park. Locals swam at the pools at Devil's Gate, hiked to the waterfall at Millard Canyon, and took pack animal trips to Mount Wilson. At the turn of the twentieth century, Arroyo Seco enjoyed a long period of recreational development, such as at Camp Oakwilde, a rustic resort constructed in 1911, and several private and public cabins throughout the canyon. (*see continuation sheet*)

B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**

(*see continuation sheet*)

B13. Remarks:

***B14. Evaluator:** Kara R. Dotter, MSHP
***Date of Evaluation:** December 27, 2019

(This space reserved for official comments.)



***P3a. Description: (continued)**

A new temporary bridge with concrete access ramps passes across the deck of Bridge No.1. Aerial images indicate a bridge crossing over Millard Canyon existed at the same location prior to 1927. Archival research indicates that the original bridge was either damaged or destroyed by the 1938 floods, and replaced with the existing two-span box culvert bridge either during a CCC repair campaign in 1939 or as part of the 1941 Arroyo Seco Program. A previous report identified the bridge deck as being replaced with a "similar reinforced concrete span" in 1979, and that river rock was applied to both sides of the deck at the time to "visually integrate it with the existing river rock-clad bridge components" (Daly 2014). Comparison of photographs taken in 2019 during the site visit with those included in a 2015 report indicate that the bridge deck was coated with a layer of tarmac c. 2017, prior to installing the temporary bridge (TJC & Associates 2015). Two pipelines emerge from the ground near the southern end of Bridge No. 1 and run along the west side of the Arroyo Boulevard/Gabrielino Trail. The larger metal pipe is wrapped with what appears to be disintegrating asphalt rolled material, and continues underground near the southern end of Bridge No. 2. The smaller pipeline appears to be concrete and dives underground north of Bridge No. 2, just after a bolted metal pipe connection between two runs of concrete pipe.



Figure 1. Bridge No. 1 with temporary bridge in place, view looking south (DSC02332)



Figure 2. Bridge No. 1, detail of cobblestone edge and central supporting wall (DSC02336)



Figure 3. View of pipelines, near Bridge No. 1 (DSC02327)



Figure 4. View of pipelines, near Bridge No. 1 (DSC02323)

***B10.Significance: (continued)**

In 1911, the City of Pasadena annexed the lower and middle sections of the Arroyo Seco, and in 1919, the area now known as Hahamongna Watershed Park was annexed to the city (City of Pasadena 2019b).

With the recreation movement taking hold in the Arroyo Seco, and the Arts and Crafts Movement (1895-1920) influencing building and landscape architecture at large in southern California, the area within and around the Arroyo Seco developed several unifying features that were consistently used throughout the Arroyo Seco canyon area, including parks, trails, landscaping features, neighborhoods, and civic structures. These included the emphasis on the natural environment and use of native cobblestone in walls, gates, and fences, especially as accents to pedestrian walkways and roads that might otherwise have a utilitarian appearance. Native rock cobblestone walls also complemented the larger Arts and Crafts-style residential architecture of Pasadena. Even after the Arts and Crafts Movement waned in popularity, the use of native cobblestone persisted as a unifying landscape feature in the Arroyo Seco (Bricker et al. 1992; Pasadena 2003a).

A road through Arroyo Seco Canyon has been visible on maps since the 1894 "Los Angeles, Calif." topographical map of the area. This earliest topographical map of the area shows the road extending between the Los Angeles Terminal Railroad Line and a mountain hamlet called Las Casitas before looping back west and south to La Cañada, following an older trail forged by the native Gabrielinos. The road was subjected to several floods over the years, damaging the road bed, bridges, dams and other infrastructure placed along it. Arroyo Seco Canyon Road, also known as Arroyo Boulevard, was paved for use as a county highway c. 1920, during which time Bridge No. 2 was constructed as a necessary improvement

along the Arroyo Boulevard/Gabrielino Trail. Bridge No. 2 appears on the very first available aerial map from 1927, as well as other smaller bridges along the road and at the mouth of the canyon. A secondary spur road, leading east from the Bridge No. 1 crossing location, is also present on aerial photos as early as 1927. At the end of this spur road was a square-plan, river cobble-clad building on a concrete platform and a small, concrete diversion dam. Both of these structures are located outside of the Project site (LAT 1919; USGS 2019).

Arroyo Seco Road appears improved by bridges in the earliest available aerial photograph from 1927; however, subsequent floods in 1934 and 1938 appear to obliterate the road and bridges in the canyon, with the exception of Bridge No. 2. The road between Devil's Gate Dam and Oak Wilde, a forest community some 4 miles up Arroyo Seco Road, remained closed until 1939, the same year local Civilian Conservation Corps (CCC) Company 903 constructed Bridge No. 3. Despite the CCC improvements, the City of Pasadena road section outside of U. S. Forest Service lands was not officially repaired until 1941 (LAT 1938, 1940a, 1940b; Pasadena Star News 1939).

Local CCC Company 903 was assigned to the U.S. Forest Service in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great Depression. By June 1, 1933, over 1,400 working camps were established, employing more than 300,000 men, representing the most rapid peace-time mobilization in U.S history. Working on projects for the U.S. Forest Service, the National Park Service, and the Departments of Agriculture and Interior, CCC workers fought forest fires, planted trees, cleaned and maintained access roads, re-seeded grazing lands, implemented soil erosion controls, and built wildlife refuges, fish-rearing facilities, animal shelters, and water storage basins. Roosevelt also authorized the CCC to build bridges and campground facilities in an effort to encourage people to go enjoy America's natural resources. Although focused on providing employment for young unskilled men between 18 and 25 years of age, the CCC also employed WW1 army veterans, skilled foresters and craftsmen, and approximately 88,000 Native Americans from Indian reservations. The CCC reached its largest employment in August 1935, with more than 500,000 men working in 2,900 camps. Estimates indicate that approximately five percent of the US male population, about three million men, participated in the CCC.

The CCC planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems (History.com 2010). In 1941, the Arroyo Seco Project, part of a Los Angeles River watershed upstream work project, began with the Millard Canyon channel and road improvement project. A joint effort between Forest Service and the City of Pasadena engineers, the improvements in Millard Canyon entailed channel improvements and creating a new road cut above the channel bed with a "seven foot wall of native rock" (Pasadena Post 1941:17). The stretch of road to be improved by the retaining walls and barriers was described as above Devil's Gate Dam, and below the Brown Mountain truck trail turn off. The road improvements were in support of the larger goal of the watershed upstream work project: to build the Brown Mountain Dam near Arroyo Seco headwaters as a means of flood control. When the upstream project was completed, the City entered into a contract with the Forest Service to share costs of maintenance and patrols for the sections of Arroyo Seco and Millard Canyon that were in City of Pasadena Land, but adjacent to Forest Service land. Improvements are also visible in aerial photographs between 1938 and 1944, such as the construction of Bridge No. 1, road pavement, and the construction of native rock retaining walls and barriers (Pasadena Post, 1941a, 1941b; Pasadena Star News 1941, 1944; UCSB 2019).

NRHP/CRHR Statement of Significance

Bridge No. 1 does not meet any of the criteria for listing in the NRHP or CRHR, either individually or as part of an existing historic district.

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. Archival research indicates that the original bridge was either damaged or destroyed by the 1938 floods, and replaced with the existing two-span box culvert bridge either during a CCC repair campaign in 1939 or as part of the 1941 Arroyo Seco Program. Bridge No. 1 was completed c. 1940, replacing the original bridge, and is a simple utilitarian design. Even if the bridge was constructed as part of the CCC repair campaign in 1939, it does not maintain any significant physical features that convey this association. Further, evidence suggests that the bridge deck was replaced in 1979 (Daly 2014). It has no direct association with events that have made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Bridge No. 1 is a two-span box culvert bridge of simple utilitarian design completed c. 1940, replacing an older bridge damaged or destroyed by the 1938 floods. Although parts of it are cobblestone, the material was popular during the early 20th C. due to the influence of Greene and Greene and the Arts & Crafts style, and it was inexpensive and readily available from the Arroyo Seco stream bed. Additionally, a previous evaluation of the bridge (Daly 2014) indicates that the bridge deck was replaced in 1979 with reinforced concrete, and subsequently topped with at least one layer of tarmac (c. 2017). The bridge itself is not characteristic of a type, period, or method of construction, nor does it represent the work of a master, nor does it possess high artistic values, and it is not part of a significant and distinguishable entity whose components may lack

individual distinction. For these reasons, Bridge No. 1 does not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property does not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

Bridge No. 1 maintains integrity of location, as it remains in its original location. The bridge does not retain integrity of design as its deck was replaced in 1979. The bridge retains diminished integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge also lacks integrity of materials and workmanship due to replacement of the bridge deck and other features. The bridge's simple design does not convey the feeling or association with a CCC-built bridge as it lacks major visible character-defining features and associated materials. In summary, Bridge No. 1 does not retain the requisite integrity for designation, nor does it rise to the level of significance required for designation at the national, state or local levels.

***B12. References:**

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NETR (Nationwide Environmental Title Research LLC). 2019. Historic Aerial Photographs of Pasadena, CA dating from 1952, 1953, 1954, 1964, 1972, 1977, 1978, 1980, 1982, 1994, 2002, 2003, 2004, 2005, 2009, 2010, 2012, 2014, and 2016. Accessed November 14, 2019. https://www.historicaerials.com/viewer

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Pasadena Post. 1941b. "Work started on dam near Oak Wilde." Pasadena Star News Collection, Pasadena Public Library, August 14, 1941, pg. 5.

Pasadena Star News. 1939. "Arroyo Seco Road Opening Sought." Pasadena Star News Collection, Pasadena Public Library, June 1, 1939, pg. 3.

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State of California ♘ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3S, 3CS

Other Listings
Review Code Reviewer Date

Page 1 **of** 8 ***Resource Name or #:** (Assigned by recorder) Bridge 2
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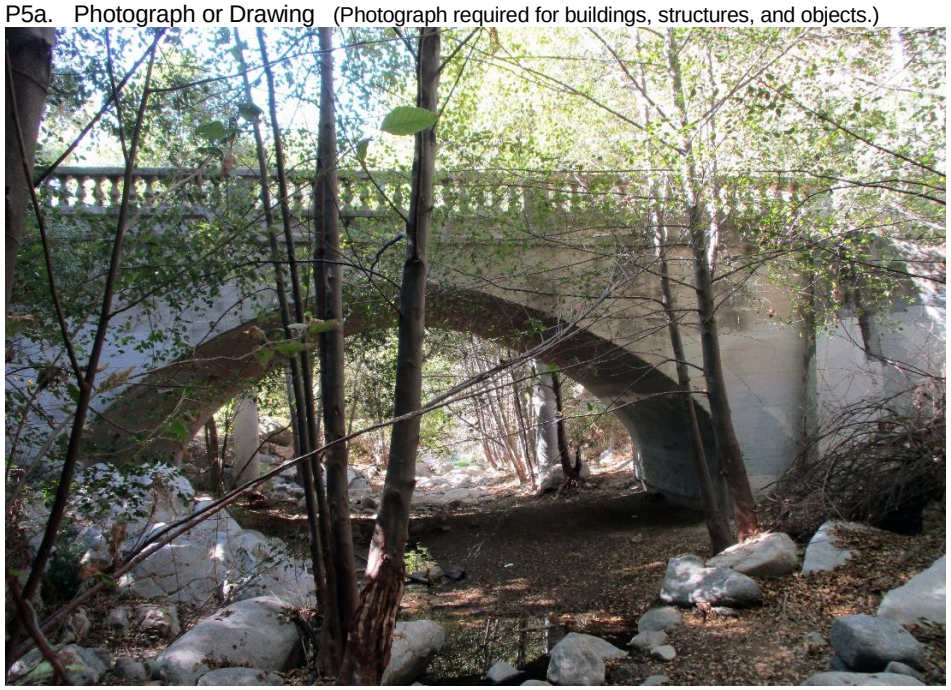
*P2. **Location:** ☐ **Not for Publication** ■ **Unrestricted**
*a. **County** Los Angeles **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
*b. **USGS 7.5' Quad** Pasadena **Date** 2018 **T** 1N; **R** 12W; ☐ **of** ☐ **of Sec** 5 ; San Bernardino **B.M.**
c. Address Arroyo Seco Canyon, north of Explorer Road City Pasadena Zip 91011
d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 392586 mE/ 3785548 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Latitude, Longitude: 34.205429, -118.165922

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Bridge No. 2 is a board-formed concrete arch bridge, with board-formed concrete abutments and a subtle four-point arch, spanning the Arroyo Seco, constructed circa 1920 (Figure 29). Rectangular concrete railings border the upstream and downstream edges of the bridge deck, with openings between upper and lower rails sporting a row of classically shaped single balusters resembling the form of a flower bud from a pomegranate tree (Figure 30). The bridge deck is covered with tarmac. (*see continuation page*)

***P3b. Resource Attributes:** (List attributes and codes) HP19 Bridge
***P4. Resources Present:** ☐ Building ■ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



P5b. Description of Photo: (view, date, accession #) view looking west 10/22/2019 (IMG 2730)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
c.1920 (aerials)

***P7. Owner and Address:**
City of Pasadena, Water and Power Department
150 S. Robles Avenue, #300
Pasadena, CA 91101

***P8. Recorded by:** (Name, affiliation, and address) Kara R. Dotter, MSHP. Dudek
38 N. Marengo Avenue
Pasadena, CA 91101

***P9. Date Recorded:** 12/27/2019
***P10. Survey Type:** (Describe) pedestrian
***P11. Report Citation**: (Cite survey report and other sources, or enter "none.") Kaiser, K., K.R. Dotter, A. Dorrler, L. Kry, H. McDaniel McDevitt, and S. Murray. 2020. *Cultural Resources Technical Report for the Arroyo Seco Canyon Project, Areas 2 and 3, Pasadena, California*. Prepared for City of Pasadena Water and Power Department. Prepared by Dudek. June 2020.

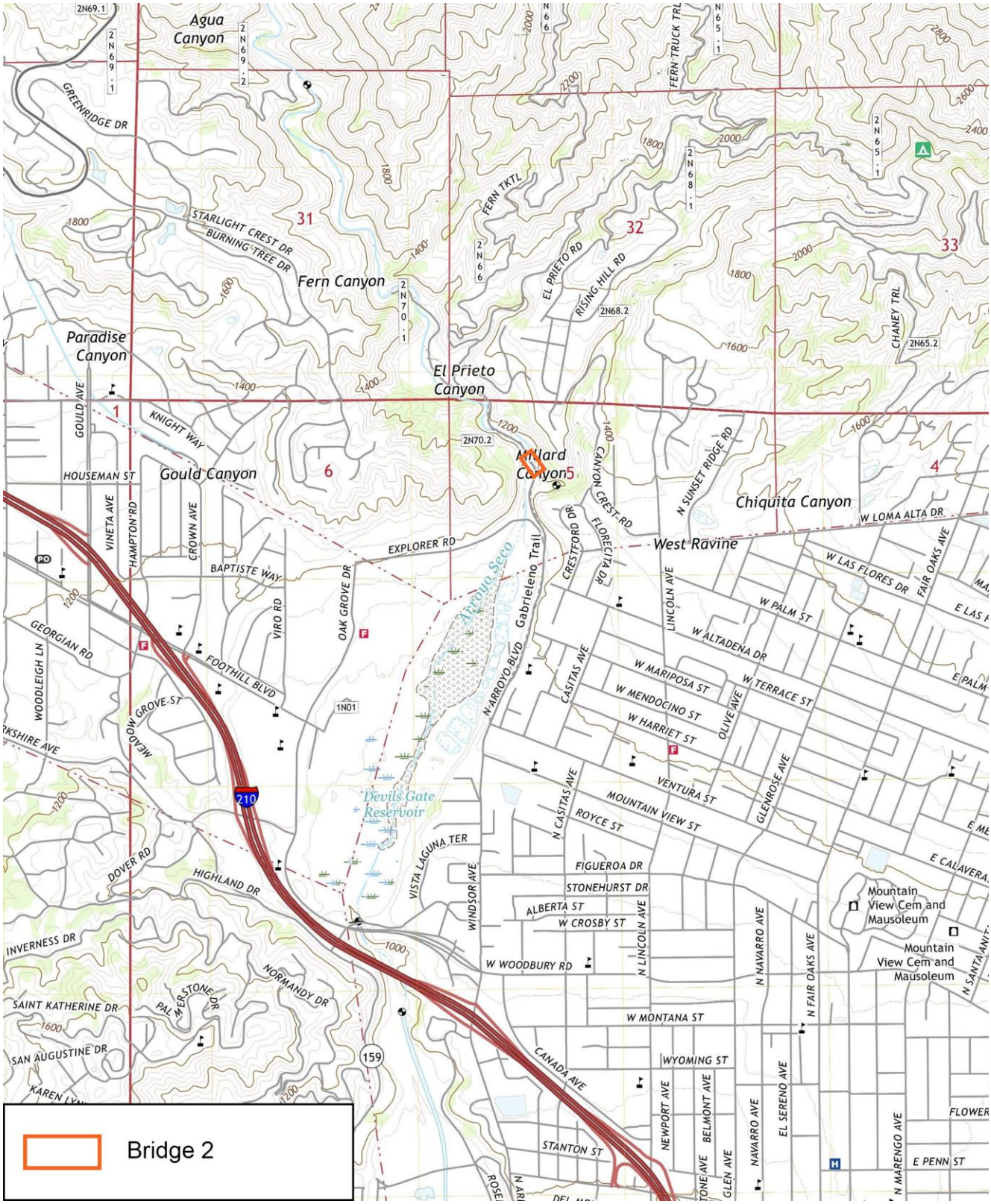
***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California ◆ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 8 ***Resource Name or #** (Assigned by recorder) Bridge 2
***Map Name:** Pasadena USGS 7.5′ Quadrangle ***Scale:** 1:24,000 ***Date of map:** 2018



BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Bridge 2 ***NRHP Status Code** 3S, 3CS
Page 3 **of** 8

B1. Historic Name:
B2. Common Name: Bridge No. 2
B3. Original Use: bridge B4. Present Use: bridge
***B5. Architectural Style:** N/A
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Built c.1920.

***B7. Moved?** ■No □Yes □Unknown **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: unknown b. Builder: unknown
***B10. Significance: Theme** water control infrastructure, transportation **Area** Pasadena, CA
Period of Significance c.1920 **Property Type** bridge **Applicable Criteria** NRHP: C, CRHR: 3, City of Pasadena: 2c
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Arroyo Seco Canyon Developments (1887-present)

The Project site is located within the Hahamongna Watershed Master Plan Area, within the larger Arroyo Seco which also includes the Central and Lower Arroyo Seco Master Plan Areas. Arroyo Seco Canyon is an important watershed which begins in the San Gabriel Mountains at Mount Wilson, continues west of the cities of Pasadena and Altadena, and extends south to join the Los Angeles River. The canyon was used as a prehistoric through-route for the Hahamongnas (a band of native Tongva people), connecting the area that is now Hahamongna Watershed Park to trade partners to the north. The canyon continued to be a source of water, recreation, and travel route well into the nineteenth century. As early as 1887, the City of Pasadena and citizens were recognizing the Arroyo Seco as a whole for its benefits as a park. Locals swam at the pools at Devil's Gate, hiked to the waterfall at Millard Canyon, and took pack animal trips to Mount Wilson. At the turn of the twentieth century, Arroyo Seco enjoyed a long period of recreational development, such as at Camp Oakwilde, a rustic resort constructed in 1911, and several private and public cabins throughout the canyon. (*see continuation sheet*)

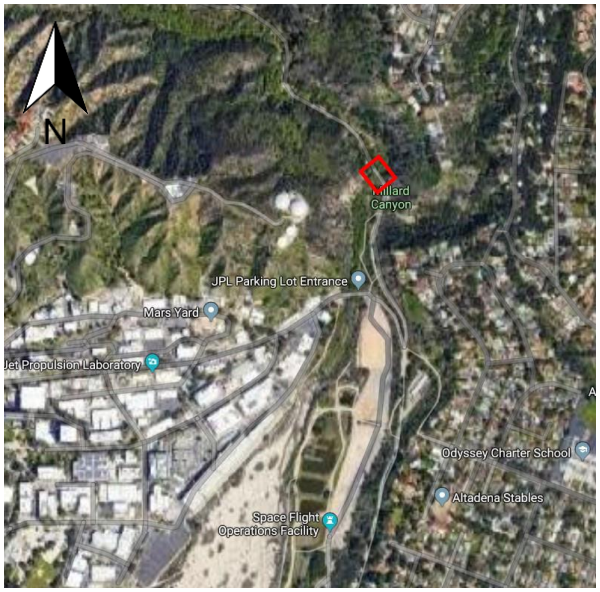
B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**

(*see continuation sheet*)

B13. Remarks:

***B14. Evaluator:** Kara R. Dotter, MSHP
***Date of Evaluation:** December 27, 2019

(This space reserved for official comments.)



***P3a. Description: (continued)**



Figure 1. Bridge No. 2, detail of deck and railing with balusters (DSC02361)

***B10. Significance: (continued)**

In 1911, the City of Pasadena annexed the lower and middle sections of the Arroyo Seco, and in 1919, the area now known as Hahamongna Watershed Park was annexed to the city (City of Pasadena 2019b).

With the recreation movement taking hold in the Arroyo Seco, and the Arts and Crafts Movement (1895-1920) influencing building and landscape architecture at large in southern California, the area within and around the Arroyo Seco developed several unifying features that were consistently used throughout the Arroyo Seco canyon area, including parks, trails, landscaping features, neighborhoods, and civic structures. These included the emphasis on the natural environment and use of native cobblestone in walls, gates, and fences, especially as accents to pedestrian walkways and roads that might otherwise have a utilitarian appearance. Native rock cobblestone walls also complemented the larger Arts and Crafts-style residential architecture of Pasadena. Even after the Arts and Crafts Movement waned in popularity, the use of native cobblestone persisted as a unifying landscape feature in the Arroyo Seco (Bricker et al. 1992; Pasadena 2003a).

A road through Arroyo Seco Canyon has been visible on maps since the 1894 "Los Angeles, Calif." topographical map of the area. This earliest topographical map of the area shows the road extending between the Los Angeles Terminal Railroad Line and a mountain hamlet called Las Casitas before looping back west and south to La Cañada, following an older trail forged by the native Gabrielinos. The road was subjected to several floods over the years, damaging the road bed, bridges, dams and other infrastructure placed along it. Arroyo Seco Canyon Road, also known as Arroyo Boulevard, was paved for use as a county

highway c. 1920, during which time Bridge No. 2 was constructed as a necessary improvement along the Arroyo Boulevard/Gabrielino Trail. Bridge No. 2 appears on the very first available aerial map from 1927, as well as other smaller bridges along the road and at the mouth of the canyon. A secondary spur road, leading east from the Bridge No. 1 crossing location, is also present on aerial photos as early as 1927. At the end of this spur road was a square-plan, river cobble-clad building on a concrete platform and a small, concrete diversion dam. Both of these structures are located outside of the Project site (LAT 1919; USGS 2019).

Arroyo Seco Road appears improved by bridges in the earliest available aerial photograph from 1927; however, subsequent floods in 1934 and 1938 appear to obliterate the road and bridges in the canyon, with the exception of Bridge No. 2. The road between Devil's Gate Dam and Oak Wilde, a forest community some 4 miles up Arroyo Seco Road, remained closed until 1939, the same year local Civilian Conservation Corps (CCC) Company 903 constructed Bridge No. 3. Despite the CCC improvements, the City of Pasadena road section outside of U. S. Forest Service lands was not officially repaired until 1941 (LAT 1938, 1940a, 1940b; Pasadena Star News 1939).

Local CCC Company 903 was assigned to the U.S. Forest Service in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great Depression. By June 1, 1933, over 1,400 working camps were established, employing more than 300,000 men, representing the most rapid peace-time mobilization in U.S history. Working on projects for the U.S. Forest Service, the National Park Service, and the Departments of Agriculture and Interior, CCC workers fought forest fires, planted trees, cleaned and maintained access roads, re-seeded grazing lands, implemented soil erosion controls, and built wildlife refuges, fish-rearing facilities, animal shelters, and water storage basins. Roosevelt also authorized the CCC to build bridges and campground facilities in an effort to encourage people to go enjoy America's natural resources. Although focused on providing employment for young unskilled men between 18 and 25 years of age, the CCC also employed WW1 army veterans, skilled foresters and craftsmen, and approximately 88,000 Native Americans from Indian reservations. The CCC reached its largest employment in August 1935, with more than 500,000 men working in 2,900 camps. Estimates indicate that approximately five percent of the US male population, about three million men, participated in the CCC.

The CCC planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems (History.com 2010). In 1941, the Arroyo Seco Project, part of a Los Angeles River watershed upstream work project, began with the Millard Canyon channel and road improvement project. A joint effort between Forest Service and the City of Pasadena engineers, the improvements in Millard Canyon entailed channel improvements and creating a new road cut above the channel bed with a "seven foot wall of native rock" (Pasadena Post 1941:17). The stretch of road to be improved by the retaining walls and barriers was described as above Devil's Gate Dam, and below the Brown Mountain truck trail turn off. The road improvements were in support of the larger goal of the watershed upstream work project: to build the Brown Mountain Dam near Arroyo Seco headwaters as a means of flood control. When the upstream project was completed, the City entered into a contract with the Forest Service to share costs of maintenance and patrols for the sections of Arroyo Seco and Millard Canyon that were in City of Pasadena Land, but adjacent to Forest Service land. Improvements are also visible in aerial photographs between 1938 and 1944, such as the construction of Bridge No. 1, road pavement, and the construction of native rock retaining walls and barriers (Pasadena Post, 1941a, 1941b; Pasadena Star News 1941, 1944; UCSB 2019).

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. Bridge No. 2 was constructed c. 1920 as a necessary improvement along the Arroyo Boulevard/Gabrielino Trail, around the time Arroyo Boulevard was paved for use as a county highway. However, the road no longer functions as a county highway or a major thoroughfare, and has no direct association with events that made a significant contribution to the history of the City of Pasadena, the State of California, or the Nation. Therefore, Bridge No.2 does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Built c. 1920, around the time Arroyo Boulevard was paved for use as a county highway, Bridge No. 2 exhibits classical design elements in the rows of classically shaped single balusters resembling the form of a flower bud from a pomegranate tree, as well as the subtle four-point shape of the arch. The bridge also displays the pattern of board-formed concrete, a method of construction popular for civil works during the early 20th Century. The designed structure successfully relied on massed reinforced concrete with a broad arched opening to withstand the destructive forces of periodic floods down Arroyo Seco. As such, the bridge embodies distinctive characteristics of a type, period, and method of construction. **Therefore, Bridge No. 2 appears eligible for listing under Criterion C of the NRHP and Criterion 3 of the CRHR at the local level of significance.**

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear

likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property **appears eligible as a landmark under local designation criterion 2c**.

Integrity Discussion

Bridge No. 2 maintains integrity of location, as it remains in its original location. The bridge retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The bridge retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge retains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The bridge no longer retains integrity of feeling and association, since Arroyo Boulevard/Gabrielino Trail no longer serves as an important thoroughfare. In summary, Bridge No. 2 retains the requisite integrity for designation, and appears eligible for listing under NRHP Criterion C, CRHR Criterion 3, and City of Pasadena Landmark criterion 2c.

***B12. References:**

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LAT (Los Angeles Times). 1919. "Many Motorists in Arroyo Seco." Newspapers.com: The Los Angeles Times (Los Angeles, California). August 24, 1919, pg. 98.

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Pasadena Post. 1941a. "Vast Upstream Flood Control Project Starts in Foothills." Pasadena Star News Collection, Pasadena Public Library, July 13, 1941, pg. 15, 17.

Pasadena Post. 1941b. "Work started on dam near Oak Wilde." Pasadena Star News Collection, Pasadena Public Library, August 14, 1941, pg. 5.

Pasadena Star News. 1939. "Arroyo Seco Road Opening Sought." Pasadena Star News Collection, Pasadena Public Library, June 1, 1939, pg. 3.

Pasadena Star News. 1941. "They draft spending of $1,170,000 flood funds: Engineers go into canyon for work." Pasadena Star News Collection, Pasadena Public Library, July 20, 1941, pg. 11.

Pasadena Star News. 1944. "Board votes forest fund." Pasadena Star News Collection, Pasadena Public Library, March 28, 1944, pg. 13.

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State of California ♦ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3S, 3CS

Other Listings
Review Code Reviewer Date

Page 1 **of** 9 ***Resource Name or #:** (Assigned by recorder) Bridge 3
P1. Other Identifier:

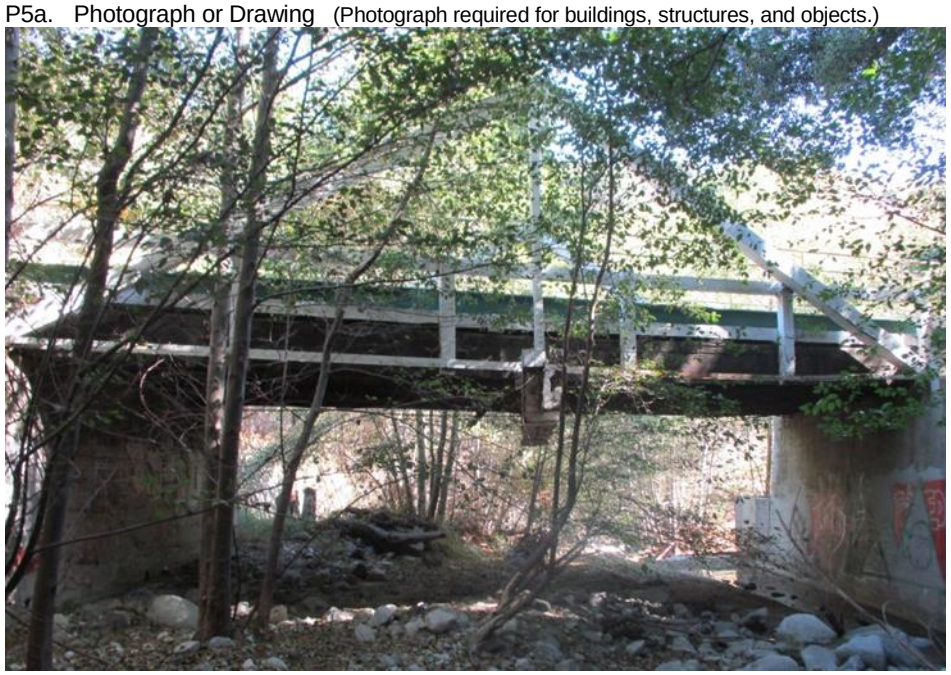
*__P2.__ **Location:** □ **Not for Publication** ■ **Unrestricted**
***a. County** Los Angeles **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad** Pasadena **Date** 2018 **T** 1N; **R** 12W; __ □ **of** __ □ **of Sec** 5 ; San Bernardino **B.M.**
c. Address Arroyo Seco Canyon, north of Explorer Road City Pasadena Zip 91011
d. UTM: (Give more than one for large and/or linear resources) Zone 11S, 392378 mE/ 3785770 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Latitude, Longitude: 34.207410, -118.168205

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Bridge No. 3 is a wooden kingpost truss bridge, with heavy timber supports braced by a vertical metal rod and angled wood beam braced on a cantilevered timber girder. Timber railings line both side of the bridge deck, and board-formed concrete retaining walls support either end of the bridge. A metal plaque attached to one end of the southern retaining wall indicates the wood bridge was erected in 1939 by "C.C.C. Company 903 – U.S.F.S. in cooperation with Pasadena Water Department." A temporary bridge deck is positioned directly above the original wood bridge. (*see continuation sheet*)

***P3b. Resource Attributes:** (List attributes and codes) HP19 Bridge
***P4. Resources Present:** □ Building ■ Structure □ Object □ Site □ District □ Element of District □ Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



P5b. Description of Photo: (view, date, accession #) view downstream 10/22/2019 (IMG 2761)

***P6. Date Constructed/Age and Source:** ■ Historic □ Prehistoric □ Both
1939 (CCC plaque)

***P7. Owner and Address:**
City of Pasadena, Water and Power Department
150 S. Robles Avenue, #300
Pasadena, CA 91101

***P8. Recorded by:** (Name, affiliation, and address) Kara R. Dotter, MSHP. Dudek
38 N. Marengo Avenue
Pasadena, CA 91101

***P9. Date Recorded:** 12/27/2019
***P10. Survey Type:** (Describe)
pedestrian

***P11. Report Citation**: (Cite survey report and other sources, or enter "none.")
Kaiser, K., K.R. Dotter, A. Dorrler, L. Kry, H. McDaniel McDevitt, and S. Murray. 2020. *Cultural Resources Technical Report for the Arroyo Seco Canyon Project, Areas 2 and 3, Pasadena, California*. Prepared for City of Pasadena Water and Power Department. Prepared by Dudek. June 2020.

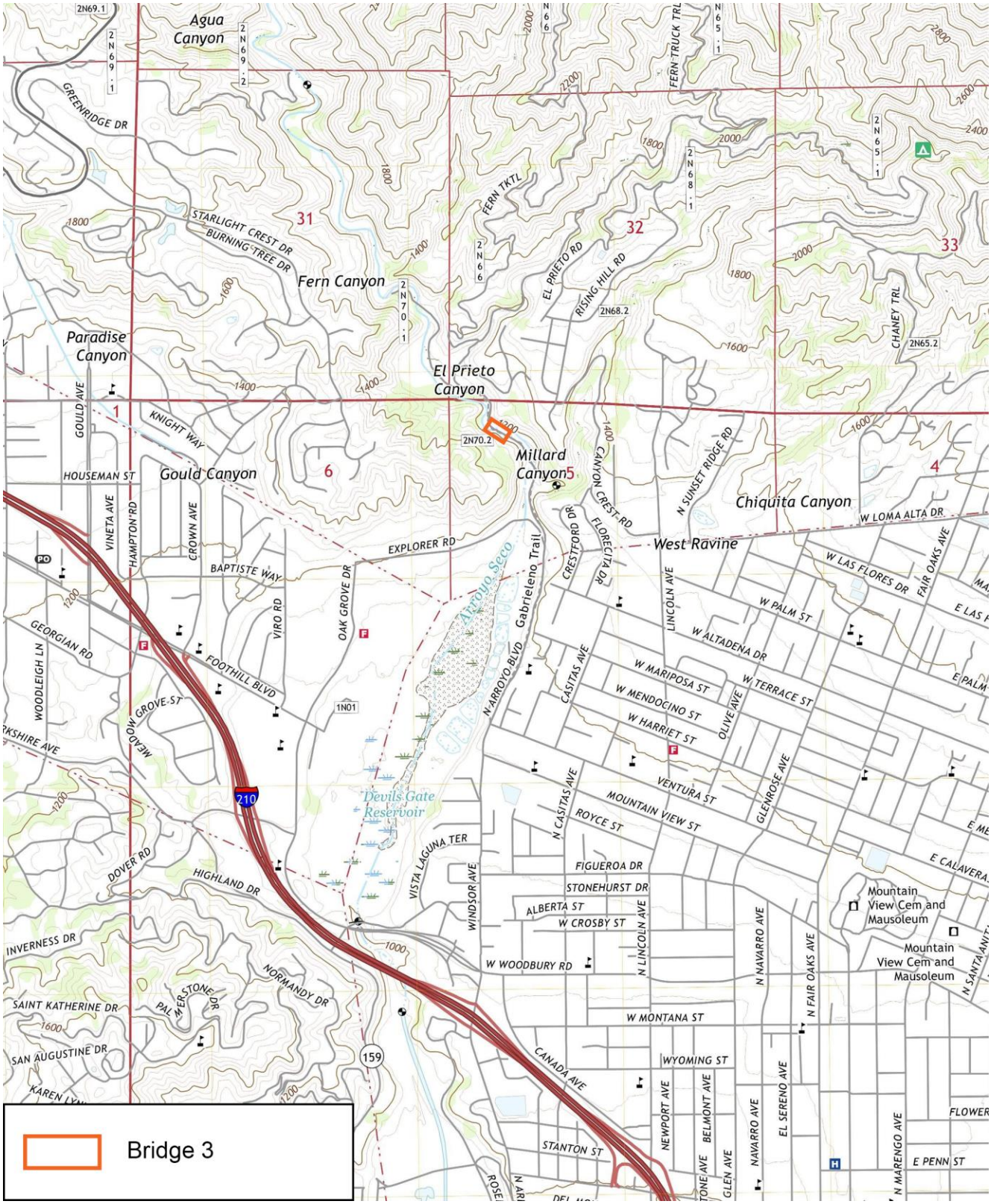
***Attachments:** □NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
□Archaeological Record □District Record □Linear Feature Record □Milling Station Record □Rock Art Record
□Artifact Record □Photograph Record □ Other (List):

State of California ◆ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 9 ***Resource Name or #** (Assigned by recorder) Bridge 3
***Map Name:** Pasadena USGS 7.5′ Quadrangle ***Scale:** 1:24,000 ***Date of map:** 2018



BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Bridge 3 ***NRHP Status Code** 3S, 3CS
Page 3 **of** 9

B1. Historic Name: unknown
B2. Common Name: Bridge No. 3
B3. Original Use: bridge B4. Present Use: bridge
***B5. Architectural Style:** N/A
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Built 1939. Repaired c.1970. Temporary bridge over existing bridge deck constructed 2017.

***B7. Moved?** ■No □Yes □Unknown **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: unknown b. Builder: unknown
***B10. Significance: Theme** water control infrastructure, bridge **Area** Pasadena, CA
Period of Significance 1939 **Property Type** bridge **Applicable Criteria** NRHP: A, C. CRHR: 1, 3. City of Pasadena: 2a, 2c.
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Arroyo Seco Canyon Developments (1887-present)

The Project site is located within the Hahamongna Watershed Master Plan Area, within the larger Arroyo Seco which also includes the Central and Lower Arroyo Seco Master Plan Areas. Arroyo Seco Canyon is an important watershed which begins in the San Gabriel Mountains at Mount Wilson, continues west of the cities of Pasadena and Altadena, and extends south to join the Los Angeles River. The canyon was used as a prehistoric through-route for the Hahamongnas (a band of native Tongva people), connecting the area that is now Hahamongna Watershed Park to trade partners to the north. The canyon continued to be a source of water, recreation, and travel route well into the nineteenth century. As early as 1887, the City of Pasadena and citizens were recognizing the Arroyo Seco as a whole for its benefits as a park. Locals swam at the pools at Devil's Gate, hiked to the waterfall at Millard Canyon, and took pack animal trips to Mount Wilson. At the turn of the twentieth century, Arroyo Seco enjoyed a long period of recreational development, such as at Camp Oakwilde, a rustic resort constructed in 1911, and several private and public cabins throughout the canyon. (*see continuation sheet*)

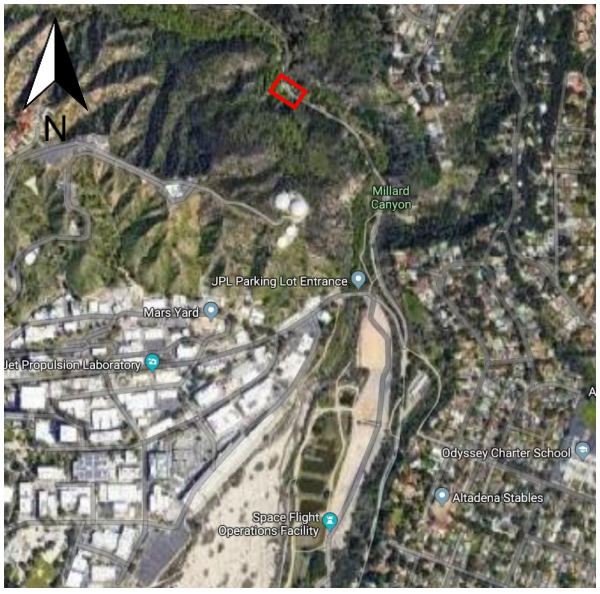
B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**

(*see continuation sheet*)

B13. Remarks:

***B14. Evaluator:** Kara R. Dotter, MSHP
***Date of Evaluation:** December 27, 2019

(This space reserved for official comments.)



***P3a. Description: (continued)**

The temporary bridge was initially installed to accommodate the loading from heavy equipment needed during construction of the Arroyo Seco Canyon Project that would be beyond the capacity of the original Bridge 3. However, as the condition of the original bridge has continued to deteriorate and is no longer safe for use, the temporary structure allows for continued passage into the canyon and access to the USFS compound by isolating traffic weight and movement from affecting the older wood bridge. The temporary bridge deck is built with anti-skid steel decking supported by steel I-beam girders, and is bolted through wood sill plates into the top of the original bridge's concrete retaining walls. Sloped, poured-in-place concrete ramps provide access to the temporary bridge deck at either end. Tubular metal railings line each side of the temporary bridge deck and concrete access ramps.



Figure 1. Bridge No. 3 with temporary bridge in place, view looking north-northwest (IMG_2749)

***B10. Significance: (continued)**

In 1911, the City of Pasadena annexed the lower and middle sections of the Arroyo Seco, and in 1919, the area now known as Hahamongna Watershed Park was annexed to the city (City of Pasadena 2019b).

With the recreation movement taking hold in the Arroyo Seco, and the Arts and Crafts Movement (1895-1920) influencing building and landscape architecture at large in southern California, the area within and around the Arroyo Seco developed several unifying features that were consistently used throughout the Arroyo Seco canyon area, including parks, trails, landscaping features, neighborhoods, and civic structures. These included the emphasis on the natural environment and use of native cobblestone in walls, gates, and fences, especially as accents to pedestrian walkways and roads that might otherwise have a utilitarian appearance. Native rock cobblestone walls also complemented the larger Arts and Crafts-style residential architecture of Pasadena. Even after the Arts and Crafts

Movement waned in popularity, the use of native cobblestone persisted as a unifying landscape feature in the Arroyo Seco (Bricker et al. 1992; Pasadena 2003a).

A road through Arroyo Seco Canyon has been visible on maps since the 1894 "Los Angeles, Calif." topographical map of the area. This earliest topographical map of the area shows the road extending between the Los Angeles Terminal Railroad Line and a mountain hamlet called Las Casitas before looping back west and south to La Cañada, following an older trail forged by the native Gabrielinos. The road was subjected to several floods over the years, damaging the road bed, bridges, dams and other infrastructure placed along it. Arroyo Seco Canyon Road, also known as Arroyo Boulevard, was paved for use as a county highway c. 1920, during which time Bridge No. 2 was constructed as a necessary improvement along the Arroyo Boulevard/Gabrielino Trail. Bridge No. 2 appears on the very first available aerial map from 1927, as well as other smaller bridges along the road and at the mouth of the canyon. A secondary spur road, leading east from the Bridge No. 1 crossing location, is also present on aerial photos as early as 1927. At the end of this spur road was a square-plan, river cobble-clad building on a concrete platform and a small, concrete diversion dam. Both of these structures are located outside of the Project site (LAT 1919; USGS 2019).

Arroyo Seco Road appears improved by bridges in the earliest available aerial photograph from 1927; however, subsequent floods in 1934 and 1938 appear to obliterate the road and bridges in the canyon, with the exception of Bridge No. 2. The road between Devil's Gate Dam and Oak Wilde, a forest community some 4 miles up Arroyo Seco Road, remained closed until 1939, the same year local Civilian Conservation Corps (CCC) Company 903 constructed Bridge No. 3. Despite the CCC improvements, the City of Pasadena road section outside of U. S. Forest Service lands was not officially repaired until 1941 (LAT 1938, 1940a, 1940b; Pasadena Star News 1939).

Local CCC Company 903 was assigned to the U.S. Forest Service in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great Depression. By June 1, 1933, over 1,400 working camps were established, employing more than 300,000 men, representing the most rapid peace-time mobilization in U.S history. Working on projects for the U.S. Forest Service, the National Park Service, and the Departments of Agriculture and Interior, CCC workers fought forest fires, planted trees, cleaned and maintained access roads, re-seeded grazing lands, implemented soil erosion controls, and built wildlife refuges, fish-rearing facilities, animal shelters, and water storage basins. Roosevelt also authorized the CCC to build bridges and campground facilities in an effort to encourage people to go enjoy America's natural resources. Although focused on providing employment for young unskilled men between 18 and 25 years of age, the CCC also employed WW1 army veterans, skilled foresters and craftsmen, and approximately 88,000 Native Americans from Indian reservations. The CCC reached its largest employment in August 1935, with more than 500,000 men working in 2,900 camps. Estimates indicate that approximately five percent of the US male population, about three million men, participated in the CCC.

The CCC planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems (History.com 2010). In 1941, the Arroyo Seco Project, part of a Los Angeles River watershed upstream work project, began with the Millard Canyon channel and road improvement project. A joint effort between Forest Service and the City of Pasadena engineers, the improvements in Millard Canyon entailed channel improvements and creating a new road cut above the channel bed with a "seven foot wall of native rock" (Pasadena Post 1941:17). The stretch of road to be improved by the retaining walls and barriers was described as above Devil's Gate Dam, and below the Brown Mountain

truck trail turn off. The road improvements were in support of the larger goal of the watershed upstream work project: to build the Brown Mountain Dam near Arroyo Seco headwaters as a means of flood control. When the upstream project was completed, the City entered into a contract with the Forest Service to share costs of maintenance and patrols for the sections of Arroyo Seco and Millard Canyon that were in City of Pasadena Land, but adjacent to Forest Service land. Improvements are also visible in aerial photographs between 1938 and 1944, such as the construction of Bridge No. 1, road pavement, and the construction of native rock retaining walls and barriers (Pasadena Post, 1941a, 1941b; Pasadena Star News 1941, 1944; UCSB 2019).

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research indicates that Bridge No. 3 was constructed in 1939 by the CCC, after the 1938 flood destroyed the original bridge. Local CCC Company 903 was assigned to the USFS in 1933 to work on projects within Arroyo Seco Canyon and San Gabriel Mountains. One of Roosevelt's more successful New Deal programs, the CCC was a work relief program focused on environmental projects, providing employment to young men during the Great Depression. They planted more than three billion trees and constructed facilities in more than 800 parks nationwide during the nine years which the group was in existence, helping shape our modern national and state park systems. As such, Bridge No. 3 was constructed by a group associated with events that made a significant contribution to the broad patterns of our history. **Therefore, Bridge No. 3 appears eligible under Criterion A of the NRHP and Criterion 1 of the CRHR.**

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked at this property are known to be historically significant figures at the national, state, or local level. As such, this property is not known to have any historical associations with people important to the nation's or state's past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. This property does not appear to be associated with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Bridge No. 3 is a wooden kingpost truss bridge, with heavy timber supports braced by a vertical metal rod and angled wood beam braced on a cantilevered timber girder. Timber railings line both side of the bridge deck, and board-formed concrete retaining walls support either end of the bridge. The kingpost design harkens back to timber-framed roof construction in Roman buildings, and was common in medieval architecture. The kingpost made its way into timber bridge design via Palladio, the first known personage to promote timber trusses for bridge design, and is the oldest timber truss design used for bridges.

The kingpost truss is comprised of a stringer, a kingpost (vertical beam), and two diagonal beams designed primarily for short spans of approximately 20 to 30 feet. As such, the bridge embodies the distinctive characteristics of a type and method of construction. **Therefore, Bridge No. 3 appears eligible under Criterion C of the NRHP and Criterion 3 of the CRHR.**

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the subject property **appears eligible as a landmark under local designation criteria 2a and 2c.**

Integrity Discussion

Bridge No. 3 maintains integrity of location, as it remains in its original location. The bridge retains integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, plan, space, structure, and style. The bridge retains integrity of setting, as it still rests within a natural environment along the Arroyo Seco. The bridge retains integrity of materials and workmanship due to the retention of the physical elements that date from its construction. Finally, the bridge retains the feeling of an early 20th century timber bridge constructed by the CCC and it maintains its essential character-defining features to convey its association with the CCC building campaign in the 1930s. In summary, Bridge No. 3 retains the requisite integrity for designation, and appears eligible for listing under NRHP Criteria A and C, CRHR Criteria 1 and 3, and City of Pasadena Landmark criteria 2a and 2c.

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State of California ♿ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 6Z

Other Listings
Review Code Reviewer Date

Page 1 **of** 11 ***Resource Name or #:** (Assigned by recorder) Arroyo Seco Flood Control Infrastructure
P1. Other Identifier:

***P2. Location:** ☐ **Not for Publication** ■ **Unrestricted**

***a. County** Los Angeles **and** (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Pasadena **Date** 2018 **T** 1N; **R** 12W; ___ ☐ **of** ___ ☐ **of Sec** 5 ; San Bernardino **B.M.**

c. Address Arroyo Seco Canyon, west of Explorer Road City Pasadena Zip 91011

d. UTM: (Give more than one for large and/or linear resources) North: Zone 11S, 392458 mE/ 3784909 mN
South: Zone 11S, 392030 mE/ 3783946 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)
Decimal Degrees:
North end: 34.201240°, -118.166832°, South end: 34.195486°, -118.169630°

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
Flood control infrastructure at the upstream end of the spreading basins consists of two LACFCD-owned sheds to either side of a County-owned concrete storm drain box structure, called the Altadena Storm Drain, with pulley operated components and a concrete and metal check dam. Each shed is a square plan gable fronted building, with horizontal wood board cladding, and rolled composition roofing, on a concrete slab foundation. (*see continuation sheet*)

***P3b. Resource Attributes:** (List attributes and codes) HP4 Ancillary building; HP11 Engineering structure; HP21 Dam, HP22 Lake/river/reservoir; HP31 Urban open space

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



***P4. Resources Present:** ■ Building ■ Structure ☐ Object ☐ Site ☐ District ☐ Element of District ☐ Other (Isolates, etc.)
P5b. Description of Photo: (view, date, accession #) overview looking north 10/22/219 (DSC02205)

***P6. Date Constructed/Age and Source:** ■ Historic ☐ Prehistoric ☐ Both
c. 1948 (aerials)

***P7. Owner and Address:**
City of Pasadena, Water and Power Department
150 S. Robles Avenue, #300
Pasadena, CA 91101

***P8. Recorded by:** (Name, affiliation, and address) Kate Kaiser and Kara R. Dotter. Dudek
38 N. Marengo Avenue
Pasadena, CA 91101

***P9. Date Recorded:** 12/27/2019
***P10. Survey Type:** (Describe)
pedestrian

***P11. Report Citation**: (Cite survey report and other sources, or enter "none.") Kaiser, K., K.R. Dotter, A. Dorrler, L. Kry, H. McDaniel McDevitt, and S. Murray. 2020. *Cultural Resources Technical Report for the Arroyo Seco Canyon Project, Areas 2 and 3, Pasadena, California*. Prepared for City of Pasadena Water and Power Department. Prepared by Dudek. June 2020.

***Attachments:** ☐NONE ■Location Map ■Continuation Sheet ■Building, Structure, and Object Record
☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record
☐Artifact Record ☐Photograph Record ☐ Other (List):

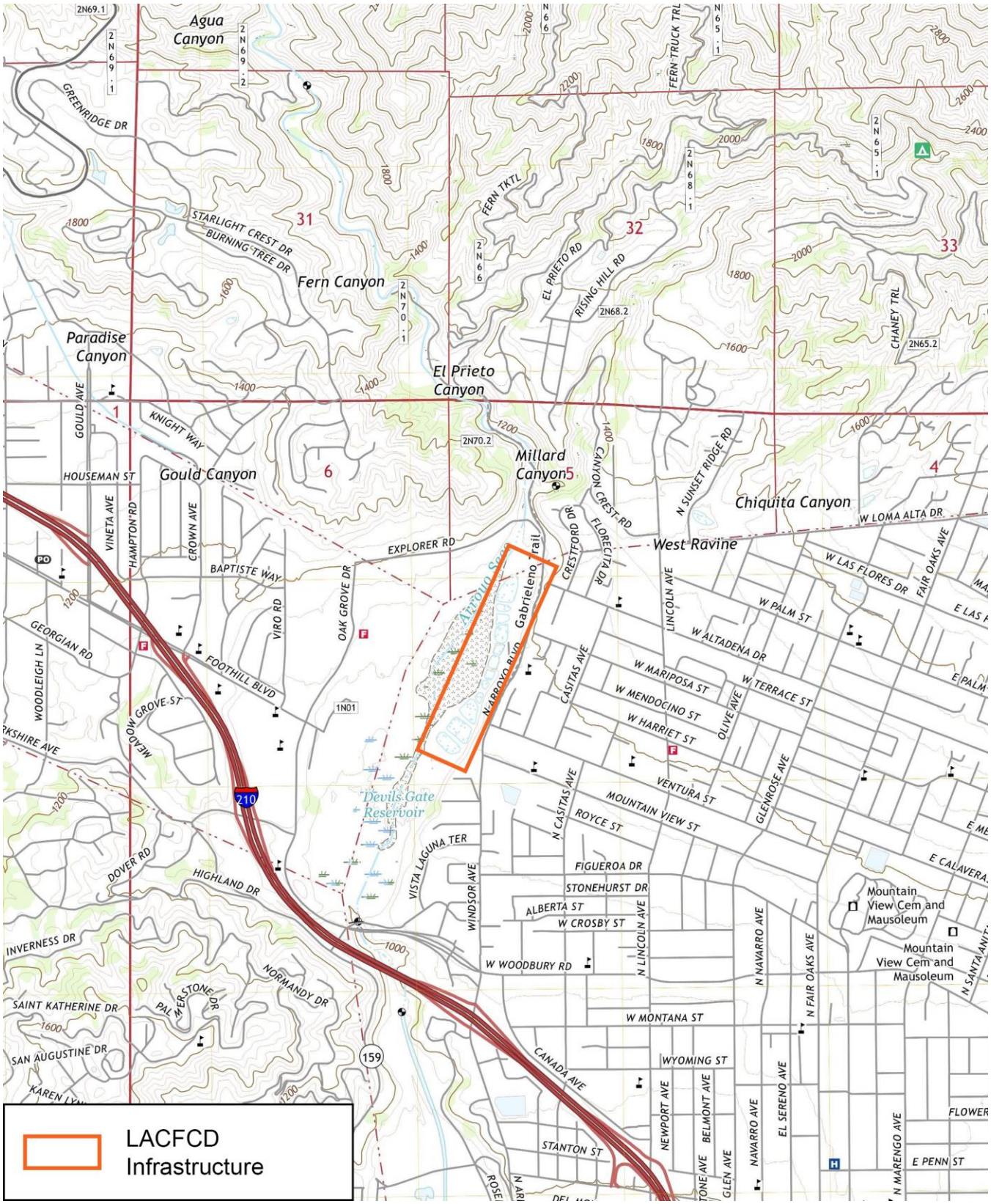
State of California ◆ Natural Resources Agency
DEPARTMENT OF PARKS AND RECREATION

LOCATION MAP

Primary #
HRI#
Trinomial

Page 2 **of** 11 ***Resource Name or #** (Assigned by recorder) Arroyo Seco Flood Control Infrastructure

***Map Name:** Pasadena USGS 7.5' Quadrangle ***Scale:** 1:24,000 ***Date of map:** 2018



State of California ♿ The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***Resource Name or #** (Assigned by recorder) Arroyo Seco Flood Control Infrastructure ***NRHP Status Code** 6Z
Page 3 **of** 11

B1. Historic Name:
B2. Common Name:
B3. Original Use: water control infrastructure B4. Present Use: water control infrastructure
***B5. Architectural Style:** utilitarian
***B6. Construction History:** (Construction date, alterations, and date of alterations)
Built c.1944-1952.

***B7. Moved?** ■**No** □**Yes** □**Unknown** **Date:** **Original Location:**
***B8. Related Features:**

B9a. Architect: unknown b. Builder: unknown
***B10. Significance: Theme** water control infrastructure **Area** Pasadena, CA

Period of Significance N/A **Property Type** N/A **Applicable Criteria** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Debris basins and flood control infrastructure (1948)

Flood control in Arroyo Seco began after the especially costly 1914 and 1916 floods damaged large portions of Los Angeles County farmland and urban areas. In 1915, the LACFCD was established in response to the in 1914 flood, and would protect an area of 2,760 square miles. Investment was initially delayed by the onset of World War I, but the first flood control feature built in the Arroyo Seco was the Devil's Gate Dam: designed in 1916, funded by bonds in 1917, and erected by Los Angeles County Department of Public Works by 1920 (Brick 2011; Pasadena Star News 1916; SB&C 1919; Van Wormer 1991) (*see continuation sheet*)

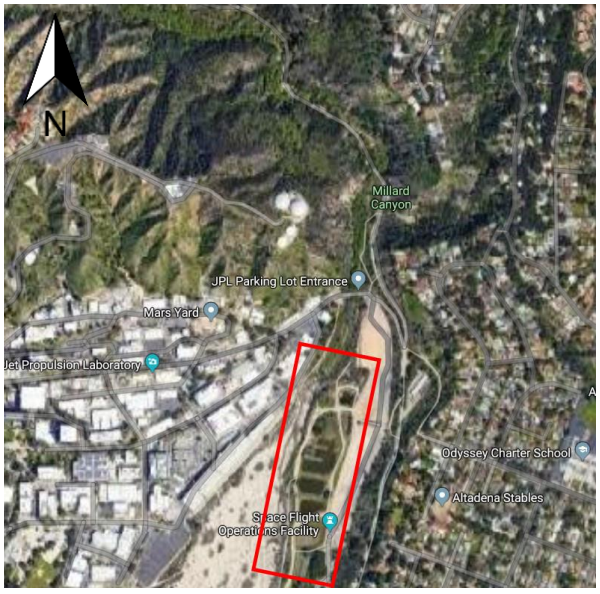
B11. Additional Resource Attributes: (List attributes and codes)
***B12. References:**

(*see continuation sheet*)

B13. Remarks:

***B14. Evaluator:** Kate Kaiser, MSHP
***Date of Evaluation:** December 27, 2019

(This space reserved for official comments.)



***P3a. Description: (continued)**
The doors are both located on the south elevations and consist of vertical wood board doors, braced on the interior. Other fenestration consists of screened window openings and a louvered vent in the gable end. The two sheds are to either side of the storm drain box structure with three openings on the top side, and letting out via culvert into the Arroyo Seco.



Figure 1. Altadena Storm Drain structure, pulley mechanism, and west-most shed, View looking west (IMG_2606)

The PWP spreading basins consist of, two spreading basins (Pasadena Ponds 1 and 2) formerly used as sludge ponds during operation of the Behner WTP, and 14 additional spreading basins (originally developed by LACFCD) separated by check dams completed between 1948 and 1952. Spreading basin features are engineered earthen ponds separated by soil embankments and small wood and concrete flow control dams. Each basin varies in total size and depth. The Pasadena Ponds 1 and 2 also have buried concrete culverts between them and the Parshall Flume, as well as chain link fence surrounding them.



Figure 2. Overview to spreading basins; View looking south (IMG_2631)



Figure 3. Overview to PWP sludge basins, now Pasadena Ponds 1 and 2; View looking southwest (IMG_2608)

A flow control dam is located west of the westernmost shed. Situated in a naturalized channel, west of the Altadena Storm Drain, the flow control dam consists of two walls of wood cribbing, and a wood board dam in the center, with removable boards in a metal track in order to control flow in the narrow channel. The downstream side of the channel has had a gunite mixture applied to the channel walls. On the east side of the dam, is a concrete platform, stair and metal handrail. On the west side of the dam, are two corrugated metal canisters, one lidded with flat metal and the other with conical metal.



Figure 4. Dam, View looking northwest (IMG_2600)

Finally, downstream of the flow control dam, there is a culvert and vehicle bridge through which water is measured (via a Parshall Flume) before it flows into the spreading basins. The culvert has two 18-inch openings in the channel basin. The roadbed is filled with gravel, but the culvert is constructed of board-formed concrete, with metal lining, and metal guard rails on top for safety. There is also a corrugated galvanized steel tank with a conical lid placed on a concrete platform on the upstream side of the culvert. The tank is currently used to house the controls for the Parshall Flume's metering device.



Figure 5. Culvert and Vehicle bridge, looking southwest (IMG_2612)

Identified Alterations

The following alterations were observed during the field visit:

- windows removed from shed (date unknown)
- LACFCD signs added to both shed exteriors (date unknown)
- metal railing replacing older wood handrail on flow control dam structure (date unknown)

***B10.Significance: (continued)**

The City of Pasadena, which had water rights to Arroyo Seco, began a spreading program in Arroyo Seco in 1914 to replenish the Raymond Basin aquifer; however, the program was abandoned in 1924 due to drought. The remnants of the 1914 spreading basins were washed out in 1936 when the Arroyo Seco stream changed its course to the east side of the Arroyo. Historic aerial photographs and maps indicate that the LACFCD-owned spreading grounds were installed in 1948, as a result of a 1940 push to build upstream flood control features in the Angeles National Forest. $1.17 million was used towards the establishment of silt and debris check dams on the upstream side of the Devil's Gate reservoir and the Brown Mountain Dam. The first funding installment was approved in 1941 and another in 1944, resulting from the 1944 storm and subsequent flood. Federal funds also went to the channelization of Arroyo Seco Canyon further downstream of Devil's Gate Dam By 1952, the Los Angeles County-owned Altadena Storm Drain and sheds were completed as well. The PWP-owned sludge basins were added in the 1970s, after the construction of the Behner Water Treatment Plant (Brown and Taylor 1982; City of Pasadena 2003b; ETA 1941; LAT 1940c, 1946; SCPR 2016; UCSB 2019; Van Wormer 1991).

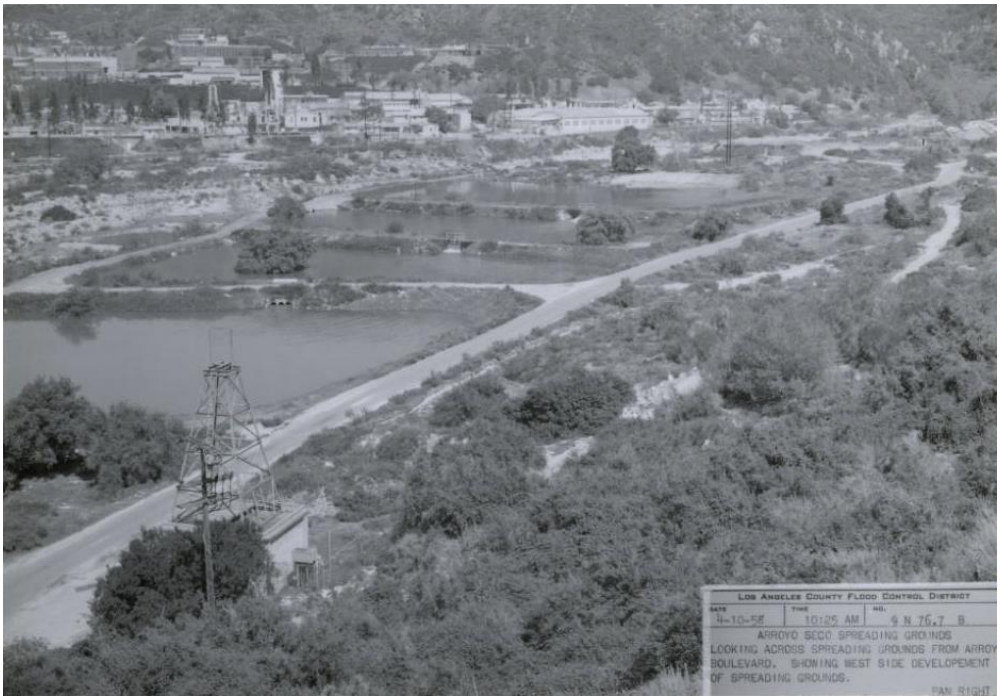


Figure 6. Arroyo Seco Spreading Basins, 1958 (Los Angeles County Flood Control District File Copy Prints Collection, Los Angeles County Library)

NRHP/CRHR Statement of Significance

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

Archival research did not find any associations with events that have made a significant contribution to the broad patterns of our history. The spreading basins were completed in 1948, and the Altadena Storm Drain, sheds, culverts, and check dams completed between 1948 and 1952. These date have no bearing on the industrial, commercial, and institutional growth of Pasadena nor is it directly related to a historical natural disaster such as a specific flood. The flood control infrastructure appears to have no direct association with events that have made a significant contribution to the history of the City of Pasadena, or Los Angeles County, the State of California, or the Nation. Therefore, the property does not appear eligible under Criterion A of the NRHP or Criterion 1 of the CRHR.

Criterion B/2: That are associated with the lives of persons significant in our past.

Archival research did not indicate that any previous property owners or people who have worked on these structures are known to be historically significant figures at the national, state, or local level. The structures have been owned by PWP or LACFCD since construction, and as such is not associated with the life of a specific person significant to the past. Furthermore, to be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. The structures do not appear to be associated

with any individual's important historic work and does not appear eligible for the NRHP under Criterion B or CRHR under Criterion 2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The flood control structures, including spreading basins completed in 1948, and the Altadena Storm Drain, sheds, culverts and checkdams completed between 1948 and 1952, are utilitarian in construction and lack association to a specific architectural style or method of construction. They have no specific character-defining features, do not represent the work of a master engineer, do not possess high artistic value and are not significant as contributing features of an entity whose components may lack individual distinction. Therefore the structures do not appear eligible for listing in the NRHP under Criterion C or CRHR under Criterion 3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The property is not significant under Criterion D of the NRHP or Criterion 4 of the CRHR as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies.

Pasadena Statement of Significance

The City of Pasadena's landmark designation criteria is based on the NRHP/CRHR designation criteria and integrity requirements, Therefore, for all of the reasons identified in the discussion of NRHP and CRHR eligibility, the flood control structures do not appear eligible under any local designation criteria, either individually or as part of a district.

Integrity Discussion

The spreading basins, Altadena Storm Drain, checkdams, culverts, and sheds, as a collective engineered structure retain integrity of location and have not been moved since their construction in 1948. They maintain integrity of design as it has not undergone any large-scale exterior alterations since its construction and maintains the essential features of form, structure, and function. The structures retain integrity of setting, as they remain in the Arroyo Seco floodplain north of the Devil's Gate Dam, structures retain between a steep hillside and the campus of JPL. The structures retain integrity of materials and workmanship due to the retention of the physical elements that date from its construction. The structures retain integrity of feeling and association, as they can still express their purpose as water and flood related infrastructure. In summary, while the structures retain the requisite integrity, it does not rise to the level of significance required for designation at the national, state or local levels.

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Appendix E-2

Vertebrate Paleontology Records Check, prepared by the Natural History Museum of Los Angeles County, October 2020

Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3325

e-mail: smcleod@nhm.org

1 October 2019

Dudek
605 Third Street
Encinitas, CA 92024

Attn: Michael J. Williams, Ph.D., Senior Paleontologist

re: Vertebrate Paleontology Records Check for paleontological resources for the proposed Arroyo Seco Project, Dudek Project # 11884, in the City of Pasadena, Los Angeles County, project area

Dear Michael:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Arroyo Seco Project, Dudek Project # 11884, in the City of Pasadena, Los Angeles County, project area as outlined on the portion of the Pasadena USGS topographic quadrangle map that you sent to me via e-mail on 17 September 2019. We do not have any vertebrate fossil localities that lie directly within the proposed project area boundaries, but we do have localities nearby from the sedimentary deposits that occur in the proposed project area, either at the surface or at depth.

In the elevated terrain of the San Gabriel Mountains around the northern parcel of the proposed project area the bedrock is composed of plutonic igneous rocks that will not contain recognizable fossils. Most of the proposed project area, though, has surficial deposits that consist predominantly of younger Quaternary gravels in the Arroyo Seco Canyon drainage, but with older Quaternary Alluvium, derived as alluvial fan deposits from the San Gabriel Mountains to the northeast, on the northeastern side of the southern parcel of the proposed project area. These sedimentary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but underlying older and perhaps finer-grained Quaternary deposits may well contain significant vertebrate fossils.

Our closest vertebrate fossil locality in older Quaternary deposits is LACM 2027, southeast of the proposed project area, south of Washington Boulevard and west of Allen Avenue near the western end of Brigden Road, that produced a fossil specimen of mastodon, *Mammut*, at unstated depth. Further to the southwest of the proposed project area, in Eagle Rock east of the Pasadena Freeway (I-110) and Eagle Rock Boulevard just south of York Boulevard, our older Quaternary locality LACM (CIT) 342 produced fossil specimens of turkey, *Parapavo californicus*, and mammoth, *Mammuthus*, at a depth of 14 feet below the surface. The fossil turkey specimen from locality LACM (CIT) 342 was published in the scientific literature by L.H. Miller in 1942 (A New Fossil Bird Locality. Condor, 44(6):283-284) and the mammoth specimen was a rare, nearly complete skeleton and was published in the scientific literature by V.L. Roth in 1984 (How Elephants Grow: Heterochrony and the Calibration of Developmental Stages in Some Living and Fossil Species. Journal of Vertebrate Paleontology, 4(1):126-145).

Excavations in the igneous bedrock exposed in the elevated terrain in the northern part of the proposed project area will not encounter recognizable fossils. Shallow excavations in the younger Quaternary gravels exposed in the Arroyo Seco drainage, as well as the older Quaternary Alluvium on the eastern portion of the souther parcel of the proposed project area, are unlikely to uncover significant vertebrate fossils. Deeper excavations that extend down into older and perhaps finer-grained Quaternary deposits, however, may well uncover significant fossil vertebrate specimens. Any substantial excavations in the proposed project area, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Also, sediment samples should be collected and processed to determine the small fossil potential in the proposed project area. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,



Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice

Appendix F

Hydraulics, Sediment Transport, and Groundwater Analysis, Arroyo Seco Canyon Project Diversion, August 2018

Hydraulics, Sediment Transport, and Groundwater Analysis

Arroyo Seco Canyon Project Diversion

Prepared for

Pasadena Water & Power
150 S. Los Robles, Suite 200
Pasadena, California 91101

Prepared by

Psomas
225 South Lake Avenue, Suite 1000
Pasadena, California 91101
T: (626) 351-2000

August 2018

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ATTACHMENTS

Attachment

A Topography
B HEC-RAS Models
C SAM Models
D Preliminary Geologic Map of the Los Angeles Quad

LIST OF ACRONYMS

Acronym	Acronym and Abbreviation Definition
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
HEC-RAS	Hydraulic Engineering Center River Analysis System
h	depth
Q	volumetric discharge
JPL	Jet Propulsion Laboratory
USACE	U.S. Army Corps of Engineers

1.0 INTRODUCTION

Pasadena Water and Power (PWP) operates a diversion structure located approximately 0.25-mile north of Millard Creek on the Arroyo Seco. PWP has surface water rights of 25 cfs and and diverts streamflows into an intake structure. Upon entering the intake, the water is piped downstream approximately 3,000 feet to the PWP's spreading basins for groundwater recharge. The diversion structure and intake structure were damaged due to the debris flows following the 2009 Station Fire. Since then, the structures have operated at a reduced capacity.

The proposed Arroyo Seco Canyon Project (ASCP) would repair, replace and/or rehabilitate the diversion and intake structures in the Arroyo Seco in order to maximize the capture of PWP's surface water rights. The improvements, including a new sedimentation basin in the vicinity of the spreading basins, would facilitate management of sediment for diversion and spreading operations that were in the past managed with a headworks structure and settling basins further upstream. The ASCP also includes the expansion of PWP's spreading basins. The facilities and improvements that would be constructed as part of the Arroyo Seco Canyon Project would be located at three areas along the Arroyo Seco: Area 1 – Arroyo Seco Headworks; Area 2 – Arroyo Seco Intake; and Area 3 – Former JPL East Parking Lot/Spreading Basins (refer to Exhibit 2). This Hydraulics, Sediment Transport, and Groundwater Analysis (Report) analyzes one component of the larger Arroyo Seco Canyon Project: water diversions from the Arroyo Seco Intake structure in Area 2 (proposed Project).

Changes to riparian habitats in the Project area can result from several potential sources, including changes in discharge patterns into the Devil's Gate Reservoir associated with water use practices (i.e. urban runoff) and diversions; infiltration of water in the existing spreading basins; alterations in sediment deposition and ponding patterns associated with the operation of Devil's Gate Dam; variation in sediment yield associated with fires in the upper watershed, such as the 2009 Station Fire; and long-term climate changes (including changes in drought cycles).

The purpose of this analysis is to evaluate the relative impact of the City's proposed management of diversions from the Arroyo Seco on riparian resources located downstream of the diversion structure. The goal of this Report is to identify the changes specifically concerning sediment transport, hydraulics, and groundwater that may affect down-stream riparian habitats. The results shall provide the baseline for further ecological modeling to assess biological impacts of the project on riparian resources.

2.0 PROJECT SETTING

2.1 PROJECT LOCATION

The Project site is located within the Arroyo Seco Watershed, which is a subwatershed of the larger Los Angeles River Watershed. The Arroyo Seco is a perennial creek, which means there is generally flowing water year-round, but the flow is below the surface (underground) in some locations. Creek flows that originate in the San Gabriel Mountains continue to flow south through the cities of Pasadena, South Pasadena and Los Angeles, before joining the Los Angeles River just east of Elysian Park and west of the Interstate (I) 5/I-110 Interchange. Within the City of Pasadena, the Arroyo Seco passes through three distinct recreational areas: (1) Upper Arroyo Seco, containing Hahamongna Watershed Park and Devil's Gate Dam; (2) Central Arroyo Seco, containing the Brookside Golf Course and Rose Bowl; and (3) Lower Arroyo Seco, containing an archery range, casting pond, and Memorial Grove. The proposed Project involves the construction of a new diversion structure in the Upper Arroyo Seco (in the City of Pasadena on land owned by the City). Exhibit 1, Regional Location and Local Vicinity, shows the location of the Arroyo Seco in the City of Pasadena, as well as the boundaries of the Project Study Area.

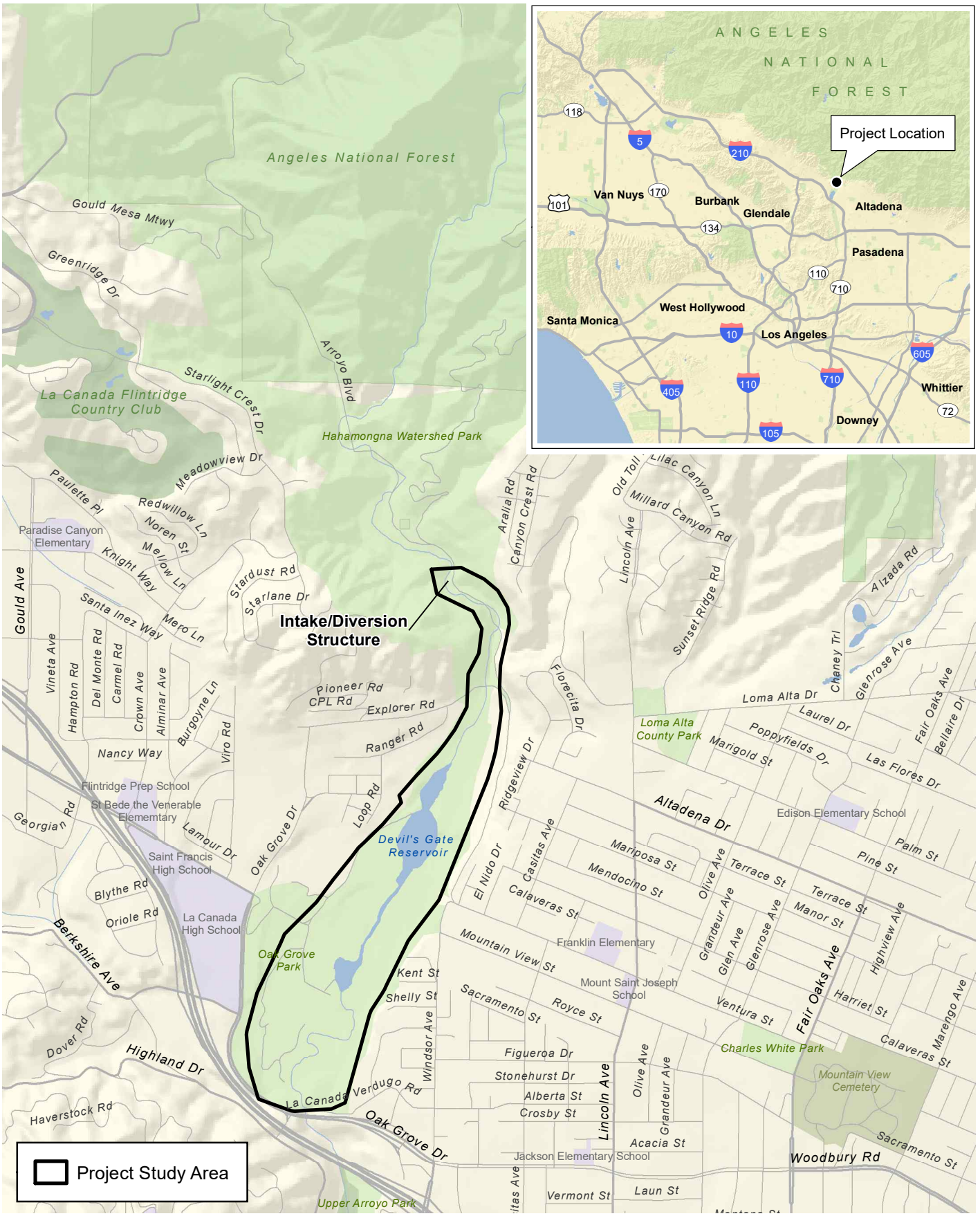
The locations of the Areas 1, 2, and 3, as identified in the larger Arroyo Seco Canyon Project, are shown in Exhibit 2, Location of Areas 1, 2, and 3. These areas are connected by the Gabrielino Trail, which serves as a recreational trail and the access road for City of Pasadena and United States Forest Service (USFS) vehicles heading into the Arroyo Seco Canyon. This Hydraulics, Sediment Transport, and Groundwater Analysis (Report) analyzes one component of the larger Arroyo Seco Canyon Project: water diversions from the Arroyo Seco Intake structure in Area 2 to the spreading grounds in Area 3.

The Project site can be accessed via I-210 by exiting Windsor Avenue and traveling northward for approximately 0.8 mile to its intersection with Ventura Street. From this intersection, the former JPL East Parking Lot is located approximately 0.27 mile north along Explorer Road, which can be accessed by walking, bicycling, driving, or by horse.

2.2 EXISTING CONDITIONS

The Arroyo Seco is an important source of water supply for the City of Pasadena. The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco into the City's spreading basins located along the east side of the Devil's Gate Reservoir, upstream of Devil's Gate Dam.. PWP uses the surface water to recharge the underlying Monk Hill Subbasin (a sub-aquifer of the Raymond Basin) for groundwater well extraction.

PWP currently operates several structures in the Arroyo Seco Canyon that capture and convey stream water to a series of groundwater recharge (spreading) basins that are located adjacent to the National Aeronautics and Space Administration's (NASA's) Jet Propulsion Laboratory (JPL) campus. These facilities include the Arroyo Seco Headworks structure and adjacent sedimentation basins, the Arroyo Seco Intake Dam, and the associated pipelines that convey water to the existing spreading basins. A large number of these facilities were entirely or severely damaged due to debris flows in 2010 and 2011, subsequent to the 2009 Station Fire.



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Regional Location and Local Vicinity

Exhibit 1

Arroyo Seco Diversion Hydraulics Analysis

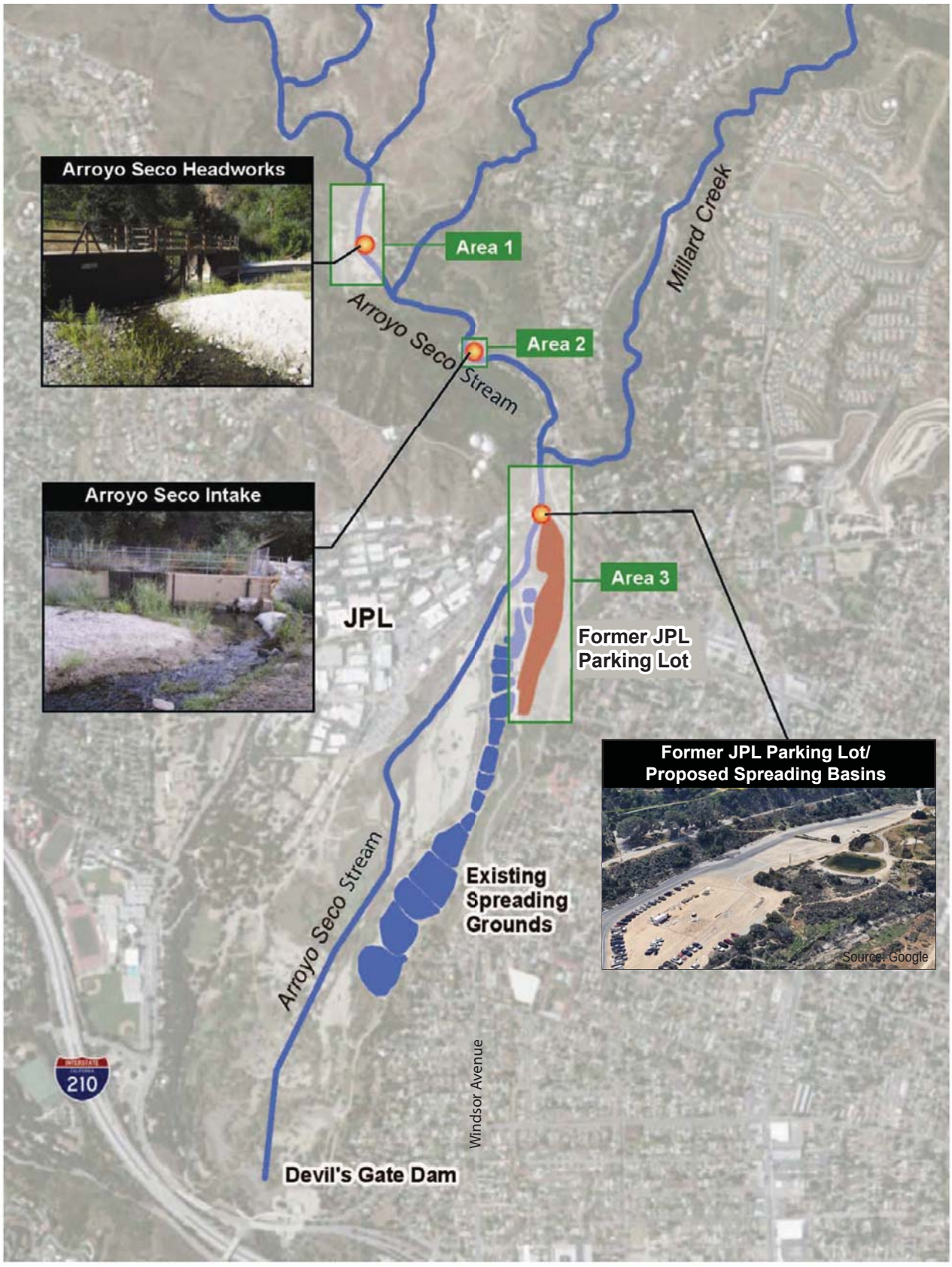
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Source: Carollo 2013, Psomas 2018

Project Location Areas 1, 2, and 3

Exhibit 2

Arroyo Seco Diversion Hydraulics Analysis

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Map not to scale

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3.0 PROJECT DESCRIPTION

3.1 PROJECT PURPOSE AND NEED

PWP proposes the ASCP to repair and replace damaged facilities in Arroyo Seco Canyon. The improvements will allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this historically important local water resource. Specifically, modifications to the facilities in Area 2 will allow for increased diversion by capturing stream flows during storm events that in the past have been bypassed. PWP typically does not divert the stream water for recharge during large storm events (i.e. flows greater than approximately 100 cfs) due to the high total suspended solids (TSS) in the water. If water with high TSS levels is used for recharge, the ground surface in the spreading basins can be "blinded" or plugged by fine material, such as clays and silts, which would then reduce percolation and groundwater recharge rates. This reduced efficacy of the spreading basins is counterproductive in terms of groundwater recharge, and requires more maintenance to remove the top layer of fine materials at the spreading basins in order to recover the original recharge rates. Letting water with high TSS levels bypass without recharge is not preferred from a water supply perspective, but helps reduce maintenance issues associated with excessive cleanup of the basins. For the purposes of the present analysis, a maximum discharge in the Arroyo Seco must be defined to represent the upper limit at which water can be withdrawn. This flow rate is assumed to be 100 cfs.

3.2 PROJECT COMPONENTS

The proposed new diversion structure would capture all flows during small storm events and dry weather flows in the Arroyo Seco, and up to PWP's surface water rights during large storm events. During larger storms when the water is too turbid, the stream (with its associated sediment load) would bypass the structure and continue downstream in the creekbed. Operation during high flows would be facilitated by the adjustable height weir or crest gate. At low flows, the gate would start in the 'up' position and as flows increase, the gate would be lowered to maintain a constant water surface level in the diversion pool. When the gate is fully lowered, flows will be bypassed and carry sediment downstream.

City personnel would continue to provide maintenance of the diversion and intake structures as occurs under existing conditions.

4.0 PREVIOUS STUDIES

Two studies were reviewed to enhance the background understanding of the Project area hydraulics. A summary of each relative to the analysis in this Report is provided below.

PHILLIP WILLIAMS & ASSOCIATES (2000) – The purpose of the Phillip Williams & Associates (PWA) study was to provide supplemental analysis of hydrology and geomorphology to the development of a master plan for the Hahamongna Watershed Park. The study specifically examined hydrology, geomorphology, flood hazards, water resources history, sediment transport and maintenance, and groundwater recharge. Pertinent to the proposed Project are the hydrology, flood hazards and sediment transport analyses.

The hydrology element of the study examined precipitation gages near the Project site, including USGS stream gage #11098000. A flood frequency analysis of the gage data was conducted. Additional analysis of a Los Angeles County Department of Public Works stream gage (F277-R) was also completed. A review of the stream gage data showed that several major floods have occurred during the period of record for the stream gage and as recently as 1983. (It should be noted that the 1998 peak discharge was greater than the 1983 peak discharge, however, a vetted data set may not have been available at the time.) Interestingly, none of the major floods were preceded by a wildfire within three years. The PWA study also followed Waanan & Crippen (1977) in developing a relationship between the discharge at the gage and the discharge below the gage based on tributary area. The base relationship takes the form:

$$Q_d = Q_{gage}\left(A_d/A_{gage}\right)^n$$

where Q_d and Q_{gage} are the discharge rates at a location downstream of the gage and at the gage, respectively, A_d and A_{gage} are the watershed areas at a location downstream of the gage and at the gage, respectively, and n is an exponent based on the return frequency of the discharge being scaled. It is important to note that PWA assumed that all discharges are bulked, which appears to be reasonable for the study area and the USGS gage data.

Hydraulic numerical modeling was completed for the study using the MIKE11 model for a combination of the 2- 10- and 50-year annual return frequency events. The model was limited to the stretch of Arroyo Seco between the Jet Propulsion Laboratory (JPL) Bridge and the Devil's Gate Dam. MIKE modeling focused on flood management.

The sediment transport analysis included geomorphology and hydraulics. The geomorphic analysis noted the importance of floods, fires and debris flows within the watershed, and noted that these types of events play an important role in the frequency and magnitude of watershed and stream sediment yield in the study area. The study examines the many published rates of watershed debris yield and notes the alluvial fan-like environment of the lower portion of the study area. PWA also presents the record of sediment management within the Devil's Gate Reservoir.

Historical aerial photograph analysis was performed to determine the historical extent of the active bed and erosional patterns. The analysis found that the limits of erosion are topographically controlled and that the upper portion of the reservoir has typically been braided where the lower portion exhibits ponding.

A two-dimensional FLO-2D numerical model was run for the 2-, 10-, and 50-year hydrographs. The purpose of the model was to determine the debris flow in the reservoir. The model extents were the same as the MIKE model. Historical sectional and longitudinal analysis was also completed within the reservoir. Additional empirical analysis was completed to estimate sediment yield for discrete events. The study found what is commonly accepted as the basis for sediment

yield in southern California watersheds: yield scales with volume of precipitation. Therefore, the smallest, most frequent runoff events or the driest years will transport little or no sediment to the reservoir, while high volume, infrequent events or wet years may potentially transport relatively large volumes of sediment within the study area. The MIKE model was also updated to analyze sediment transport within the study area using sediment data collected within the reservoir. The model was calibrated against historical section data. The model results appear to over-predict bed change during the 2-year event with up to 9.5 feet of aggradation in the model bed at the most upstream cross section. The authors attribute this to the rapid expansion of channel width immediately downstream of the entrance to the reservoir.

JET PROPULSION LABORATORY (2003) – The Jet Propulsion Laboratory (JPL) study describes the development and calibration of the JPL groundwater model as part of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site. Of interest to the present work, the JPL study found no constant loss from Arroyo Seco to Raymond Basin, the underlying groundwater basin, nor any regular and consistent contribution from Raymond Basin to the Arroyo Seco. This indicates that water from the aquafer is not at a depth shallow enough to provide water to sustain vegetation.

5.0 HYDRAULIC MODEL

5.1 MODEL DESCRIPTION

Hydraulic modeling was completed using the U.S. Army Corps of Engineers' (USACE) Hydraulic Engineering Center River Analysis System (HEC-RAS). The HEC-RAS numerical model was designed to calculate water surface profiles in channels assuming a steady flow and uniform discharge based on site hydrology. The HEC-RAS model was run in two-dimensional mode. A description of the model and the model set-up follows.

5.1.1 Equations of Motion

Multi-Dimensional shallow water models can be used to resolve depth and depth-averaged velocities in the horizontal directions x and y. The shallow water equations appear in integral form as (Chaudhry 1993):

$$\frac{\partial}{\partial t}\int_{\Omega} \mathrm{U}d\Omega + \oint_{\partial\Omega} (Fdy - Gdx) = \int_{\Omega} Sd\Omega$$

The dependent variables, U, fluxes F and G, and the source terms are defined as,

$$U = \begin{pmatrix} h \\ uh \\ vh \end{pmatrix} F = \begin{pmatrix} uh \\ u^2h + \frac{gh^2}{2} \\ uvh \end{pmatrix} G = \begin{pmatrix} vh \\ uvh \\ v^2h + \frac{gh^2}{2} \end{pmatrix} S = \begin{pmatrix} 0 \\ gh(s_{ox} - s_{fx}) \\ gh(s_{oy} - s_{fy}) \end{pmatrix}$$

where u and v are the depth averaged flow velocities in the x (easterly) and y (northerly) directions, respectively. The terms in S account for the bed and friction slopes and are given as,

$$s_{ox} = -\frac{\partial z}{\partial x}\ s_{oy} = -\frac{\partial z}{\partial y}$$

and

$$s_{sf} = \frac{n^2 u\sqrt{u^2 + v^2}}{h^{3/4}}\ s_{fy} = \frac{n^2 v\sqrt{u^2 + v^2}}{h^{3/4}}$$

where z=z(x,y) is the bed elevation above an arbitrary datum. Finally, Ω represent the domain of two-dimensional control, and $\partial\Omega$ is its boundary.

5.2 TOPOGRAPHIC REPRESENTATION AND MODEL EXTENT

The HEC-RAS model domain for the study area (as identified on Exhibit 1) was developed in RAS Mapper, a subroutine of HEC-RAS, using topographic 2015 information (tested at an accuracy of 1.25' at 95% confidence level) provided by the City of Pasadena. The topographic data is found in Attachment A. A Manning's coefficient was applied to the study reach and hydrographs were developed for analysis, both described below. As shown in Exhibit 3, HEC-RAS Model Extent, the model extends from upstream of the proposed diversion point to Devil's Gate Dam to upstream of the diversion. The upstream extent was selected because it is the upstream limit of potential impacts to the stream since diversions will not impact hydraulics or hydrology upstream of this location. The downstream limit was chosen because it represents the downstream limits of impacts to the stream because of the presence of Devil's Gate Dam. Numerical hydraulic models are made up of individual computational cells (units of area analyzed) which can vary in size. This model includes approximately 22,250 computational cells with an 18-square foot cell size.

5.3 MANNING'S VALUES

HEC-RAS uses Manning's Equation to represent friction loss in the model, as described above. Manning's values were selected based on aerial (Google Earth) and site photography. The Manning's values range from 0.065 to 0.085. In the present analysis, Manning's value of 0.065 is representative of sandy bottom, wide, braided channel sections with vegetation, while a Manning's value of 0.085 is representative of relatively narrow, steep canyon sections with trees, brush and variable bed section. These values follow guidance for the selection of Manning's values as presented in Barnes (1967) and Chow (1959).

A sensitivity analysis was determined to be unnecessary. The majority of habitat of concern within the study area is generally within the reservoir and the velocities that will be experienced by this vegetation in the reservoir's pool area is at or near zero feet per second. Changing the Manning's value will not change the velocity experienced by the vegetation. Moreover, changing the velocity in the stream by modifying the Manning's values will not alter the velocities experienced by the vegetation in the reservoir. Finally, the largest discharges that occur in the study's numerical modeling are not altered by the proposed project so the roughness values that control the depth and velocities that vegetation experiences during these large events is the same in both the existing and proposed conditions. Alteration of roughness will not change the outcome during these events.

5.4 BOUNDARY CONDITIONS

The down-stream model boundary condition is set to normal depth, while the inflowing boundary condition is set to an inflowing hydrograph, described below. Model outflow is based on the operational curve of Devil's Gate Dam. Generally, there is no outflow from the model for water surface elevations below 1,025 feet. Between 1,025 feet and 1,030 feet the outflow from the Dam is 100 cfs; between 1,030 feet and 1,035 feet the outflow from the Dam is 300 cfs; above 1,035 feet the outflow is 800 cfs. The greatest observed elevation in the reservoir during the representative wet year without diversion is 1,035 feet.

5.5 HYDROLOGY

All hydraulic modeling is based on USGS daily gage data at stream gage #11098000. Daily average discharge data is utilized for the period 1989 to 2014, which is the vetted stream gage data available at the time of writing and is not strongly influenced by drought. Individual water year hydrographs representing dry, average and wet years are selected for modeling, as described below. The hydrologic record at the gage for the period is shown in Exhibit 4, USGS Stream Gage Data for the 1989/1990 to 2013/2014 Water Years.



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HEC-RAS Model Extent

Exhibit 3

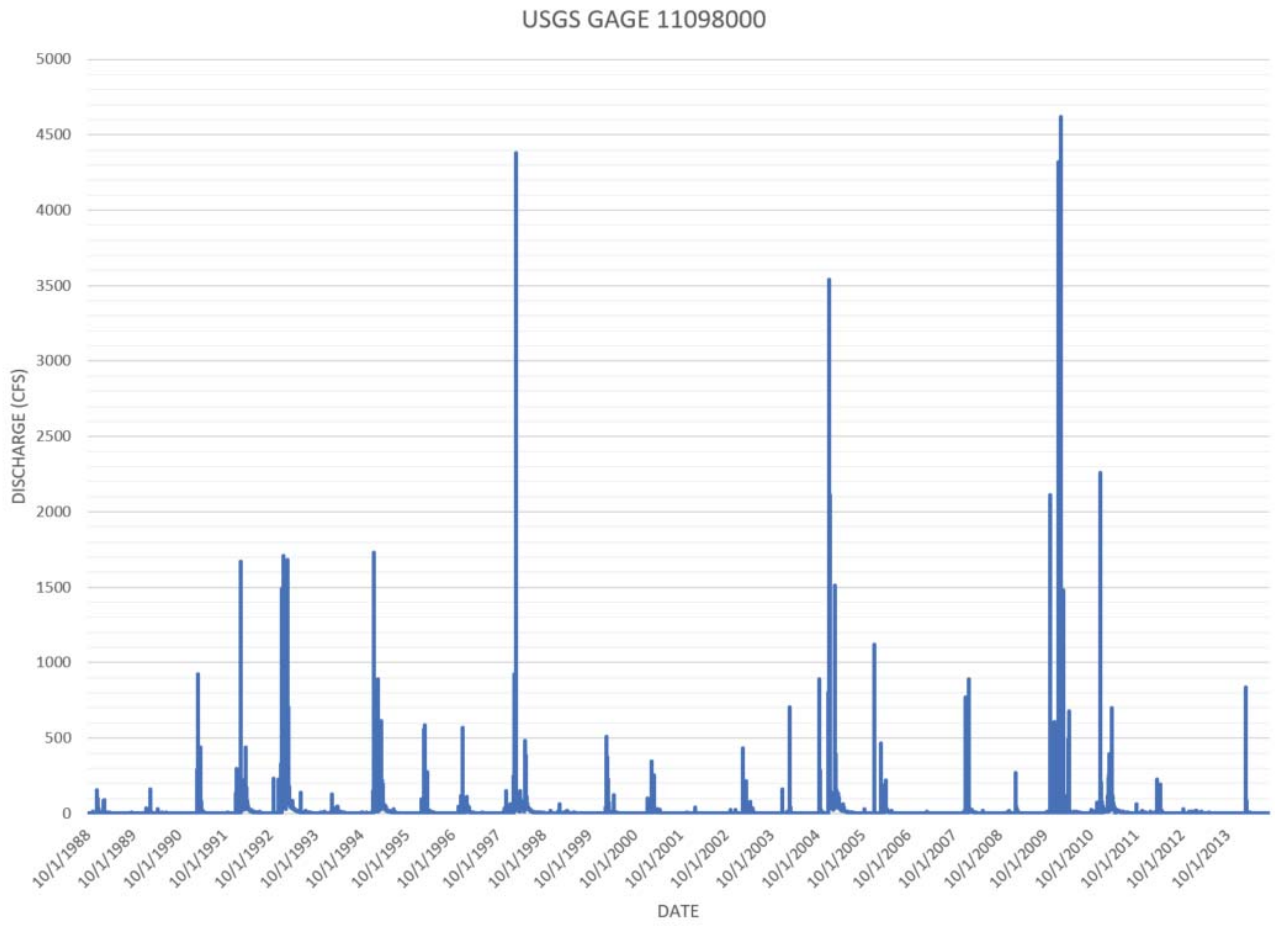
Arroyo Seco Diversion Hydraulics Analysis

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USGS Stream Gage Data for the 1988/1989 to 2013/2014 Water Years

Exhibit 4

Arroyo Seco Diversion Hydraulics Analysis

PSOMAS

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It is important to recognize that the area of the watershed contributing to the stream at the gage location is smaller than the area of the watershed contributing to the stream at the proposed diversion location. To account for the difference in watershed area the gage data has been scaled as a function of the watershed area to account for the difference. The scaling follows the approach of Waanan and Crippen (1977), which was also used by PWA (1990) in their flood frequency analysis of Arroyo Seco. The scaling is computed as:

$$Q_{diversion} = Q_{gage}(A_{diversion}/A_{gage})^n$$

where *Q* is the flow rate at a given location on the stream, *A* is the area of the watershed at a location corresponding to the respective flow rate, and *n* is an empirical value that is a function of the return period of the discharge being scaled. In the present study all daily discharges in the wet, average and dry hydrographs fall within the range of the 2-year peak discharge, therefore the exponent *n* is set to 0.72 after PWA (1990). The watershed areas were calculated using GIS-based tools and topography provided by the City. The watershed areas at the gage and proposed diversion are 16.0 square miles and 18.8 square miles, respectively.

To develop representations of wet, average and dry years the relative deviation percent was calculated for each year (Gao et al. 2018). The relative deviation percent was calculated by comparing the average annual runoff volume to the annual runoff volume for each year. Years where annual runoff was less than the average are considered dry, while years where the annual runoff was greater than the average are considered wet. Approximately 28% and 72% of annual runoff volumes were determined to be wet and dry, respectively. The years selected to represent wet and dry hydrographs were taken as the median wet and dry annual runoff volumes, respectively. The average runoff year was taken to be the year where annual runoff was closest to the average. The relative deviation percent data for all years is shown in Table 1.

TABLE 1
WET AND DRY ANNUAL RUNOFF VOLUME BY RELATIVE DEVIATION PERCENT AT USGS GAGE #11098000

WATER YEAR		ANNUAL RUNOFF (AF)	RELATIVE DEVIATION %	WET OR DRY?
1989	1990	752	-90.2	DRY
1990	1991	3,499	-54.6	DRY
1991	1992	13,876	80.2	WET
1992	1993	31,231	305.5	WET
1993	1994	2,307	-70.0	DRY
1994	1995	17,957	133.1	WET
1995	1996	5,040	-34.6	DRY
1996	1997	3,867	-49.8	DRY
1997	1998	20,330	164.0	WET
1998	1999	2,094	-72.8	DRY
1999	2000	2,965	-61.5	DRY
2000	2001	3,224	-58.1	DRY
2001	2002	472	-93.9	DRY
2002	2003	2,314	-70.0	DRY
2003	2004	1,290	-83.3	DRY
2004	2005	37,888	391.9	WET
2005	2006	5,239	-32.0	DRY
2006	2007	616	-92.0	DRY
2007	2008	5,754	-25.3	DRY
2008	2009	1,857	-75.9	DRY
2009	2010	9,713	26.1	WET
2010	2011	14,804	92.2	WET
2011	2012	2,759	-64.2	DRY
2012	2013	1,305	-83.1	DRY
2013	2014	1,398	-81.9	DRY
	AVERAGE=	7702		
	MEDIAN=	3224	DRY % =	0.72
			WET % =	0.28
			WET MEDIAN=	17,957
			DRY MEDIAN=	2,311

For modeling purposes, the 1994-1995 water year is used to represent a wet year's runoff volume, the 2007-2008 water year is used to represent an average year's runoff volume, and the 2002-2003 water year is used to represent a dry year's runoff volume.

To develop hydrograph input for modeling, the hydrograph data was limited to daily average discharges greater than 1 cfs. Therefore, no days without runoff are represented in the model. This approach is undertaken because discharges lower than 1 cfs will not reach the Dam owing largely to frictional attenuation within the model. Moreover, the model does not consider infiltration, and is very conservative with respect to the volume of water (more than actual) reaching the dam. It is likely that discharges less than 1 cfs not fully attenuated by friction will be infiltrated before reaching the Dam. Finally, the diversion is being modeled as capable of collecting all the water in the stream, which is unlikely since diversion structures are "leaky" by their nature and at present we cannot account for the leaky loss. Like the modeling approach to

infiltration, this approach is also very conservative with respect to the volume of water that reaches the Dam.

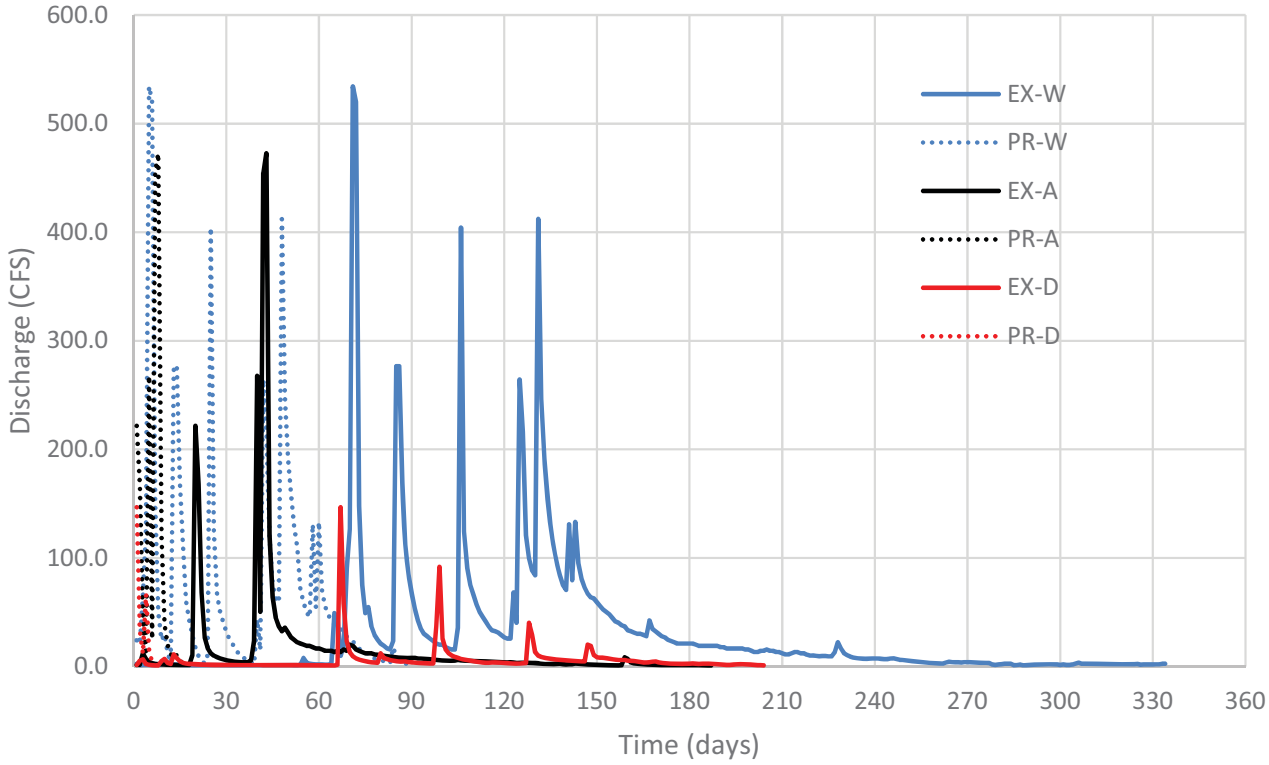
The proposed operational curve of the diversions includes three elements : 1) the diversion will remove all water from the stream up to 25 cfs; 2) diversions will cease for discharges above 100 cfs; and 3) all diverted water is assumed to infiltrate in the spreading basins regardless of the total volume of diversion. Curve elements 1 and 3 are conservative statements. Curve element 1 simplifies modeling because it doesn't consider the leaky nature of diversions, and it is conservative in approach since the constructed system will not be able to capture 100 percent of all discharges, which is typical for operations of diversion structures in natural systems, as noted above (NRC 1939). Curve element 3 is conservative because it states that all of the water to which the City has legal rights can be infiltrated, and that infiltration basins (will have sufficient capacity for all of the diverted water as designed. Factor 2 is represented in modeling since the turbidity of 100 cfs discharges typically represents the upper limit of turbidity that can be successfully managed by the proposed diversion system (City of Pasadena pers comm).

Diversions are represented in the model by subtracting 25 cfs from the daily average discharge values in the modeled hydrographs for discharge values less than 100 cfs. Durations of the discharges remain unchanged (one day), and all days with no discharge are removed from the hydrograph. The without diversion and proposed (with diversion) hydrographs for wet, average and dry years are shown in Exhibit 5, Existing and Proposed Modeling Hydrographs for the Wet, Average, and Dry Runoff Years.

Note that the "without diversion" scenario is used as the most conservative approach to reflect the maximum possible change from existing conditions. Currently there are some diversions of unspecified rates and durations, but they are well below PWP's surface water rights.

5.6 HYDRAULIC ASSUMPTIONS

Modeling used in the present study is uncalibrated hydraulically because no data exists with which to calibrate the model. That is, there does not exist any data that compares discharge to depth, velocity or other hydraulic parameters. It is assumed that the present modeling is conservative, as it doesn't consider evaporation, infiltration, evapotranspiration or other forms of loss besides friction. Attenuation in the model is only a function of friction, and both direct and anecdotal evidence exist to indicate that stream flows in the Arroyo Seco reach the Dam and reservoir.



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Existing (EX) and Proposed (PR) Modeling Hydrographs for the Wet (W), Average (A) and Dry (D) Runoff Years

Exhibit 5

Arroyo Seco Diversion Hydraulics Analysis

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6.0 HYDRAULIC MODEL OUTPUT.;

The HEC-RAS model was run for three representative water years as described above: wet, average and dry total runoff volumes. The HEC-RAS model was also run for the three representative years with proposed Project diversions, also described above. What follows is a comparison of maximum depth and maximum velocity for each representative water year for both the hydrology with and without diversions.

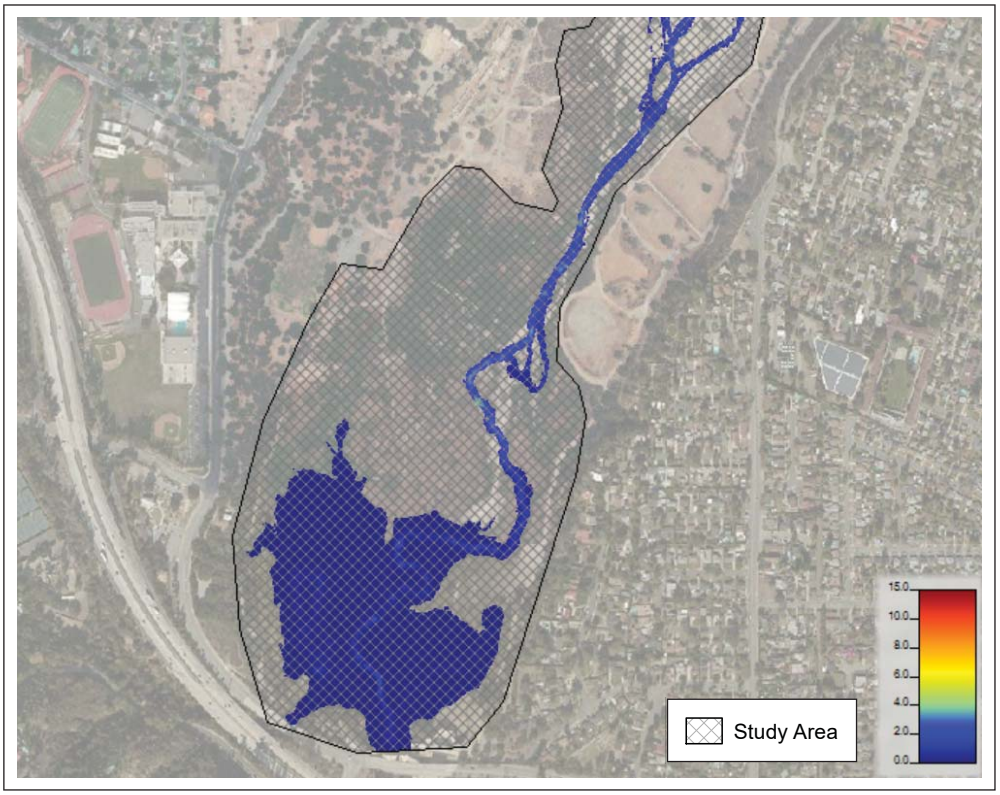
6.1 DRY YEAR VELOCITY

The representative dry year and representative dry year with diversions maximum velocity are shown in Exhibit 6, Representative Dry Year Maximum Velocity. Comparing the two graphics reveals that the maximum velocity in the with-diversion scenario is higher than in the without-diversion scenario in some locations immediately upstream of the Dam. In the primary stream channel upstream of the Dam the maximum velocity doubles from approximately 2.5 feet per second (fps) in the without-diversion condition to approximately 4.2 fps in the with-diversion scenario. In addition, there is an approximate doubling of velocity in some portions of the backwater area upstream and to the west of the Dam from approximately 0.3 fps in the without-diversion scenario to approximately 0.6 fps in the with-diversion scenario.

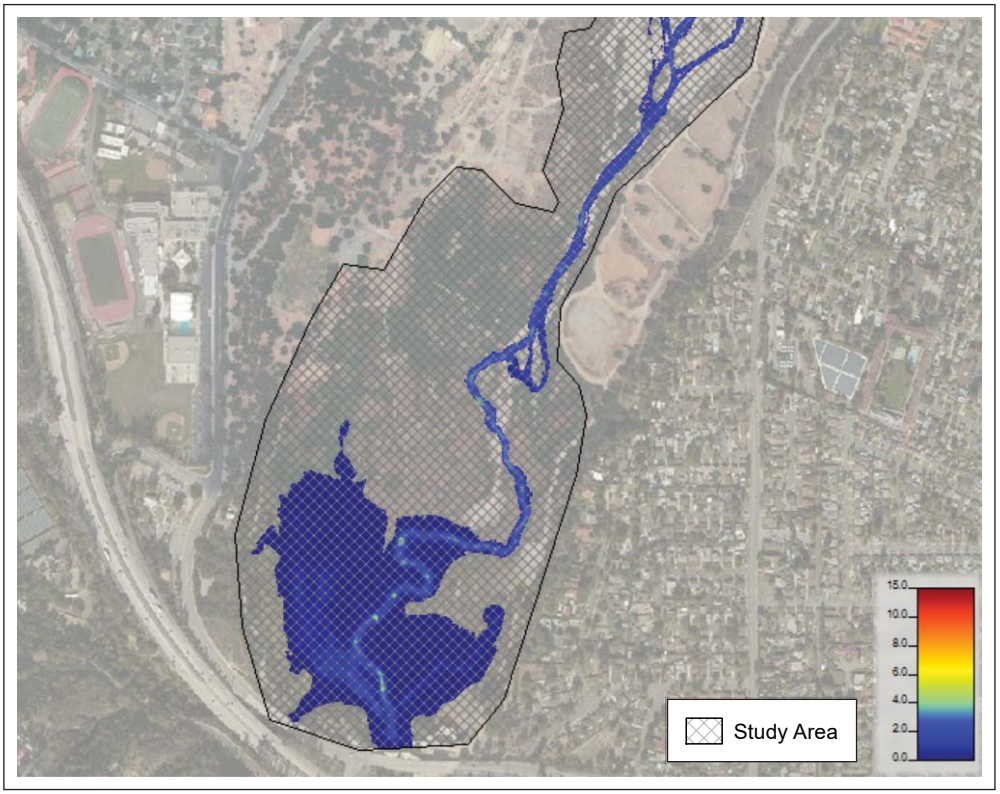
A review of Exhibit 5 indicates what the driver is for the increase in velocity. In the without-diversion scenario small discharge events (Q<25 cfs) begin to fill the reservoir prior to a significant event (Q>>25 cfs). When the smaller events pond upstream of the Dam, the larger events maximum velocity is lower because of backwatering from the Dam due to ponding. In contrast, when water has not ponded upstream of the Dam, no backwatering will occur during a more significant event and velocities will be higher in the main stream and in some of the backwatering areas. It is important to note that these higher velocities can occur in a dry, average or wet year regardless of whether diversions occur if an early runoff event in the season is relatively large and little or no backwatering has occurred prior to the runoff event. It is also important to note that the total change in velocity is relatively low and occurs well below (v=0.6 fps) or just below (v=4.0 fps) a typical velocity (i.e. 4.5 fps) for initiation of sediment transport in sandy bed, vegetated streams.

6.2 DRY YEAR DEPTH

The representative dry year without-diversions and representative dry year with-diversions maximum depth are shown in Exhibit 7, Representative Dry Year Maximum Depth. The graphics show that the maximum depth between the without-diversion and with-diversion scenarios drops by approximately 1.3 feet. A review of Exhibit 5 indicates the cause of the decrease in maximum depth. In the without-diversion conditions, the total runoff for the representative dry year is approximately 2,480 acre-feet (af), while the hydrograph with-diversions for the representative dry year is approximately 550 af. Therefore, the difference in runoff volume accounts for the difference in maximum depths shown in Exhibit 7. It is important to note that the area of inundation is approximately the same between the two scenarios owing largely to the shape of the reservoir upstream of the Dam.



Representative dry year maximum velocity without diversions.



Representative dry year maximum velocity with diversions.

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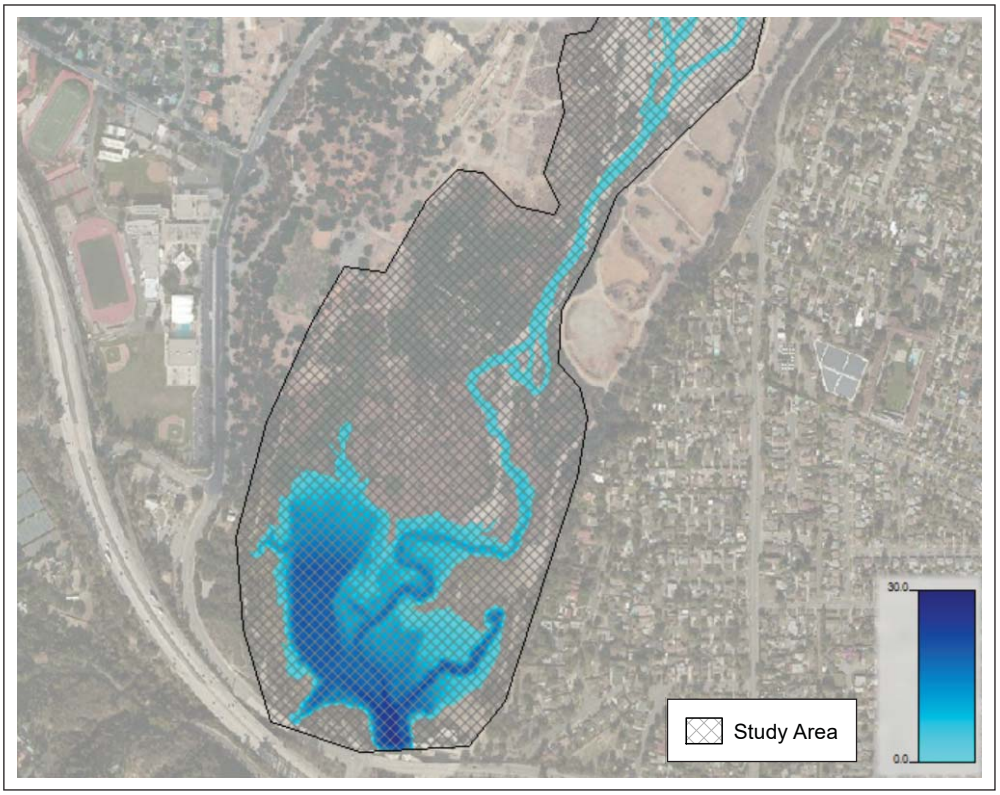
Representative Dry Year Maximum Velocity

Exhibit 6

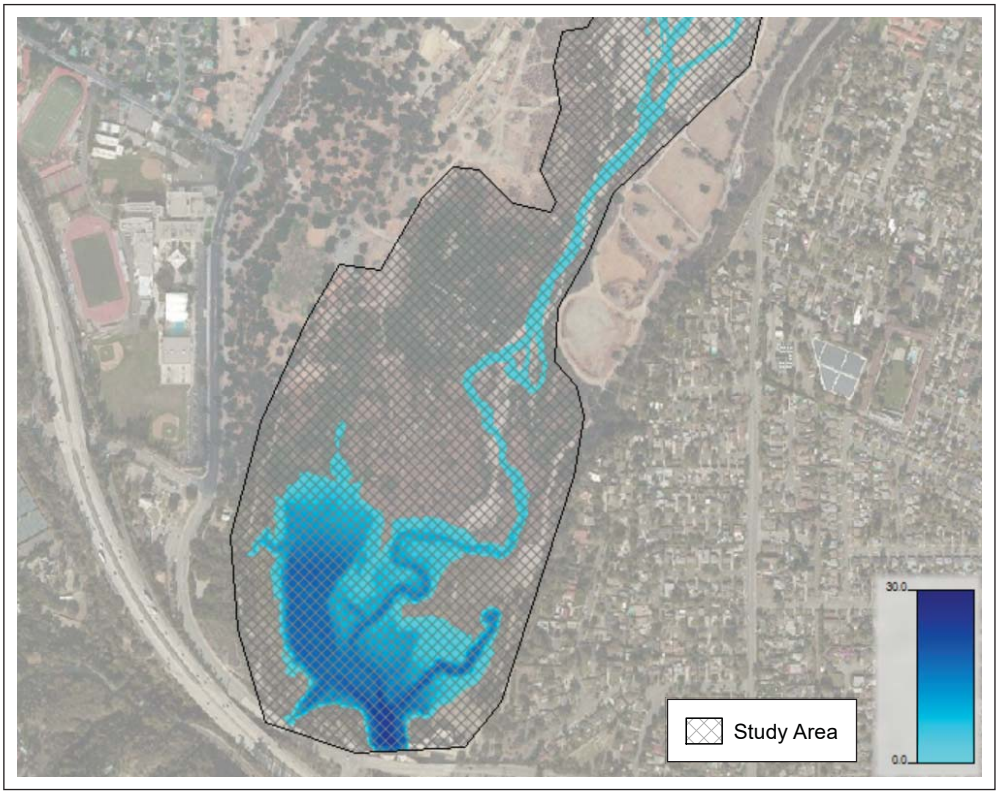
Arroyo Seco Diversion Hydraulics Analysis

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Representative dry year maximum depth without diversions.



Representative dry year maximum depth with diversions.

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Representative Dry Year Maximum Depth

Exhibit 7

Arroyo Seco Diversion Hydraulics Analysis

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6.3 AVERAGE YEAR VELOCITY

The representative average year and representative average year with-diversions maximum velocity are shown in Exhibit 8, Representative Average Year Maximum Velocity. Unlike the dry scenarios, the maximum velocity in the without-diversion scenario is higher than in the with-diversion scenario in some locations immediately upstream of the Dam. In the primary stream channel upstream of the Dam, the maximum velocity doubles from approximately 2.5 fps in the with-diversion condition to approximately 5.5 fps in the without-diversion scenario. In addition, this is an approximate doubling of velocity in some portions of the backwater area upstream of the Dam from approximately 0.6 fps in the with-diversion scenario to approximately 1.0 fps in the without-diversion scenario.

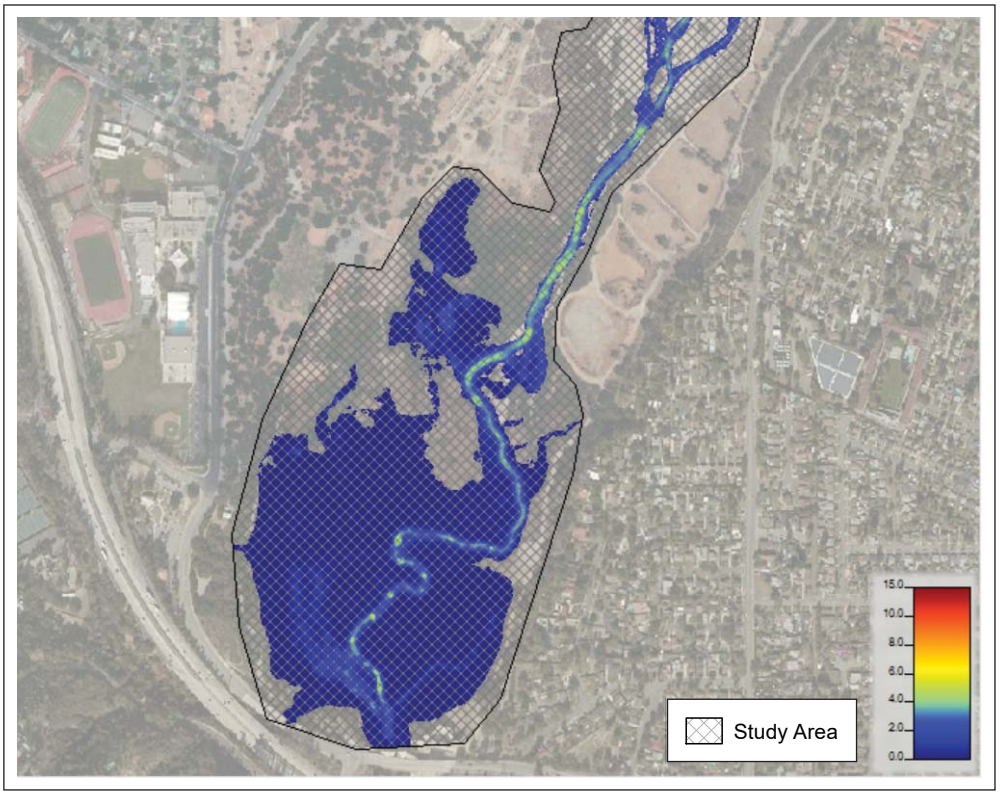
The reason for these differences is similar to that in the representative dry year scenarios, except that the reservoir has relatively high ponding in the with-diversion scenario compared to the without-diversion scenario before a significant (Q>>25 cfs) event occurs. In the representative average year scenario, the resulting maximum velocities are relatively higher than in the representative dry year scenario (5.5 fps vs. 4.2 cfs, respectively). It appears from Exhibit 5 that the difference in modeled maximum velocity in this location is a function of hydrograph shape (rate of flow versus time) as opposed to other hydraulic or hydrologic factors.

6.4 AVERAGE YEAR DEPTH

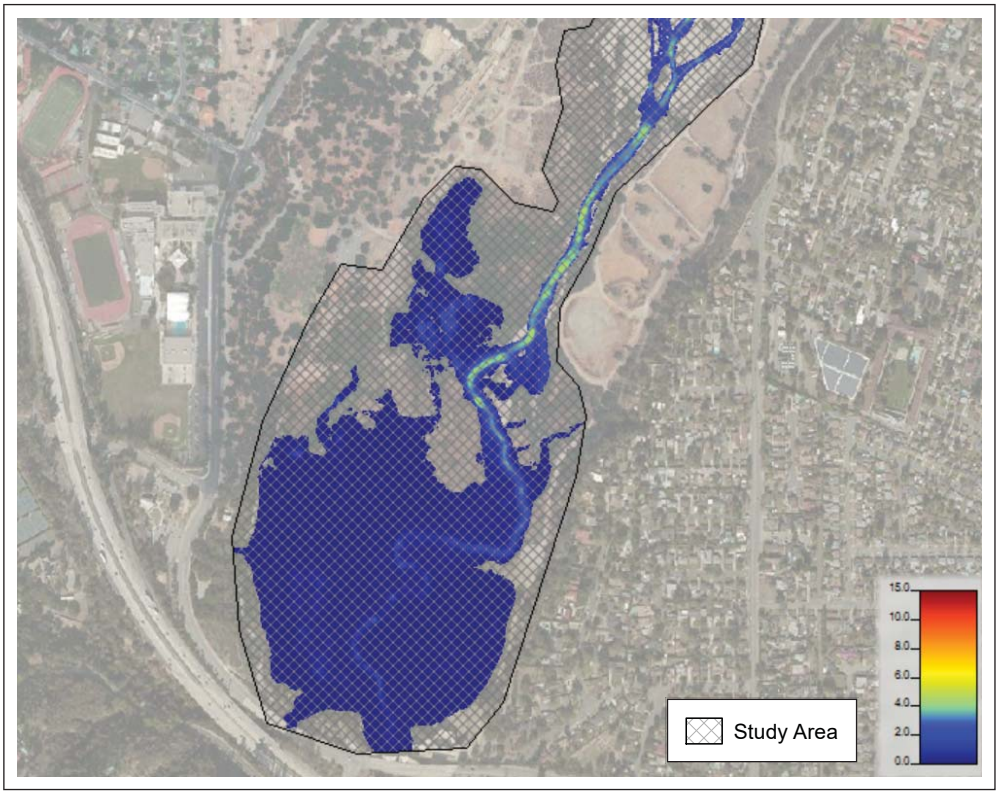
The representative average year without diversion and representative average year with diversions maximum depth is shown in Exhibit 9, Representative Average Year Maximum Depth.. The images are indistinguishable from one another because the maximum water surface elevation is the same, approximately WSE (water surface elevation) = 1,035 feet. In these scenarios, the factor that controls the depth and WSE is the operation of Devil's Gate Dam. Despite the same maximum depths, the with-diversion scenario has greater inundation durations at the reservoir fringes because the with-diversion scenario reservoir depth reaches the operational curve elevation more slowly than does the without-diversion scenario.

6.5 WET YEAR VELOCITY

The representative wet year without diversion and representative wet year with diversions maximum velocity is shown in Exhibit 10, Representative Wet Year Maximum Velocity.. Like the other representative scenarios, there are differences in maximum velocity upstream of the reservoir. The difference between the representative wet year without-diversion and with-diversion maximum velocity is lower in magnitude than in the similar representative dry and average scenarios. This appears to be a function of the rate at which the reservoir fills in the represented wet year scenarios. In the wet year scenarios, the difference in maximum velocity in the channel upstream of the reservoir is approximately 3.0 cfs and 1.5 cfs for the with-diversion and without-diversion scenarios, respectively. One interesting difference between the representative wet year scenarios and other scenarios is how far upstream the differences are observed. In the case of the wet year scenarios, the differences in velocity are observed in the channel upstream of the ponded reservoir, while in the representative average scenarios the differences are confined to downstream of the infiltration basins on the east bank. A review of the model output indicates that the difference in extent of impacts is a function of the extent of ponding and ponded elevation in the reservoir, which alters the backwatering further upstream than in the average scenario conditions. The difference is not attributable to change in hydrology resulting from diversions since the largest discharges (Q>100 cfs) are not impacted by the diversions.



Representative average year maximum velocity without diversions.



Representative average year maximum velocity with diversions.

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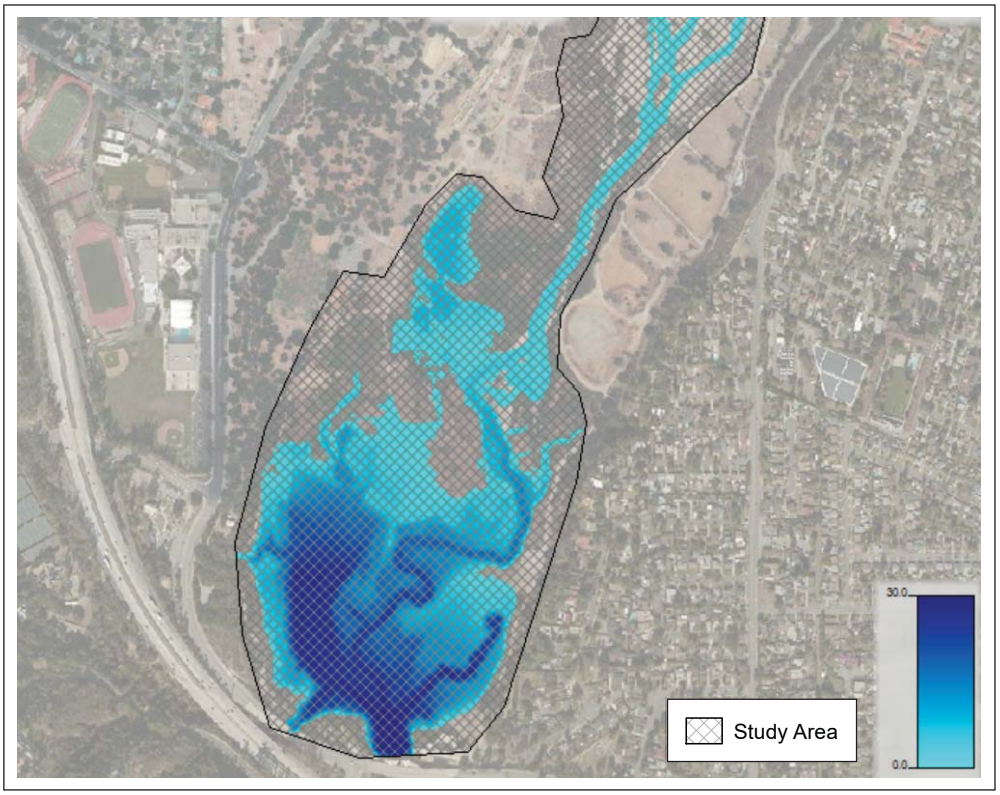
Representative Average Year Maximum Velocity

Exhibit 8

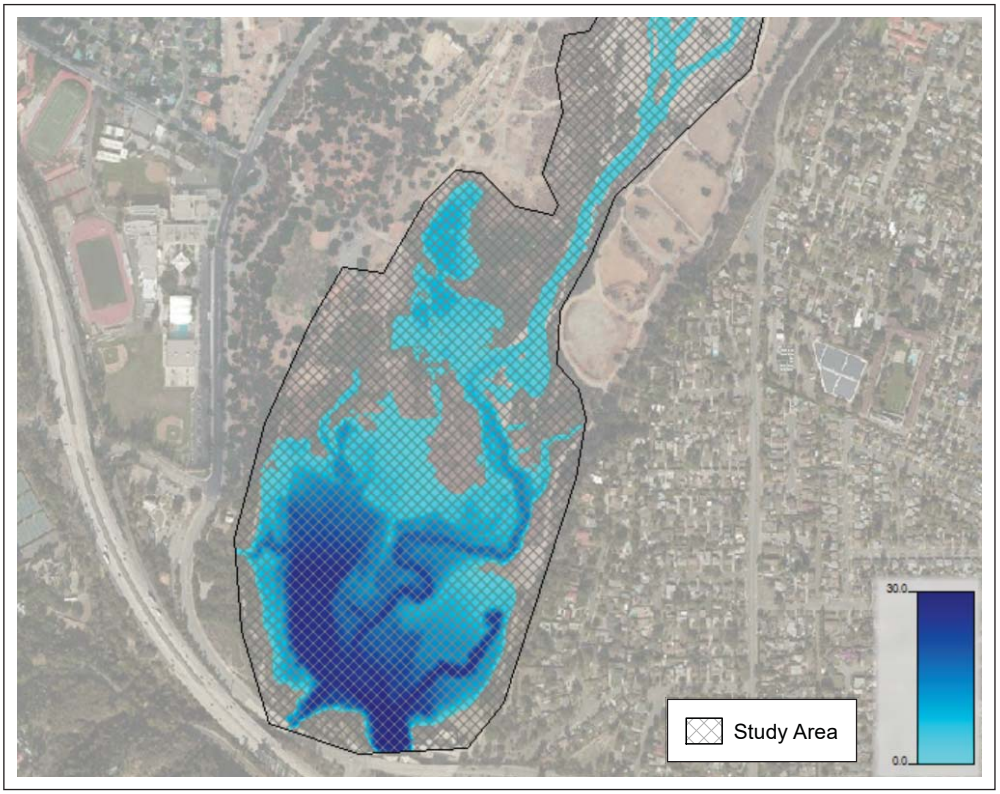
Arroyo Seco Diversion Hydraulics Analysis

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Representative average year maximum depth without diversions.



Representative average year maximum depth with diversions.

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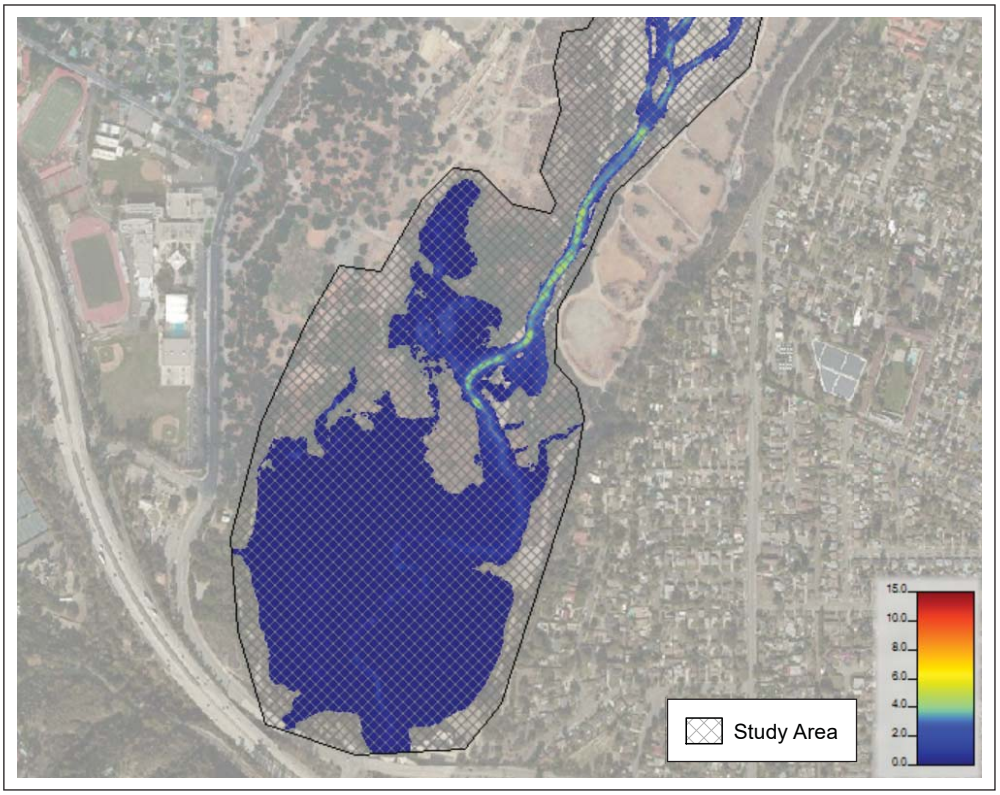
Representative Average Year Maximum Depth

Exhibit 9

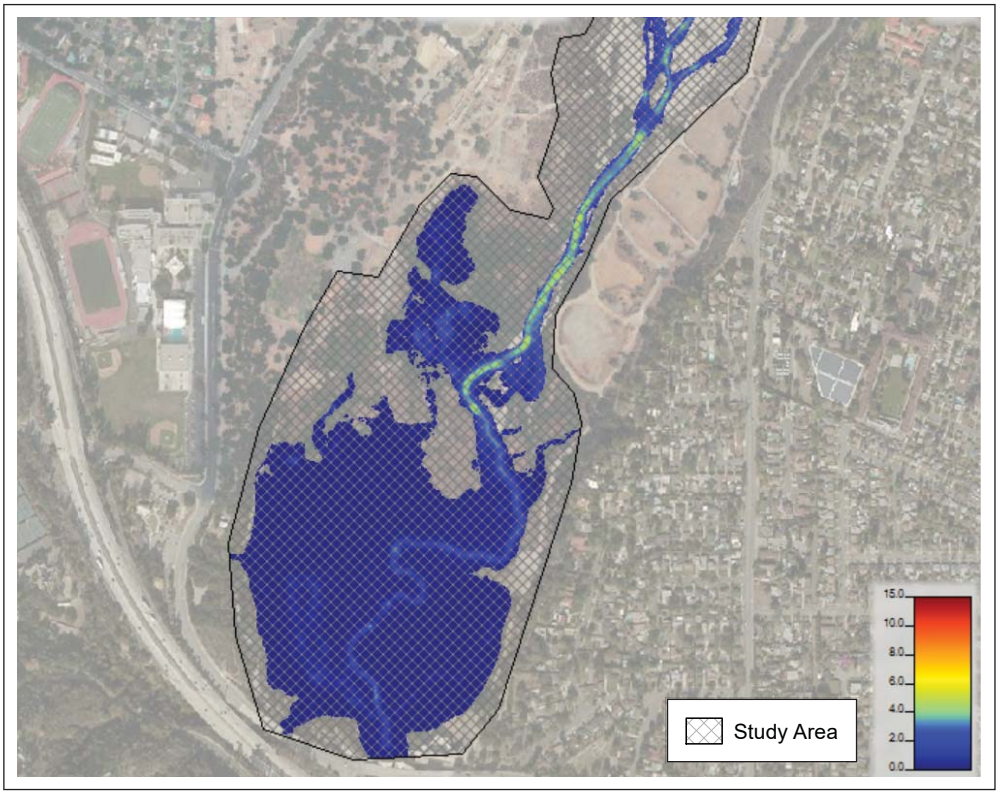
Arroyo Seco Diversion Hydraulics Analysis

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Representative wet year maximum velocity without diversions.



Representative wet year maximum velocity with diversions.

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Representative Wet Year Maximum Velocity

Exhibit 10

Arroyo Seco Diversion Hydraulics Analysis

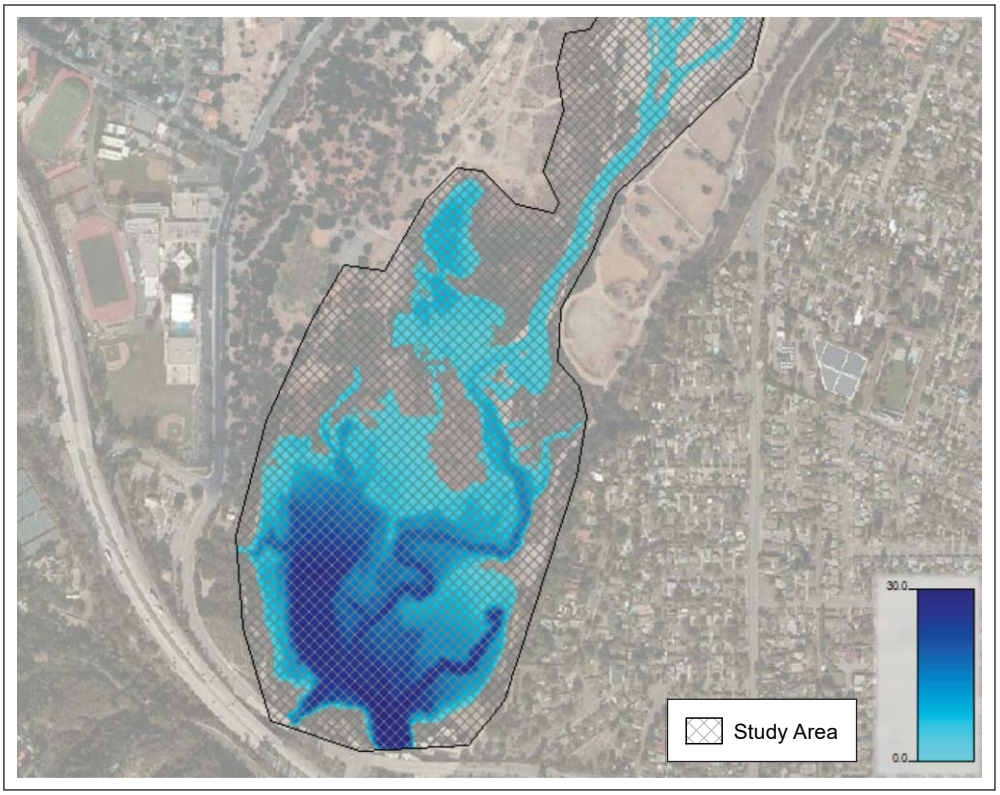
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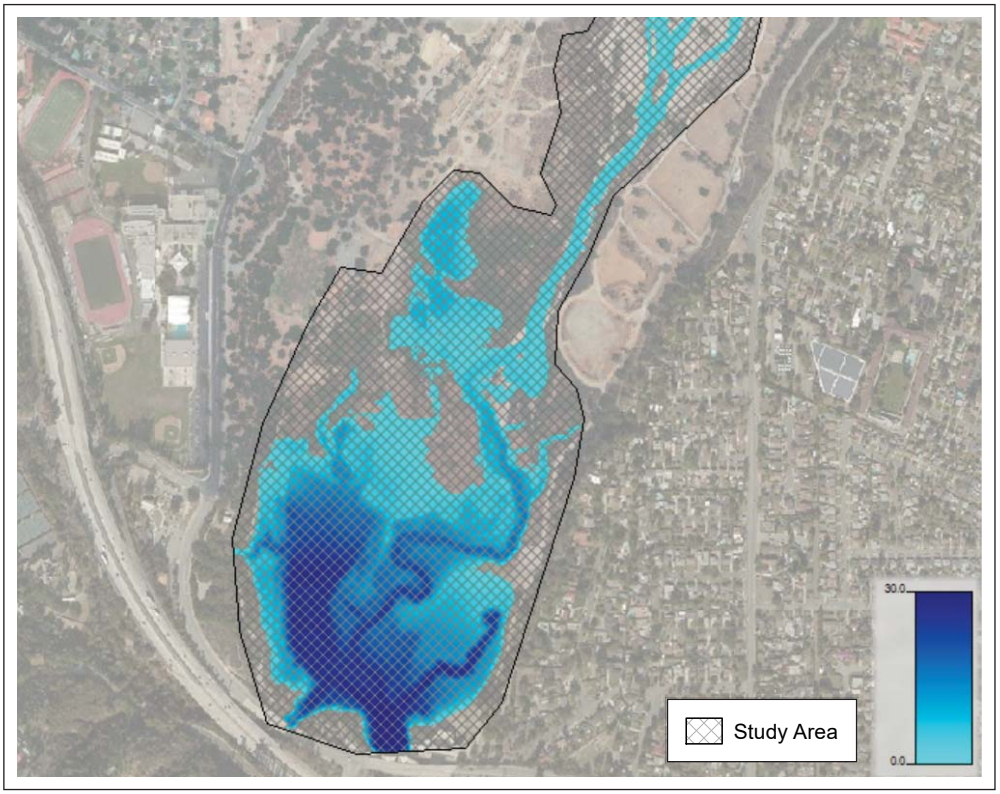
6.6 WET YEAR DEPTH

The representative wet year without-diversions and representative wet year with-diversions maximum depth is shown in Exhibit 11, Representative Wet Year Maximum Depth. Like the representative average year scenarios, the representative wet year maximum depth exhibits are indistinguishable because the Dam operational curve is controlling the maximum depth in the reservoir, approximately WSE=1,035 feet. Like the average year scenarios, the with-diversion scenario has greater inundation durations at the reservoir fringes because the with-diversion scenario reservoir depth reaches the operational curve elevation more slowly than does the without diversion scenario.

All model input and output can be found in Attachment B.



Representative wet year maximum depth without diversions.



Representative wet year maximum depth with diversions.

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Representative Wet Year Maximum Depth

Exhibit 11

Arroyo Seco Diversion Hydraulics Analysis

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7.0 SEDIMENT TRANSPORT MODEL

7.1 MODEL DESCRIPTION

General adjustment was estimated in this study using the U.S. Army Corps of Engineers (USACE) SAM steady-state numerical model. Here, SAM was employed to provide a first calculation of sediment transport potential within Arroyo Seco. The SAM Sediment Hydraulic Package is an integrated system of programs developed through the Flood Damage Reduction and Stream Restoration Research Program to aid in the analyses associated with designing, operating, and maintaining flood control channels and stream restoration projects. SAM combines the hydraulic information and the bed material gradation information to compute the sediment transport capacity for a given channel or floodplain hydraulic cross-section for a given discharge at a single point in time. Several sediment transport functions are available for this analysis and SAM can assist in selecting the most appropriate sediment transport equation.

The three primary fluvial components of SAM are SAM.HYD, SAM.SED and SAM.AID. SAM.HYD provides a steady state, normal-depth, one-dimensional representation of channel hydraulics. The SAM.SED module combines the hydraulic parameters with the bed material gradation curve to compute bed material discharge rating curves by size classification. The SAM.AID module provides the user with recommended sediment transport equations based on the best matches between hydraulic parameters and grain size distribution of the study reach with parameters from widely accepted and published research.

The SAM numerical model is built upon hydraulic and fluvial components. The hydraulic components include representations of river bed characteristics that are input into an analytical procedure. The fluvial component includes representation of bed gradation as percent finer statistics and a selection of up to twenty sediment transport equations. SAM's hydraulic component will accept either average reach parameters or cross-section data imported from HEC-2/HEC-RAS/HEC-6 models. Hydraulic modeling is based on a uniform flow equation where discharge is the dependent variable such that,

$$Q = f(D, n, W, z, S)$$

where Q is discharge in cfs, D is flow depth in feet, n is the Manning's number, W is bottom width in feet, z is the channel side slope, and S is the energy slope. The bottom width is representative of the total moveable bed width of the channel and Manning's number is a composite value. Normal depth is calculated using Manning's equation, and effective values of width and depth are calculated following normal depth calculations.

The fluvial component is based on sediment transport functions to calculate the bed portion of the sediment discharge-rating curve. The sediment transport equations are of the form,

$$GS_i = f(V, D, S_e, B_e, d_e, \rho_s, G_{sf}, d_s, i_b, \rho_f, T)$$

where GS_i is the transport rate for sediment size class i; the hydraulic terms V, D, S_e, and B_e, are the average velocity, effective flow depth, energy slope, and effective flow width, respectively; the sediment particle parameters d_e, ρ_s, and G_{sf} are the effective particle size, particle density, and grain size shape factor, respectively; the sediment mixture properties, d_s and i_b are the geometric mean particle size of sediment class i and fraction of class i in the bed, respectively; and the fluid properties ρ_f, and T, the water density and temperature, respectively. Twenty well known, published, peer-reviewed transport equations are available including Ackers-White, Colby, Laursen-Copeland, Laursen–Madden, MPM, Toffaleti, Yang, Van Rijn and others. Once the data assembly is complete, the SAM.SED module can be used to create a sediment discharge-rating

curve based on grain size distribution. The reader is referred to the SAM user's documentation for further reference.

It is important to note that the SAM model is a zero-dimensional computational package that is only based on a single cross-section at a point in time. As such, SAM simulations can only represent a reach average during a steady state discharge. Because SAM applies sediment transport to a point, no variability in size distribution in either space or time is calculated. With these limitations in mind, in this study SAM is intended to provide a first approximation to sediment transport to which other more sensitive calculations can be compared.

7.2 MODEL INPUT

In this study, hydraulic representation of the streambed is accomplished in several distinct steps. First, the HEC-RAS numerical model is used to develop a representative cross section for analysis. Second, the HEC-RAS geometry is combined with hydraulic data for the representative cross section. Next, the hydraulic data and cross section are entered into the SAM.HYD subroutine and the model is run. The sediment data, described below, is entered into the model, the SAM.AID subroutine is run, and a transport equation is selected. Once the equation is selected the SAM.SED subroutine is run.

7.3 SEDIMENT DATA

To characterize the sediment of the streambed and by extension, the possible bed load of sediment during discharge events, a sediment grain size analysis was conducted. The goal of the analysis is to gain a statistical representation of the size distribution of soil components of the streambed. Grain size distribution analysis is a powerful tool because the results can represent both a qualitative description of soil make up as well as quantitative input for further predictive measures, such as fluvial modeling.

Sediment sampling was conducted by R. T. Frankian & Associates (2018). Sampling was conducted at a total of 6_locations, approximately every 2,000 feet within the stream bed from 200 feet upstream of the existing diversion structure to 200 feet upstream of the Dam face, which is a distance of approximately two miles. A total of three samples were taken within the stream bed at each of the proposed sample locations; each sample location was taken from a depth of approximately 18 inches. Samples were only obtained in surface-dry areas of the stream bed. Access to each of the sample locations was limited to foot traffic from various access points. The excavation and sampling of sediments were limited to the use of hand-operated equipment. Excavated sediments were stockpiled on heavy tarps during the process of excavation, sampling, and classification. The remnant excavated sediments were used to backfill each of the sample locations. Field samples obtained from each of the test pits were laboratory sieved for grain size distribution testing in general accordance with ASTM Test Method D422. The portions of the samples tested were limited to that portion of each sample greater than the No. 200 Sieve.

Since SAM is a single point model, two specific locations were chosen for modeling. The first model location is approximately 200 feet upstream of the JPL Bridge, while the second model location is approximately 1,100 feet downstream from the bridge. Both locations are relatively distant from the influence of confluences and structures, and neither is located in the reservoir, which is not appropriate for modeling with SAM. Sample Location No. 2 and No. 3 were taken at these sites, respectively, and the average grainsize distribution at each location was used for SAM modeling. The average grainsize distribution of Sample Location No. 2 and No. 3 is shown in Exhibit 12. One benefit for selecting these sites is that the upstream location is within the more confined channel reach, while the downstream location is below the grade break in the stream where Arroyo Seco begins to widen and acquires characteristics of an alluvial surface. Therefore,

these two locations are representative of the two primary stream morphologies found in the study area. All Frankian sediment data is presented in Attachment C.

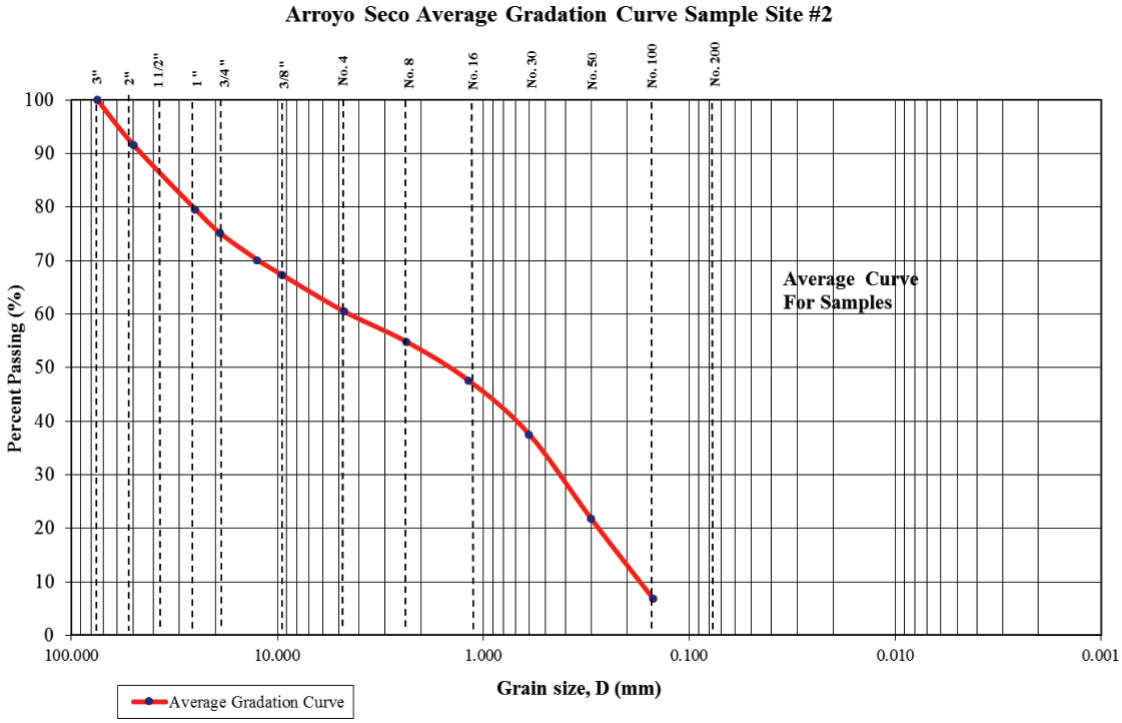
7.4 TRANSPORT EQUATION SELECTION

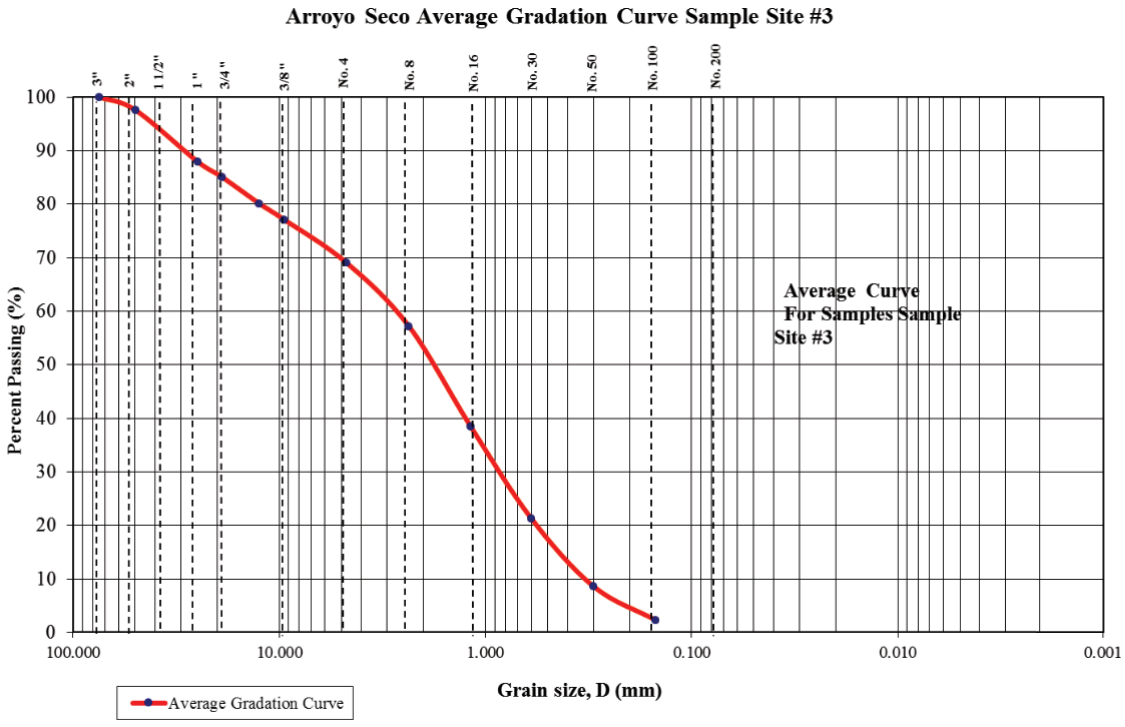
Sediment transport equations used in all SAM modeling were chosen with the assistance of the U.S. Army Corps of Engineers' (USACE's) SAM.AID subroutine. The SAM.AID subroutine determines the most representative transport function based on the hydraulic parameters and soil gradation data for a section of Arroyo Seco by comparing model data with the results of 20 peer-reviewed and widely acknowledged sediment transport studies. To accomplish the task of guiding the user in selecting an appropriate transport function, SAM.AID assumes that the function that best represents sediment transport in a gauged stream would also best represent transport in an ungauged stream with similar sediment and hydraulic characteristics. SAM.AID begins by comparing study parameters (V, D, S_e, B_e, D_{50}) with parameters in the transport function database. Comparison begins by determining if D_{50} falls within one of the ranges identified in the database. Once the initial matches have been made in the database, the three best-matched sediment transport functions for the study reach are listed along with the parameters that matched the data set. Once the best transport equation matches have been determined by SAM.AID, the most representative equations are run in SAM.SED.

The Yang and Ackers-White equations were found to be the representative transport equation for a discharge of 25 cfs, the proposed diversion discharge. A discussion of sediment transport applicability (Yang and Huang 2001) suggests that Ackers-White is more appropriate for sand transport than is the Yang equation. Therefore, all analysis is based on Ackers-White, but the Yang equation results are included for completeness. All SAM model input and output can be found in Attachment C.

7.5 SAM MODEL RUNS

The SAM model was run at Sample Location No. 2 and No. 3 for 25 cfs, the proposed diversion discharge. The SAM runs were intended to indicate the possible change in sediment transport potential at the two model locations resulting from the proposed diversions. Representative hydraulics from each location were taken from the HEC-RAS model and sediment data was taken from Frankian sieve data, as described above.





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Average Grain Size Distributions

Exhibit 12

Arroyo Seco Diversion Hydraulics Analysis

PSOMAS

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8.0 SEDIMENT TRANSPORT MODEL OUTPUT

The sediment transport potential at Sample Location No. 2 and No. 3 are, respectively, 37,680 and 169 tons per day for the Ackers-White equation and 3,788 and 148 tons per day for the Yang equation. A large portion of the difference appears to be related to Location No. 2's ability to generate sufficient transport potential in the 2.828 mm size class for Ackers-White, which does not occur at Location No. 3. Additionally, the transport potential for all size classes is approximately one order of magnitude greater at Location No. 2 than Location No. 3 for Ackers-White for almost all grain size classes. Similar results are observed for Yang's equation, although Yang predicts sediment transport potential up to 5.657 mm at Location No. 2, but only up to 2.828 mm at Location No. 3.

A review of the hydraulics at each location identifies the cause of the disparity in transport potential between the two locations. The steeper, narrower Location No. 2 has higher velocity, steeper slope and narrower top width relative to Location No. 3, which is below the channel's grade break. This finding matches the finding of PWA (2000) that significant sediment deposition occurs in what is referred to as the "upper reservoir." The implication for this finding is that the lower portion of the Arroyo Seco study area behaves in a similar way to an alluvial fan below the hydrographic apex whereby sediment is deposited in patterns associated with flow path uncertainty, and sediment transport below the grade break is strongly a function of local hydraulics (e.g. Leopold et al. 1992).

9.0 HYDRAULIC AND SEDIMENT MODELING CONCLUSIONS

In dry, average, and wet representative years, modeled diversions from Arroyo Seco have an effect on velocity in select areas of the reservoir upstream of Devil's Gate Dam. The effects on velocity are small in absolute terms ($\Delta v_{maximum} < 3$ *fps*), and in some cases the change in velocity represents a decrease from the existing conditions. Numerical modeling indicates that the factors that control change in velocity in the reservoir are the magnitude (peak discharge) and shape (number of peaks and duration of individual runoff hydrographs) of the earliest storms in a given season and the extent to which ponded water fills the lower reservoir. In cases where diversions do not effect early-season large runoff events, differences in maximum velocity can be expected to be negligible between the without and with diversion scenarios for any representative year. In contrast, the extent which the reservoir is full in either the without or with diversion scenario may affect the change in velocity by creating a backwater condition in the reservoir. Modeling suggests that the direct effect on velocity from diversions is for events where the maximum discharge is near or below 25 cfs. However, as was identified by Inman and Jenkins (1999), the dominant driver of runoff in coastal southern California is large winter storms. Therefore, only in years where the primary source of water to the Devil's Gate Reservoir is runoff events near or below 25 cfs are velocities expected to be affected by diversions. It should be noted that the representative dry year is only minimally affected in this manner.

Effects on maximum depth in dry, average, and wet representative years in Arroyo Seco are largely mediated by the amount of ponding in Devil's Gate Reservoir. Ultimately, the ponding in the reservoir is a function of the rate, frequency and volume of inflow, and the dam operation outflow. In representative average and wet years, the modeled extent of ponding is a function primarily of dam operations for both the without and with diversions. In represented dry years, numerical modeling indicates that maximum depth is primarily driven by the volume of water entering the reservoir in the absence of reaching the dam operational curve elevation. In representative dry years, diversions may have an effect on maximum water depth in the reservoir, and modeling indicates that maximum depth in these years is partially a function of when in the season the largest runoff events occur. That is, representative dry years with diversions and a few relatively large runoff events will have a similar maximum depth in the reservoir compared to representative dry years without diversions. In contrast, in representative dry years without a few relatively large events, modeling predicts that the difference in reservoir maximum depth will be greater. Finally, in representative wet and average years the duration of inundation can be impacted on the fringes of the reservoir by diversions. Diversions in these years appear to increase the inundation duration somewhat by increasing the volume of runoff required to initiate dam operations.

The numerical modeling presented here indicates that relatively small effects on maximum velocity and maximum depth occur from proposed diversions upstream. These effects (change in velocity) are limited generally to the stream channel within the lower reservoir and the backwater area immediately upstream and to the west of the dam. Additional minor effects (change in duration of inundation) are indicated at the reservoir edge and appear to be strongly a function of dam operations as well as diversions.

SAM modeling of two locations within the study area indicates that there is greater sediment transport potential at 25 cfs in upper portions of Arroyo Seco, which are steep and narrow, compared to portions below the topographic break, which are wider and flatter. This finding echoes that of PWA (2000) that found that significant sediment deposition occurs in the "upper reservoir." **The implication for the present study is that for low discharges in Arroyo Seco, the reduction in discharge of 25 cfs is expected to be unimportant to overall sediment transport potential because the controlling elements of sediment transport are geologic factors.** Moreover, in large runoff events that are typically the dominant delivery mechanism of

sediment in southern California (Inman and Jenkins 1999) no diversions are presently proposed and are therefore not expected to be impactful to stream sediment yield to the reservoir.

10.0 GROUNDWATER ASSESSMENT

10.1 PHYSIOGRAPHY

The Arroyo Seco Watershed is bounded on the north by the San Gabriel Mountains, which consist of steep, rocky ridges broken by numerous irregular canyons. The elevations of these mountains vary from about 1,200 feet along their base to a maximum of more than 6,000 feet above sea level at the headwaters of the Arroyo Seco.

The Arroyo Seco stream empties out into a broad piedmont plain that slopes downward from the base of the San Gabriel Mountains to Devil's Gate Reservoir, the lowest ground surface point of the Raymond Groundwater Basin within the Project area (see Exhibit 13). The Arroyo Seco continues south until it empties into the Los Angeles River near the intersection of the 5 and 110 freeways. The Raymond Basin (see Hydrogeology Section) forms along the southern flank of the San Gabriel Mountains and extends into the project area beneath Devil's Gate Reservoir.

10.2 GEOLOGY

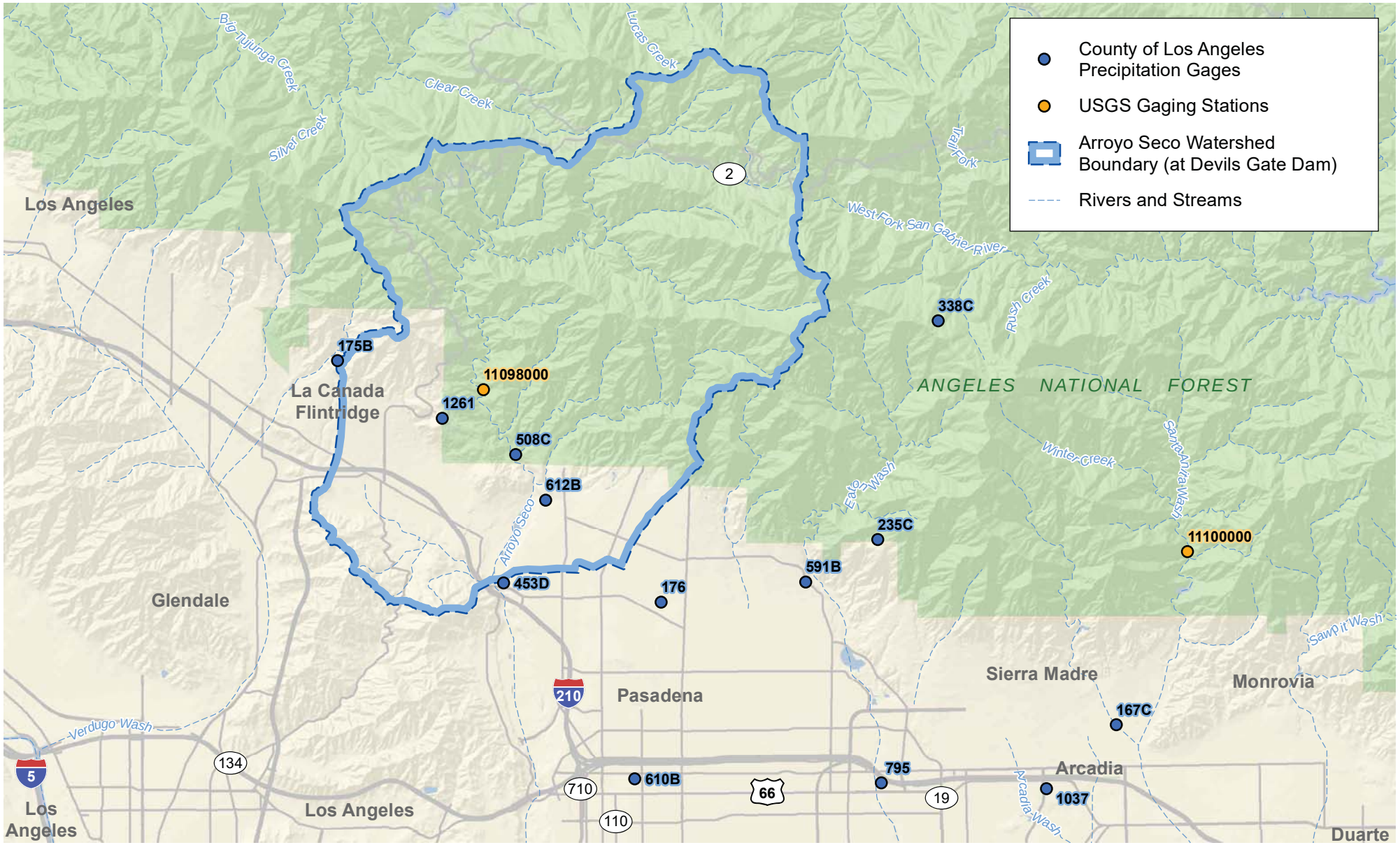
10.2.1 General Geology

The Raymond Basin lies in the northwestern part of the San Gabriel Valley, bounded by the San Gabriel Mountains to the north, the San Rafael Hills to the west, and ending to the south and east at the Raymond Fault. The San Gabriel Mountains, along with the San Bernardino Mountains to the east and the Santa Monica Mountains to the west, make up a major portion of the east-west trending Transverse Range geologic province of California. The San Gabriel Mountains are primarily composed of Cretaceous to Tertiary crystalline rocks, including diorites, granites, monzonites, and granodiorites, with a complex history of intrusion and metamorphism. The Sierra Madre fault system separates the San Gabriel Mountains to the north from the San Gabriel Valley to the south. Within the valley lies Quaternary alluvium, made up of sand, gravel, clay, or some mixture of each. Underlying the alluvium is the crystalline basement complex, comprised of the same general rock types that are exposed in the San Gabriel Mountains to the north (Foster Wheeler Environmental Corporation [FWEC], 1999).

Raymond Fault, the southern boundary of the triangle, crosses the San Gabriel Valley floor for a distance of about nine miles, connecting a granitic spur from the San Gabriel Mountains at the eastern end of the Raymond Basin with Tertiary sediments outcropping in its southwestern corner. The Raymond Fault separates the Raymond Basin from the Main San Gabriel Basin in the vicinity of the southeasterly boundary. The fault zone is not impervious and groundwater can flow across this boundary into the Main Basin (NASA 2003). The general geology of the Raymond Basin is shown in Exhibit 14.

The low water-bearing formations in the project area include the Basement Complex rocks and Tertiary sediments of the Topanga, Modelo and Puente formations (Exhibit 14 and Attachment D).

The Basement Complex is comprised of pre-Cretaceous series of crystalline rocks that comprise the basal formation of the region. These are chiefly igneous plutonic rocks of granitic type, together with their metamorphic phases, such as schists, gneisses, and also various intrusive dikes. The Basement Complex comprises the majority of San Gabriel Range to the north and the San Rafael Hills to the west. The Basement Complex protrudes above the alluvium at Monk Hill



Arroyo Seco Watershed Boundary

Exhibit 13

Arroyo Seco Diversion Hydraulics Analysis

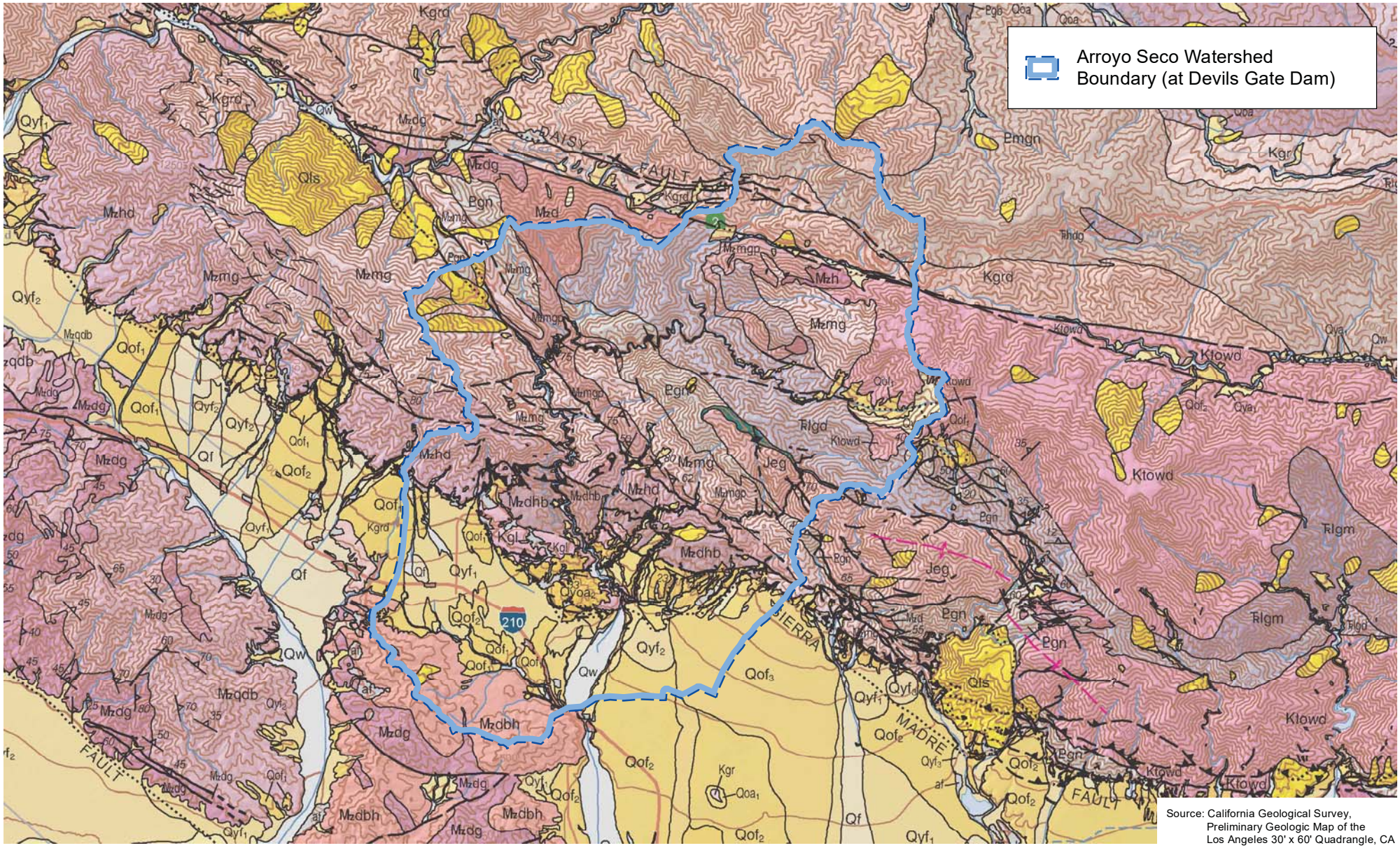
N W E S

1.75 0.875 0 1.75 Miles

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Surficial Geology of the Upper Arroyo Seco Area

Exhibit 14

Arroyo Seco Diversion Hydraulics Analysis

N
W E
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1.6 0.8 0 1.6 Miles

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and near the head of Eaton Wash demonstrating that it is continuous beneath the area. The Topanga Formation, Tertiary age sedimentary rocks, is represented in the Raymond Basin by fairly well bedded shales, sandstones, and conglomerates that are well consolidated. The exposed Topanga beds are limited to the southwesterly corner of the area along a fault block where the formation is exposed for a mile in the channel of Arroyo Seco just north of the Raymond Fault and for about one and one-quarter miles easterly from the Arroyo Seco to Raymond Hill (RBMB, 2016).

The CDWR (1966) characterized the water-bearing formations of the Raymond Basin as alluvial fill having characteristics of the coarse deposits found in the small basins near the mountain margins. The deposits are coarsest at the base of the mountains where they contain boulders several feet in diameter, but even in the southerly part of the basin, cobbles, stones, and boulders are not uncommon. There are practically no true sand beds in the northerly part of Raymond Basin. The average sand content in the basin sediments as determined from well logs is only 2.8 percent. The deposits are characterized throughout by an abundance of weathered material. Decomposed yellowish gravels, clayey yellow and red gravels, and red or brown residual soil clays are the typical deposits.

The older alluvium found within the area is nearly continuous along the entire southerly flank of San Gabriel Range with little change in composition or structure. Within the Raymond Basin, it constitutes practically all of the water-bearing series and is not only dominant at the surface but appears to continue with depth to bedrock, although at depth, it may be in contact with some of the late Tertiary sediments. The older alluvial fill consists of a small portion of sand and almost equal proportions of gravel and clay. Older alluvial fill is of great thickness and its deposition has occurred through a long period. Weathering, disintegration, and cementation have been continuous and the results have varied with local conditions and there is considerable spatial variation in the water yielding characteristics of this formation (RBMB, 2016).

Recent alluvium occupies channels, washes, and flood plains of Arroyo Seco, Eaton Creek, and Big and Little Santa Anita Creeks, and to a lesser extent, exists as veneers scattered along the slope of the valley resulting from flood discharges of intermittent streams (Exhibits 13 and 14). For the most part, the recent alluvium is believed to be shallow, but in the upper portions of Little Santa Anita Wash, the indications are that the recent alluvium may extend to a depth of about 150 feet. These sediments are similar to those found in the older alluvium but contain a much smaller proportion of clay and are unconsolidated.

10.2.2 Structural Features and Faults

According to the CDWR (1943), the geologic structure of Raymond Basin is complicated. The rough surface topography of the Basement Complex outside the area indicates that the bedrock floor beneath the alluvium undulates, although the present mountain block undoubtedly exhibits a more rugged topography due to its recent rejuvenation with accompanying accentuation of erosive forces, then the old erosion surface was buried and protected by alluvial deposits of the area. However, within the area, except at the boundaries, and the granitic protrusions at Monk Hill and near the north end of Eaton Wash, there is no surface expression of undulations of bedrock which might indicate possible impediments to groundwater movement.

The San Gabriel Fault cuts through the central portion of San Gabriel Mountains and has an east-west trend. It is one of the main faults in the mountain block but is so distant that its effect upon the Raymond Basin area is only indirect (RBMB, 2016).

The Sierra Madre Fault system is a broad zone of faulting with an east-west trend roughly parallel to the southern edge of the San Gabriel Mountains, swinging to the northwest in the vicinity of the City of Sierra Madre. The main trace of this zone leaves the southern edge of the foothills at a

point west of the mouth of Eaton Wash, penetrating the mountain block in a north-westerly direction for some distance before it again swings to the west. The bedrock contours as a result of the geophysical survey indicate a uniform northerly slope of the buried bedrock surface from San Rafael Hills (RBMB, 2016).

Hydrogeologic investigations and groundwater modeling work at the Jet Propulsion Lab (JPL) (NASA, 2003) identified a thrust fault crossing Arroyo Seco just as Arroyo Seco enters the Raymond Basin. Preliminary work indicated that the fault was a partial barrier to groundwater flow.

The Raymond fault forms the boundary between the Raymond Basin and the Main San Gabriel Basin from the City of South Pasadena on the west to the City of Monrovia on the east. It is likely a thin, impervious gouge formed in alluvium because it creates a several hundred-foot difference in water level elevation in approximately 2,700 feet between Del Mar Well of California American Water Company and Well No. 3 of San Gabriel County Water District (RBMB, 2016). In addition to the difference in water level elevation, the barrier effect of the Raymond fault is indicated by the presence of artesian conditions during periods of high water levels, and by the creation of ponds and swampy areas north of the fault line. The Raymond fault appears to impede groundwater movement southward from the Raymond Basin into the Main San Gabriel Basin (RBMB, 2016).

10.3 WATER RESOURCES

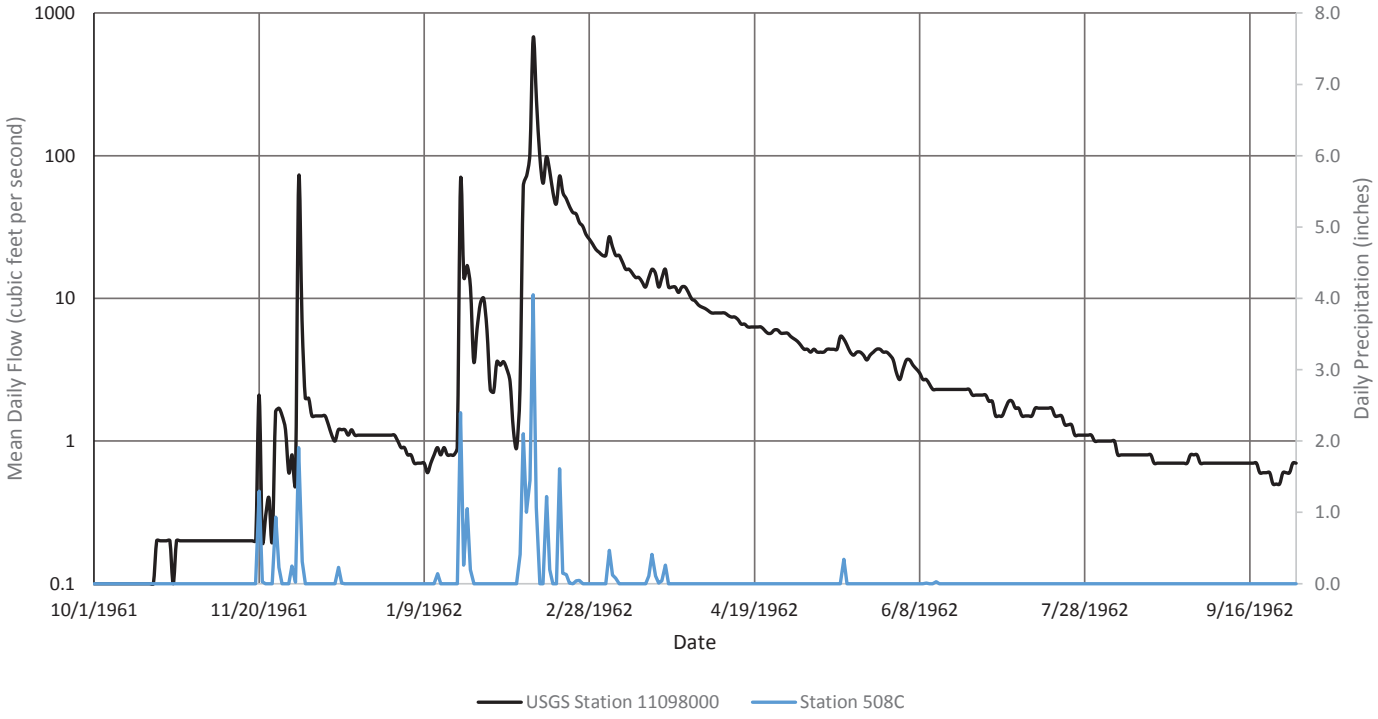
10.3.1 Precipitation

The Raymond Basin is located within a region of both semiarid and Mediterranean climate, with warm, dry summers and mild winters with intermittent rain. The majority of the annual rainfall occurs between December and March. Precipitation in the Arroyo Seco area has been monitored by a network of precipitation stations operated by Los Angeles County, Department of Public Works (LACDPW). Annual precipitation within the Raymond Basin is more variable in the mountain watershed than in the valley floor. The mountain watershed (28.40 inches) averages about 7 inches more annual precipitation than the valley floor (21.33 inches) (RBMB, 2016).

As previously indicated, RBMB (2016) conducted an evaluation of precipitation in both the mountain areas and the valley floor areas and noted about 7 inches of more precipitation in the mountain region. No existing operational precipitation gages are located in the upper portion of Arroyo Seco, however an historic gage was located at the Arroyo Seco Ranger Station (LA County gage 508C) and operated from 1914 to 1974 (see Exhibit 13). A comparison was made with LA County gage 175 (La Canada Irrigation District) to find an average year for precipitation during the same period that LA County gage 508C was operational. The period selected was October 1961 to September 1962 where LA County gage 175 recorded 26.00 inches (20-year average was 26.96 [as reported by RBMB, 2016]) and LA County gage 508C recorded 24.75 inches and is presented in Exhibit 15.

10.3.2 Surface Water

The entire Raymond Basin area lies within the watershed of the Los Angeles River (CDWR, 1966), and surface runoff from the San Gabriel Mountains enters the area through numerous streams, principally the Arroyo Seco, Eaton Wash, and Santa Anita Wash. About one-third of the surface runoff is conveyed by the Arroyo Seco, the largest of the streams, which flows across the Monk Hill Subarea and the Pasadena Subarea, and joins the Los Angeles River by cutting through the San Rafael Hills. Outflow from the western portion of the Monk Hill Subarea reaches the Los Angeles River through the Verdugo Wash. The balance of the surface runoff primarily flows in



Precipitation Reported from LA County Gage 508C

Exhibit 15

Arroyo Seco Diversion Hydraulics Analysis

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Eaton Wash and the Santa Anita Wash to the Rio Hondo and ultimately drains to the Los Angeles River.

The U.S. Geological Survey (USGS) maintains a surface water gaging station no. 11098000 and referred to as Arroyo Seco near Pasadena, CA (see Exhibit 13). Table 2 provides the mean monthly flow, measured by the USGS gage at the Arroyo Seco site.

TABLE 2
MONTHLY MEAN FLOW FOR ARROYO SECO NEAR PASADENA, CA
(USGS STATION NO. 11098000)

	Mean Monthly Flow (cubic feet per second)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1911				27.7	9.55	4.37	1.78	1.04	3.6	2.38	1.86	1.7
1912	1.9	1.5			15	9.94	2.77	0.565		0.694	0.66	0.642
1913	7.66			4.08	2.36	1.62	0.942	0.561	0.253	0.51	5.12	4.82
1914	131.9	343.8	46.8	16.9	9.18	5.62	2.23	1.52	1.77	1.58	0.667	12.9
1915	22.5	64.1	16.6	9.3	11.9	4.75	1.37	0.755	0.82	0.765	1.72	
1916				9.73	6.16	3.07	1.36	0.894	0.827	5.8	2.57	15.4
1917	12.9	25.5	16	7.05	5.25	2.02	0.59	0.365	0.14	0.213	0.54	0.89
1918	1.02	11.6	62.7	9.08	3.97	1.71	0.561	0.284	0.403	0.552	1.89	4.2
1919	1.54	6.18	6.22	2.19	1.77	0.69	0.1	0.1	0.24	0.639	0.91	4.47
1920	1.52	6.93	29.2	10.3	3.66	1.73	0.4	0.074	0.127	0.271	0.8	1.12
1921	4.85	3.11	12.2	2.94	17.7	6.89	1.7	0.242	0.2	0.326	0.427	132.4
1922	74.3	111.5	49.8	28.4	15.2	7.45	3.34	1.69	0.877	1.11	3.21	15.6
1923	5.37	9.23	5.78	7.03	3.04	1.74	0.413	0.268	0.273	0.358	0.543	0.784
1924	1	0.934	4.54	3.91	1.19	0.36	0.2	0.129	0.16	0.197	0.387	0.871
1925	0.813	1.08	1.8	10.2	1.43	0.843	0.1	0	0	0.171	0.253	1.02
1926	0.79	15.6	1.77	76.3	5.96	1.76	0.745	0.077	0	0	1.69	2.73
1927	2.11	75.3	18.9	9.23	4.72	2.44	0.713	0.1	0.1	0.271	1.27	3.74
1928	2.71	7.13	2.35	1.99	1.14	0.36	0.1	0.048	0.05	0.048	0.2	1.86
1929	1.69	3.1	5.63	8.53	1.31	0.59	0.081	0	0	0.048	0.07	0.139
1930	3.03	0.964	11	1.97	7.5	1.39	0.165	0.019	0.02	0.071	0.427	0.665
1931	1.62	13	1.42	4.49	2.35	0.907	0.045	0.019	0.01	0.061	0.473	9.47
1932	5.3	56.2	9.94	4.27	2.57	1.45	0.145	0.019	0.04	0.071	0.087	0.255
1933	22.5	10.9	5.68	3.14	2.1	0.943	0.181	0.019	0.02	0.1	0.06	7.36
1934	24.6	9.61	4.27	1.55	0.574	0.707	0.145	0.052	0.02	4.48	2.5	43.7
1935	26	15.9	10.5	30.6	8.6	3.77	1.67	1.37	0.28	0.468	0.903	1.29
1936	1.19	40	7.77	5.99	2.43	1.2	0.213	0.1	0.1	1.31	1.01	15.5
1937	19	63.7	54.1	25.7	10.9	5.64	2.31	1.1	0.757	0.858	1.26	3.82
1938	4.43	51.9	234.5	29.3	17	8.73	5.56	2.9	1.92	2.26	2	30.1
1939	8.98	7.05	8.79	4.84	3	1.64	0.926	0.539	7.33	3.09	1.51	1.75
1940	12.5	25.8	8.87	7.15	3.01	1.52	0.6	0.432	0.317	0.626	0.997	9.09
1941	5.35	126.9	132.5	91.5	30	13.4	7.44	4.58	3.59	3.64	3.39	7.88
1942	5.03	4.54	4.28	5.39	2.8	1.82	0.839	0.839	0.687	0.7	0.973	1.35
1943	123.2	65.2	107.1	24.4	12.6	7.65	4.41	3.47	2.19	2.32	2.35	12.9
1944	7.34	77.9	79	21.1	10.5	7.32	3.67	2.58	2.37	2.06	21.9	4.76
1945	3.67	26	16.3	10.8	5.39	3.61	1.93	1.21	0.907	1	1.54	20.8
1946	4.16	5.5	19.7	18.5	6.02	2.28	1.35	0.777	0.513	1.82	26.6	28.7
1947	16.1	7.31	5.99	4.56	2.65	1.93	1.15	0.558	0.567	0.706	0.77	1.81

TABLE 2
MONTHLY MEAN FLOW FOR ARROYO SECO NEAR PASADENA, CA
(USGS STATION NO. 11098000)

	Mean Monthly Flow (cubic feet per second)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1948	1.4	2.5	4.15	4.04	2.04	1.32	0.552	0.345	0.19	0.284	0.327	0.987
1949	3.35	3.49	5.89	2.16	2.29	1.25	0.465	0.245	0.18	0.226	1.53	3.41
1950	4.63	6.38	3.14	2.8	1.72	0.927	0.394	0.219	0.203	0.187	0.307	0.535
1951	1.3	1.5	1.47	1.55	1.12	0.613	0.194	0.148	0.137	0.245	1.4	9.58
1952	65.7	9.86	52.8	26.9	11.3	5.73	2.83	1.83	1.02	0.861	2.63	5.44
1953	5.76	2.03	2.12	1.96	1.45	1.12	0.59	0.248	0.317	0.265	0.31	0.506
1954	13.3	9.98	11.7	8.46	3.33	1.73	0.771	0.213	0.1	0.11	0.107	0.906
1955	5.57	2.99	3.46	2.09	4.38	1.12	0.368	0.029	0.023	0.087	0.183	0.897
1956	18.5	3.92	2.04	4.86	3.62	1.19	0.255	0.048	0	0.1	0.113	0.4
1957	3.65	4.23	4.03	1.93	4.1	0.81	0.077	0.019	0	0.155	0.627	8.64
1958	5.98	42.2	34.2	77.8	11.3	5.22	2.35	1.25	0.693	0.758	1.07	1.14
1959	3.38	14.7	2.89	1.96	1.21	0.413	0.081	0.023	0.053	0.097	0.277	0.777
1960	2.86	3.24	2.06	2.06	1.04	0.423	0.042	0.048	0.01	0.087	5.34	1.1
1961	2.12	1.4	1.16	0.69	0.503	0.35	0.152	0.1	0.127	0.126	0.48	3.6
1962	5.39	72.3	15.9	6.99	4.36	2.52	1.47	0.803	0.657	0.981	0.857	0.984
1963	1.18	11.2	3.81	4.59	3.25	2.25	0.803	0.426	0.46	0.813	2.25	0.994
1964	4.17	1.72	2.68	6.79	1.95	0.953	0.458	0.174	0.2	0.119	1.26	2.22
1965	1.7	1.44	1.27	21.8	3.59	2.05	0.752	0.384	0.66	0.674	97.4	55.6
1966	36.6	18.9	11.3	6.5	5.41	3.34	2.59	1.76	2.02	2.05	4.76	62.8
1967	29.6	19.3	43.5	51.2	31.9	15.8	9	6.25	4.57	3.56	25.2	10.2
1968	7.27	9.37	11.8	6.66	5.19	2.96	1.87	1.58	1.56	1.65	2.1	1.91
1969	251.1	249.4	115.6	33.2	16.2	13.4	10.7	6.18	4.74	5.28	5.74	5.06
1970	5.17	13.1	20.5	4.83	2.96	2.3	1.55	1.13	1.01	1.06	14.8	19.3
1971	9.67	7.44	6.86	5.22	4.15	2.86	1.56	1	0.834	1.17	1.7	10.5
1972	3.66	2.05	1.87	1.38	1.1	0.555	0.311	0.3	0.472	0.518	2.67	3.21
1973	7.14	59.6	36.1	13.1	7.28	4.73	2.29	1.5	1.33	1.51	3.56	2.49
1974	31.5	5.71	24	7.84	4.63	2.28	1.37	0.997	0.658	1.13	1.38	3.33
1975	1.83	3.91	18.2	8.16	4.19	1.9	0.849	0.491	0.304	0.481	0.754	0.865
1976	0.866	13.6	8.58	3.26	1.56	0.821	0.339	0.286	8.26	1.55	1.35	1.16
1977	8.72	2.24	2.02	1.32	9.72	1.65	0.475	0.351	0.22	0.25	0.347	11.7
1978	37.6	96.3	188.8	59	23.1	10.5	5.86	4.2	3.81	2.8	4.7	7.19
1979	19.7	20.3	15.2	21	7.71	4.24	2.34	1.22	1.4	2.26	2.01	1.95
1980	30.5	188.7	85.2	22.5	15.1	8.51	4.35	3.19	2.68	2.42	2.38	3.08
1981	7.65	4.14	12.3	4.48	2.87	1.47	0.529	0.388	0.374	0.662	2.28	1.91
1982	8.42	4.1	36.6	30.9	5.24	3.33	1.59	0.679	1.14	1.19	12.8	22
1983	28.5	61	210.7	59.5	48	19.2	10.4	7.7	7.03	8.54	8.56	14.8
1984	7.81	5.52	4.54	2.93	1.78	1.33	0.817	0.583	0.596	0.747	2.73	17.5
1985	5.67	4.92	4	2.48	1.73	0.905	0.341	0.227	0.304	0.384	5.08	3.33
1986	6.53	25.2	24.9	9.54	4.16	1.95	0.735	0.412	1.28	1.27	1.65	1.58
1987	2.8	2.49	3.22	1.49	0.744	0.429	0.247	0.122	0.136	3.01	7.68	5.23
1988	8.85	6.51	9.24	12.9	5.13	2	0.6	0.31	0.207	0.231	0.891	8.47
1989	3.45	10.8	3.41	1.47	1.02	0.686	0.238	0.165	0.197	0.191	0.288	0.405
1990	2.34	5.23	1.85	1.34	0.631	0.39	0.075	0.037	0.026	0.026	0.07	0.124

TABLE 2
MONTHLY MEAN FLOW FOR ARROYO SECO NEAR PASADENA, CA
(USGS STATION NO. 11098000)

	Mean Monthly Flow (cubic feet per second)											
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
1991	0.575	5.7	34.2	10.7	2.93	1.31	1.22	0.605	0.354	0.272	0.534	2.69
1992	7.5	88.8	76.4	32.6	12.2	5.1	4.16	1.42	0.988	2.93	2.06	14.4
1993	181.3	190.5	71.5	27.3	15	10.1	5.92	4.22	2.56	2.28	2.71	3.75
1994	3.93	9.34	6.58	4.21	3.25	1.45	0.523	0.387	0.278	0.674	1.54	1.58
1995	86.4	46.3	101	28.6	14.4	9.31	4.16	1.87	2.12	1.68	1.84	2.34
1996	3.08	38.5	23.8	7.45	3.36	1.49	0.561	0.42	0.279	0.406	2.6	14.7
1997	22.4	12.4	5.45	2.89	1.13	1.35	0.426	0.322	0.277	0.285	1.54	4.69
1998	5.32	141.1	34.6	40.3	77.1	22.9	9.32	5.06	4.15	3.29	3.54	3.43
1999	3.9	5.61	3.59	5.69	2.61	1.9	0.704	0.393	0.303	0.313	0.494	0.804
2000	1.12	19.7	14.3	7.77	3.18	1.16	0.463	0.227	0.191	0.326	0.433	0.75
2001	3.43	19.9	19.1	6.81	2.35	0.913	0.328	0.189	0.117	0.144	0.39	1.15
2002	1.94	1.51	1.02	0.631	0.449	0.276	0.146	0.124	0.091	0.123	1.04	2.16
2003	1.23	10.8	8.91	6.56	5.61	1.9	0.4	0.183	0.093	0.099	0.234	1.95
2004	1.26	10.4	5.31	1.45	0.501	0.314	0.126	0.042	0.032	19.1	4.09	32.4
2005	268.1	191.7	64	23.4	15.4	8.56	4.76	2.46	2.08	3.35	2.86	2.79
2006	14.2	9.29	15.2	26.8	7.74	2.91	1.01	0.676	0.426	0.502	0.637	1.35
2007	1.43	2.06	1.64	1.12	0.563	0.292	0.256	0.193	0.223	0.311	0.234	1.57
2008	60.6	17.6	7.04	3.48	2.14	1.11	0.583	0.214	0.097	0.108	0.395	2.39
2009	1.72	18.9	4.02	1.99	0.974	0.894	0.301	0.126	0.346	0.98	3.23	10.8
2010	34.9	48.8	19.3	22.7	7.2	6.37	4.11	2.69	2.82	3.8	3.51	63.5
2011	29.3	22.6	45.8	36.3	16.1	10.4	5.96	4.11	3.24	4.31	3.8	3.47
2012	3.36	2.93	9.76	9.79	3.37	1.96	1.19	0.82	0.876	0.998	1.56	4.19
2013	3.31	3.27	3.19	1.4	1.47	0.89	0.616	0.439	0.349	0.391	0.43	0.96
2014	0.9	7.3	9.13	1.76	0.822	0.485	0.331	0.319	0.278	0.148	0.237	3.64
2015	2.2	3.27	1.15	0.505	0.846	0.463	7.43	0.335	0.391	0.38	0.352	0.642
2016	5.7	2.66	3.68	1.91	1.31	0.526	0.516	0.228	0.211	0.288	0.217	2.34
2017	28.4	27.3	8.84	4.34	3.48	0.993	0.481	0.177	0.124	0.172	0.216	0.327
Mean	19.6	31.6	25.8	13.3	6.8	3.3	1.7	1.0	1.0	1.3	3.4	8.6

Blank spaces are missing data.

Source: Derived from USGS, 2018.

The majority of the runoff occurs between December and May with the remainder of the period with average monthly flows generally less than 5 cubic feet per second (cfs). The maximum flow measured with the USGS gage, for the period of record (1911 through 2017), was 8,620 cfs (on March 2, 1938) (USGS, 2018). While the largest responses to flow generally occur from precipitation events, the stream maintains flows during non-rainfall periods indicating that it derives some of its flow from springs, groundwater inflow and other sources, such as storm drain outlets.

A comparison was made for an average precipitation period (see Precipitation section) with the daily mean streamflow for USGS station 11098000, Arroyo Seco near Pasadena, CA and presented in Exhibit 15. The comparison indicates the Arroyo Seco quickly responds to precipitation events in excess of 0.5 inches per day which occur between mid-October through February. By mid-March, the stream goes into a baseflow condition declining from 10-20 cfs to

approximately 1 cfs in late summer. This is probably related to the delayed discharge from the fractured bedrock groundwater discharging to the shallow alluvium found in the mountainous portion of Arroyo Seco.

10.3.3 Groundwater

The Raymond Basin is a structural basin filled with permeable alluvial deposits, which is underlain and surrounded by relatively impermeable rock. The Basin aquifer is stratified in some areas by confining or semi-confining layers consisting of impermeable or less-permeable materials such as clay or silt. In these areas, the Basin aquifer is an aquifer system that may include an unconfined or water-table aquifer overlying individual confined or artesian aquifers separated by semi-confining or confining layers. In general, the Basin aquifer is classified as an unconfined to semi-confined aquifer system because the semi-confining or confining layers are not continuous across the Basin (RBMB, 2016).

The base of the water bearing zones is considered bedrock with elevations ranging from approximately 500 feet below sea level to 2,000 feet above mean sea level. The Raymond Basin is divided into three separate hydrologic sub-areas: the Pasadena Subarea, the Santa Anita Subarea, and the Monk Hill Subarea (MHSA) (see Exhibit 16, Groundwater Subareas within the Raymond Groundwater Basin). The diversion point lies just outside of the MHSA while the spreading grounds lie just inside the eastern edge of the MHSA adjacent to the City of Pasadena production wells. Downgradient of the MHSA, groundwater elevations range from 500 to 900 feet above mean sea level (msl) and have a southern flow direction, which then curves to the southeast in the southern part of the basin. The direction of groundwater flow within the basin varies depending on the subarea. Estimates of regional hydraulic gradient range between 40 and 200 feet per mile (0.008- to 0.04-foot/foot) (RBMB, 1985). The total storage capacity of the Raymond Basin is estimated to be approximately 1.37 million acre feet (maf). The amount of water in storage in 2003 was approximately 800,000 af with an unused storage space of about 570,000 (RBMB, 2016).

The Raymond Groundwater Basin is an adjudicated groundwater basin managed by Raymond Basin Management Board. The adjudication (originally completed in 1944 and amended over the years) determined who had a right to extract water and the maximum annual amount of water allowed to be pumped by each producer. This “safe yield” concept allows an annual fixed amount of water to be used by the 16 water producers served by the Raymond Basin (RBMB, 2016 and 2018).

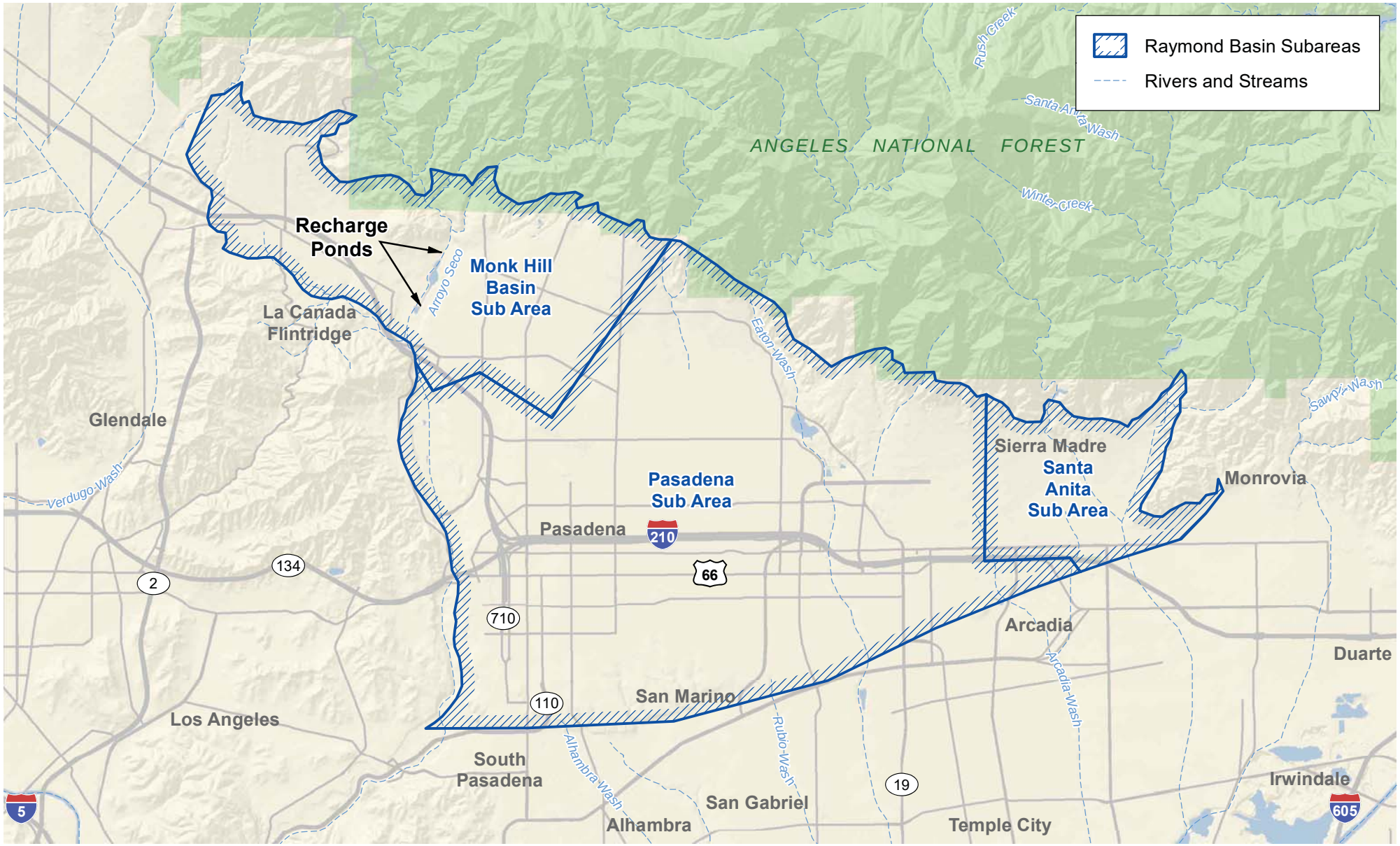
Groundwater Levels and Flow

Groundwater levels in the Raymond Basin range from about 350 feet above Mean Sea Level (MSL) in Santa Anita Subarea to more than 1,050 feet above MSL in the MHSA. Groundwater generally flows southeast from the MHSA in the northwest to the Raymond fault in the southeast (RBMB, 2016).

Monk Hill Subarea

Groundwater levels in the MHSA have fluctuated, but remained relatively stable since 2000 (RBMB, 2016). In general, groundwater flows from the MHSA into the Pasadena subarea (RBMB, 2016).

NASA (2003) reported that the water table elevation varies significantly over the JPL site, which is located immediately west of Arroyo Seco, by as much as 130 feet. The groundwater elevation high point was measured in MW-1, located at the mouth of the Arroyo Seco. The significant



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Groundwater Subareas within the Raymond Groundwater Basin

Exhibit 16

Arroyo Seco Diversion Hydraulics Analysis

N W E S

1.6 0.8 0 1.6 Miles

PSOMAS

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change in average hydraulic head between the monitoring wells located near the mouth of the Arroyo Seco and the monitoring wells to the southwest and west of the mouth of the Arroyo Seco. The change in flow regime across this area, significant difference in water levels over the relatively short distance, and lack of response of water levels near the mouth of the Arroyo Seco to pumping suggests the presence of either a very low conductivity area within the mouth of the Arroyo Seco or a hydraulic barrier that affects groundwater flow from this area (NASA, 2003).

Subsurface Flow

CDWR (1966) addresses subsurface inflow from the Raymond Basin into the Main Basin and states in part "…*Underflow into San Gabriel Valley across the Raymond fault varied from 2,000 to 12,000 acre-feet per year during the base period [from 1943-44 to 1959-60]. This subsurface flow did not occur at the same rate along the length of the fault, but varied from west to east. The lowest rates occurred near the western edge of the basin where the Raymond fault constitutes a nearly impervious barrier to groundwater movement, and the highest rates occurred near Santa Anita where the barrier effect is negligible. Estimates of underflow across the Raymond fault were based on values of groundwater gradients between water levels north of the fault."*

Monk Hill Subarea

Subsurface inflow from the Verdugo Basin into the MHSA has ranged from 890 acre-feet to 3,990 acre-feet over the period from 1994-95 to 2011-12. The long-term (31-year) average annual subsurface inflow has been 2,270 acre-feet. Subsurface outflow from the MHSA into the Pasadena Subarea has ranged from 5,750 acre-feet to 7,270 acre-feet over the period 1994-95 through 2011-12. The mean subsurface outflow to the Pasadena Subarea was 6,700 acre-feet (RBMB, 2016).

Groundwater Recharge

Monk Hill Subarea

Artificial recharge of the MHSA historically has occurred as a result of infiltration of stormwater runoff and, to a lesser degree, injection of treated imported water. Artificial recharge (through the spreading grounds) has ranged from 450 acre-feet to 9,700 acre-feet during the period of 1994-95 through 2011-12. Injection of treated imported water has ranged from zero acre-feet to 1,480 acre-feet during the period of 1994-95 through 2011-12. Average combined annual recharge from artificial recharge and injection has been 3,400 acre-feet (RBMB, 2016).

Accordingly, the diversion of water from Arroyo Seco north of the MHSA into the spreading grounds that are located inside of the MHSA has caused a mounding effect in the groundwater table in the MHSA (NASA, 2003).

10.4 GROUNDWATER CONCLUSIONS

Both surface water of Arroyo Seco and groundwater in the underlying alluvium of Arroyo Seco drainage north of the MHSA eventually discharge into the Monk Hill Subarea. The diversion of water upgradient of the MHSA from Arroyo Seco and placement into the Arroyo Seco spreading grounds (in the MHSA) adjacent to the existing Pasadena production wells is essentially assisting in the enhancement of groundwater replenishment and management of the Raymond Basin which is consistent with the requirements of the adjudicated Raymond Groundwater Basin. **As a result, it is unlikely that groundwater levels within close proximity of riparian resources would have any measurable effect on rootzones because of the relative depth of the groundwater.**

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ATTACHMENT A

TOPOGRAPHY

A link to allow download of this data can be provided upon request.

ATTACHMENT B

HEC-RAS MODELS

A link to allow download of this data can be provided upon request.

ATTACHMENT C

SAM MODELS

A link to allow download of this data can be provided upon request.

ATTACHMENT D

PRELIMINARY GEOLOGIC MAP OF THE LOS ANGELES QUAD

Preliminary Geologic Map of the Los Angeles 30’ x 60’ Quadrangle, California

Version 2.0

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INTRODUCTION

The Los Angeles 30’ x 60’ quadrangle covers approximately 5,000 km^2 including much of the densely populated urban and suburban areas of the southern California megalopolis. The quadrangle is about 90 km east-west and about 55 km north-south, extending from Fillmore and Thousand Oaks in the west to Acton in the northeast and Montebello in the southeast. It covers the urban San Gabriel Valley and San Gabriel Mountain foothill communities from Monrovia to Pasadena, as well as Glendale, downtown Los Angeles, Hollywood, Santa Monica, Malibu, and all the communities in the San Fernando Valley, Simi Valley, and the upper Santa Clara River Valley. Population of these urban and suburban areas, as listed in the 2000 Census, totals approximately 5.6 million, and property value is estimated to total hundreds of billions of dollars. The quadrangle also includes large areas of wilderness in the Angeles and Los Padres National Forests, the Santa Monica Mountains National Recreation Area, and the Sespe Condor Sanctuary. The relief in the quadrangle ranges from about a hundred meters subsea (in Santa Monica Bay) to more than 2,000 meters above sea level at Pacifico Mountain in the high San Gabriel Mountains. Residents and visitors are subject to potential hazards from earthquakes, debris flows and other landslides, floods, wildfires, subsidence from ground water and petroleum withdrawal, and swelling soils; and coastal areas are exposed to flooding and erosion by storm and tsunami waves. This geologic map is intended to illustrate the distribution of the rocks and surficial deposits of the area and their structural and stratigraphic relations to one another. It provides a regional geologic framework as an aid to better evaluations of the potential for hazard from active earth processes. As a digital product it includes some areas mapped in greater detail than others; however, it is not sufficiently detailed to serve as a basis for site-specific evaluations.

SOURCES OF GEOLOGIC MAPPING

The map has been compiled from many scientific studies in different parts of the quadrangle, and represents the work of many geologists. Compilation of the Los Angeles 30’ x 60’ quadrangle was completed by Yerkes and Campbell (2005) and published by the U.S. Geological Survey. That map, which can be considered version 1.0 of the digital geologic map of the Los Angeles 30’ x 60’ quadrangle, involved digitization of original field mapping, and digitization and assembly of numerous published and unpublished source geologic maps. This effort, led by Robert Yerkes between 1985 and completion of the map in 2005, provides a foundation for the additions and further refinement presented here.

This map, version 2.0 of the digital geologic map of the Los Angeles 30’ x 60’ quadrangle, represents an update of the map by Yerkes and Campbell with extensive revisions and additions. Many of these revisions and additions resulted from studies by the California Geological Survey to define Seismic Hazard Zones, where development must consider the potential hazards from liquefaction and earthquake-induced landslides. The listing of sources of geologic mapping below includes geologic maps that were used by Yerkes and Campbell (2005), additional geologic maps included in this compilation, and reports describing the liquefaction zoning and earthquake-induced landslide zoning for each quadrangle. Although the Seismic Hazard Zone Reports referenced below are focused on the details of delineation of the hazard zones, virtually all reports resulted in revised mapping of some geologic units. Revised mapping of younger Quaternary units, including the contact between late Quaternary alluvium and

bedrock, was a focus of the seismic hazard zoning effort because these contacts can define the boundaries of Liquefaction Hazard Zones. New mapping of Quaternary units was generally based on geomorphic expression, supplemented by descriptions of the subsurface materials in numerous boreholes from throughout the valley areas (Wills and Hitchcock, 1999, Hitchcock and others, 1999). Quaternary units are designated using the terminology of Matti and Cossette (2007).

The process of creating earthquake-induced landslide zoning resulted in compilation of bedrock units that in some cases differed from the compilation of Yerkes and Campbell (2005). This effort also included re-mapping of landslides for the region, except for areas within National Forests. In preparing this compilation, we have used the compilations from the Seismic Hazard Zonation Program, reconciled those with the source maps used by Yerkes and Campbell (2005), added additional detail based on source maps not used by either the Seismic Hazard Zonation Program or Yerkes and Campbell (2005) and added selected landslides mapped by the Seismic Hazard Zonation Program. Due to the scale of this map, most small landslides and all landslides considered "questionable" in the original landslide inventories are not shown. CGS landslide inventory maps, and related 1:24,000-scale maps, show a more complete depiction of landslides. Landslides that are too small to show on 1:24,000-scale maps can be hazardous and damaging, so no regional map should be used to evaluate the landslide hazard to a particular location or parcel.

In addition to revisions to geologic contacts based on the Seismic Hazard Zonation Program, this map includes extensive revisions to the crystalline bedrock of the San Gabriel Mountains. Yerkes and Campbell (2005) completed a generalized compilation of the San Gabriel Mountains. In their compilation, they modified the nomenclature of the basement rock units to conform with the IUGA Subcommission on Systematics of Igneous Rocks (Streckheisen, 1973), and to provide continuity with the compilation in the San Bernardino 30' x 60' quadrangle (Morton and Miller, 2003), which adjoins the Los Angeles 30' x 60' quadrangle on the east. They did not, however, attempt to reconcile the various more detailed maps of this area. For this compilation, we have attempted to use as much detailed original mapping as possible and describe the units in as much detail as possible. Where the detailed mapping and unit descriptions are from a single source, such as within the anorthosite complex described by Carter (1980, 1982), this map represents a complete, consistent interpretation. In other areas, detailed mapping and description of map units are lacking or are provided by different authors who had differing interpretations. In some cases, we have extended units described by one author based on contacts by another. Although the resulting compilation is more detailed than that by Yerkes and Campbell (2005), there are significant areas where map unit boundaries, descriptions, and correlations could be improved by new mapping.

In addition to the major updates noted above, CGS has updated numerous other local areas based on map sources not used in the map by Yerkes and Campbell (2005). These more local updates include new mapping of parts of the active Hollywood, San Cayetano, and Simi Faults, updates to mapping and stratigraphy of the Plio-Pleistocene sedimentary rocks of the Ventura basin (see Appendix A), and updates to the Tertiary units in the Soledad basin.

The major sources of mapping are listed below by the 7.5-minute quadrangles shown in Figure 1. Sources are underlined if they are a major source of geologic unit boundaries shown on this compilation, and in italics if they were not used in the compilation by Yerkes and Campbell (2005). Seismic Hazard

Zone (SHZ) Reports for each quadrangle are also listed, along with landslide inventory maps that resulted from the Seismic Hazard Zonation Program, which are published as part of the CGS Landslide Inventory Map Series (LSIM).

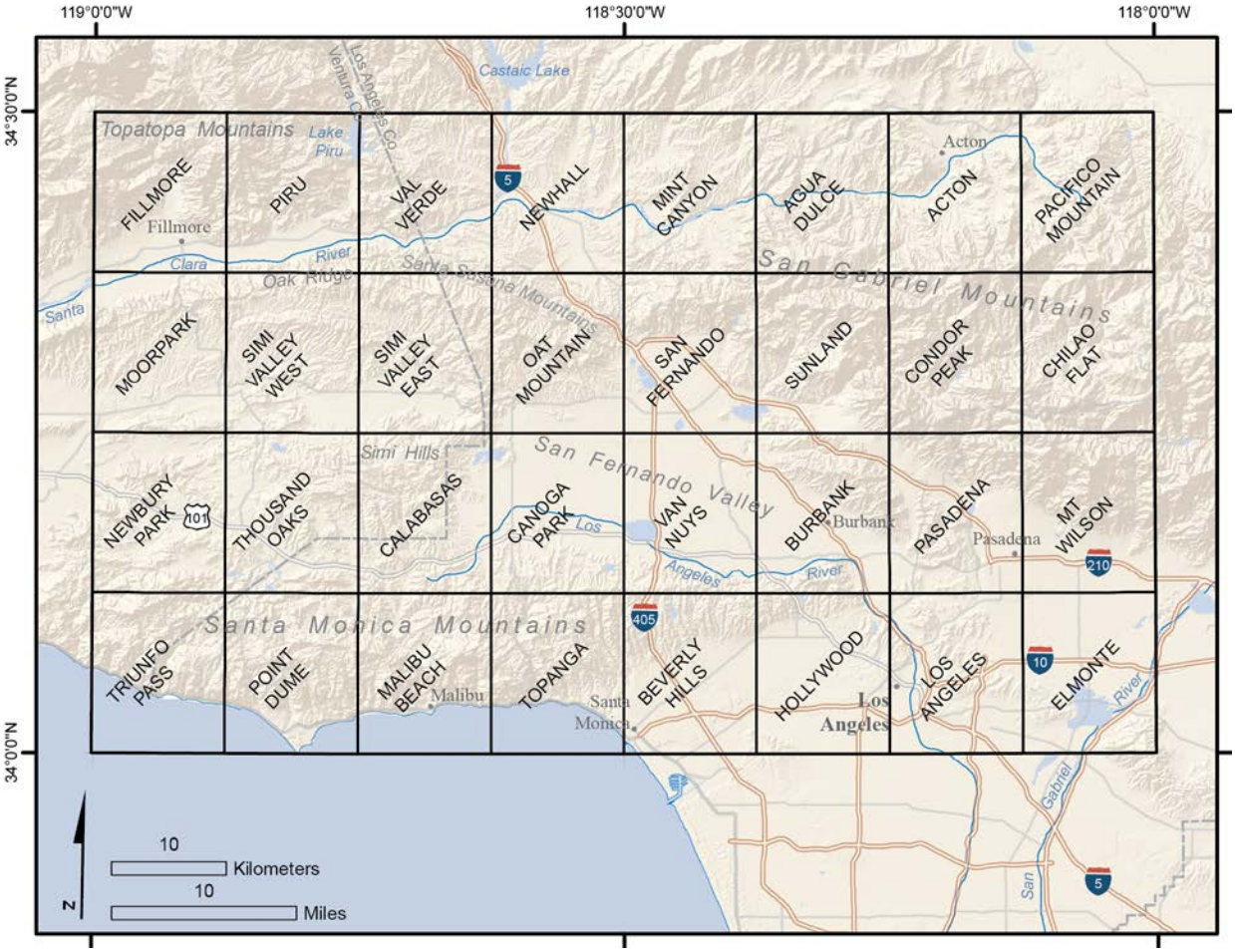


Figure 1. Index map of 7.5 minute quadrangles within the Los Angeles 30'x60' quadrangle.

Acton: Carter, 1980; *Dibblee, 1996a*; Ehlig, 1981; Jahns and Muehlberger, 1954; Morton and Streitz, 1969.
SHZ Reports: Mattison, and Hernandez, 2003a; Wilson, and Hernandez, 2003a, LSIM Series: Hernandez, 2006a.

Agua Dulce: Carter, 1980*; Dibblee, 1996b*; Jahns and Muehlberger, 1954; Morton and Streitz, 1969; Oakeshott, 1958.
SHZ Reports: Mattison and others 2003a; Wilson and others, 2003a; LSIM Series: Hernandez, 2006b.

Beverly Hills: *Dibblee, 1991a*; Hoots, 1931; Hsu and others, 1982; Poland, and others, 1959; Tinsley and others, 1985.
SHZ Reports: DeLisle 1998; Silva and Irvine, 1998a.

Burbank: Dibblee, 1991b, 1991e*; Hitchcock and Wills, 2000*; Hoots, 1931*; Jennings and Saul, 1969*; Lamar, 1970; *Neuerburg, 1953*; Weber, 1980.
SHZ Reports: Wills and Barrows, 1998a; Silva and others, 1998; LSIM Series: Treiman and Wills, 2013.

Calabasas: *Hitchcock and Wills, 2000*; Squires, 1983a; Weber, 1984; Yerkes and Showalter, 1993.
SHZ Reports: Wills and Barrows, 1997a; McCrink and others, 1997c.

Canoga Park: *Hitchcock and Wills, 2000*; Hoots, 1931; Soper, 1938; Weber and Frasse, 1984; Weber, 1983; Yeats and Shields, 1977b; Yerkes and Campbell, 1995a.
SHZ Reports: Wills and Barrows, 1997b; Silva and Irvine, 1997.

Chilao Flat: *Carter, 1980; Barth, unpublished; Dibblee, 2002a*; Ehlig, 1981; Powell and others, 1983; Morton and Streitz, 1969.

Condor Peak: *Carter, 1980*; Crook, and others, 1987*; Dibblee, 2002b*; Ehlig, 1981; Morton and Streitz, 1969*; Powell and others, 1983; Weber, 1982*.
SHZ Reports: Mattison and others, 2003b; Wilson and others, 2003b.

El Monte: Bullard and Lettis, 1993; Daviess and Woodford 1949; McCalpin 1988; Quarles, 1941; Tan, 1997; *Treiman, 1991*.
SHZ Reports: Loyd, 1998; Perez and others, 1998.

Fillmore: Bailey, 1951; *Dibblee, 1990a*; Cemen, 1977; Eschner, 1969; *Kahle, 1986*; Morton, 1972.
SHZ Reports: Loyd and Barrows, 2002a; Silva and others, 2002a.

Hollywood: *Dibblee, 1991a*; Hernandez and Treiman, 2014; Hoots, 1931; Hsu and others, 1982; Lamar, 1970; Neuerburg, 1953; Tinsley and others, 1985.
SHZ Reports: Mattison and Loyd, 1998a; Silva and Irvine, 1998b; LSIM Series: Irvine, 2013.

Los Angeles: Bullard and Lettis, 1993; Hsu and others, 1982; Lamar, 1970; *Land and others, 2004*; Tinsley and others, 1985.
SHZ Reports: Mattison and Loyd, 1998b; Silva and others, 1998.

Malibu Beach: Yerkes, and others, 1971; Yerkes and Campbell, 1980.
SHZ Reports: Woods, 2001a; Silva and Irvine, 2001a.

Mint Canyon: *Carter, 1980; Dibblee, 1996c*; Jacobson, 1990; Jahns and Muehlberger, 1954; Saul and Wootton, 1983; Saul, 1985; Weber, 1982.
SHZ Reports: Haydon, 1998; Wilson and Haydon, 1998.

Moorpark: *DeVecchio and others, 2012b; Irvine, 1995*; Weber, 1972*; William Lettis and Associates, 1999*.
SHZ Reports: Loyd, 2000a; Silva and Irvine, 2000a.

Mount Wilson: Bryant, 1978; Crook and others, 1987; Ehlig, 1981; McCalpin, 1988; Morton, 1973b; *Powell and others, 1983*; Saul, 1976.
SHZ Reports: Loyd and Wills, 1998; Wilson and Wills, 1998a; LSIM Series: Treiman and Wills, 2007a.

Newbury Park: *Dibblee and Ehrenspeck, 1990a*; Sonneman, 1975; Weber, 1972; Weber, 1984; Yerkes and Campbell, 1997b.
SHZ Reports: Loyd, 2002; Silva and Rosinski, 2002.

Newhall: Smith, 1984; Stitt, 1979*; Allan E. Seward Engineering Geology Inc., 2008, Treiman, 1986; Treiman 1987a*; Weber, 1982; Winterer and Durham, 1962.
SHZ Reports: Haydon and Barrows, 1997; Wilson and others, 1997.

Oat Mountain: *Dibblee 1992c*; Evans and Miller, 1978*; Hitchcock and Wills, 2000*; Saul, 1979*; Treiman, 1987b*; Winterer and Durham, 1962.
SHZ Reports: Wills and others, 1997; Schlosser and others, 1997.

Pacifico Mountain: *Barrows and others, 1985; Barth, unpublished*; Carter, 1980*; Dibblee, 2001*; Ehlig, 1981*; Ehlig, unpublished*; Jahns and Muehlberger, 1954; Morton and Streitz, 1969.
SHZ Reports: Mattison and Hernandez, 2003b; Wilson and Hernandez, 2003b.

Pasadena: *Byer, 1968*; Crook and others, 1987; Ehlig, P.L., 1981; Lamar, 1970; McCalpin, 1994(?); Morton and Streitz, 1969*; Powell and others, 1983*; Smith, 1982; Winterer and Durham, 1962.
SHZ Reports: Wills, 1998b; Wilson and Wills, 1998b; LSIM Series: Treiman and Wills, 2007b.

Piru: Huftile and Yeats, 1995; Morton, 1972; Olson, 2012.
SHZ Reports: Loyd and Barrows, 2002b; Silva and others, 2002b.

Point Dume: Campbell, and others, 1996.
SHZ Reports: Woods, 2001b; Silva and Irvine, 2001b.

San Fernando: Barrows, and others, 1974*; Hitchcock and Wills, 2000*; Oakeshott, 1958*; Oakeshott, unpublished*; Weber, 1982.
SHZ Reports: Wills, 1998c; Schlosser and Haydon, 1998a.

Simi Valley East: Butler, 1977*; Dibblee 1992d*; Hanson, 1981*; Haydon and Loyd, 1997; Irvine, 1990*; Squires, 1983a*; Treiman, 1998*; Weber, 1972; Winterer and Durham, 1962.
SHZ Reports: Haydon and Loyd, 1997; McCrink and others, 1997a.

Simi Valley West: *Dibblee 1992e*; Ehrenspeck, 1972; Hanson, 1981*; Haydon and Loyd, 1997; Irvine, 1990*; Ricketts and Whaley, 1975; Squires, 1983a*; Treiman, 1998*.
SHZ Reports: Haydon and Loyd, 1997; McCrink and others, 1997a.

Sunland: Barrows and others, 1974*; Carter, 1980; Hitchcock and Wills, 2000*; Oakeshott, 1958*; Oakeshott, unpublished; Smith, 1978*; Weber, 1982.
SHZ Reports: Wills, 1998d; Schlosser and Haydon, 1998b.

Thousand Oaks: Blackerby, 1965; Squires, 1983a; Weber, 1984; Yerkes and Campbell, 2005.
SHZ Reports: Loyd, 2000b; Silva and Irvine, 2000b.

Topanga: Hoots, 1931; McGill, 1989; Yerkes and Campbell, 1980; Yerkes and Campbell, 1995b.
SHZ Reports: Wills and McCrink, 1997; McCrink and others, 1997b.

Triunfo Pass: Guynes, 1959; Sonneman, 1975; Yerkes and Campbell, 2005.
SHZ Reports: Woods, 2002; Silva and Wiegers, 2002.

Val Verde: Barrows, 1986; Morton 1972*; Allan E. Seward Engineering Geology Inc., 2008*; Yeats and others, 1985.
SHZ Reports: Loyd and Barrows, 2002c; Silva and Hernandez, 2002.

Van Nuys: *Dibblee, 1991a, 1991d; Hitchcock and Wills, 2000*; Hoots, 1931; Tan, 1995.
SHZ Reports: Wills and Barrows, 1997c; Irvine and Silva, 1997.

THE TRANSVERSE RANGES AND THE SAN ANDREAS FAULT

Nearly all of the Los Angeles quadrangle lies within the south-central part of the Transverse Ranges geomorphic province, a band of west-trending mountain ranges and valleys, varying from 50 km to 130 km in width that extends about 400 km from Point Arguello on the west to the eastern San Bernardino Mountains on the east (Fig. 2). The east-west grain of the Transverse Ranges Province presents a stark and abrupt interruption of the general northwesterly trends of the Peninsular Ranges Province (including the California Continental Borderland) to the south and the northwesterly to northerly grain of the California Coast Ranges, the Great Valley, the Sierra Nevada, and the Mojave Provinces to the north. The southeastern corner of the Los Angeles quadrangle includes the northern part of the Los Angeles basin, which lies at the northern end of the Peninsular Ranges Province. The northwestern quarter of the Los Angeles quadrangle includes the eastern part of the Ventura basin and its southeastern extension, the San Fernando basin. These basins were the sites of very thick accumulations of marine sediments in the late Miocene and Pliocene. The southern boundary of Transverse Range structures is commonly placed at the Anacapa-Santa Monica-Hollywood-Raymond-Cucamonga zone of interconnected north-dipping thrust faults. West of Santa Monica, the southern limit of Transverse Range structures is the offshore Anacapa Fault, which lies a few kilometers south of the southern boundary of the quadrangle. Northwesterly trending faults in the Peninsular Ranges Province, such as the Newport-Inglewood zone, the Elsinore-Whittier Fault, and several faults in the offshore Continental Borderland, appear to be truncated by the east-west zone of interconnected faults, although the apparent step between the Hollywood and Santa Monica Fault zones along the projection of the Newport-Inglewood Fault suggests that the boundary has been modified locally.

The Transverse Ranges are a major anomaly embedded across the general grain of the North American Continent and, although middle Miocene and younger tectonism is responsible for much of the present rock distribution and physiographic relief, the distributions of different crystalline basement rocks, and their Cretaceous and Paleogene superjacent strata, suggest the influence of earlier tectonic episodes. The geologic history remains imperfectly understood, and many interpretations concerning specific aspects are actively disputed among earth scientists (e.g., Campbell and others, 1966; Dibblee and Ehrenspeck, 1993). The distinctive physiographic and structural characteristics of the provinces are superimposed on a preexisting framework of Proterozoic through early Cretaceous igneous and metamorphic basement rocks, which occur chiefly in fault-bounded blocks. This simple relationship has been modified in places so that rocks that are commonly associated with one province can be found in an adjacent province. For example, strata found south of the Malibu Coast Fault and west of the Newport-Inglewood zone of faulting and folding include probable Catalina Schist basement overlain by Miocene volcanics and Monterey facies sedimentary strata in a sequence best correlated with that of the Palos Verdes Peninsula-Santa Catalina Island area of the northern Peninsular Ranges. Although Catalina Island and the Palos Verdes Peninsula are dominated by northwesterly trending structures, and are included in the Peninsular Ranges Province, an east-trending band, bounded by the Malibu Coast Fault on the north and the offshore Anacapa-Santa Monica Fault, is characterized by east-trending folds and north-over-south thrust faults and, therefore, is included in the Transverse Ranges province. Some province-bounding faults take advantage of pre-existing structures in places, but not everywhere.

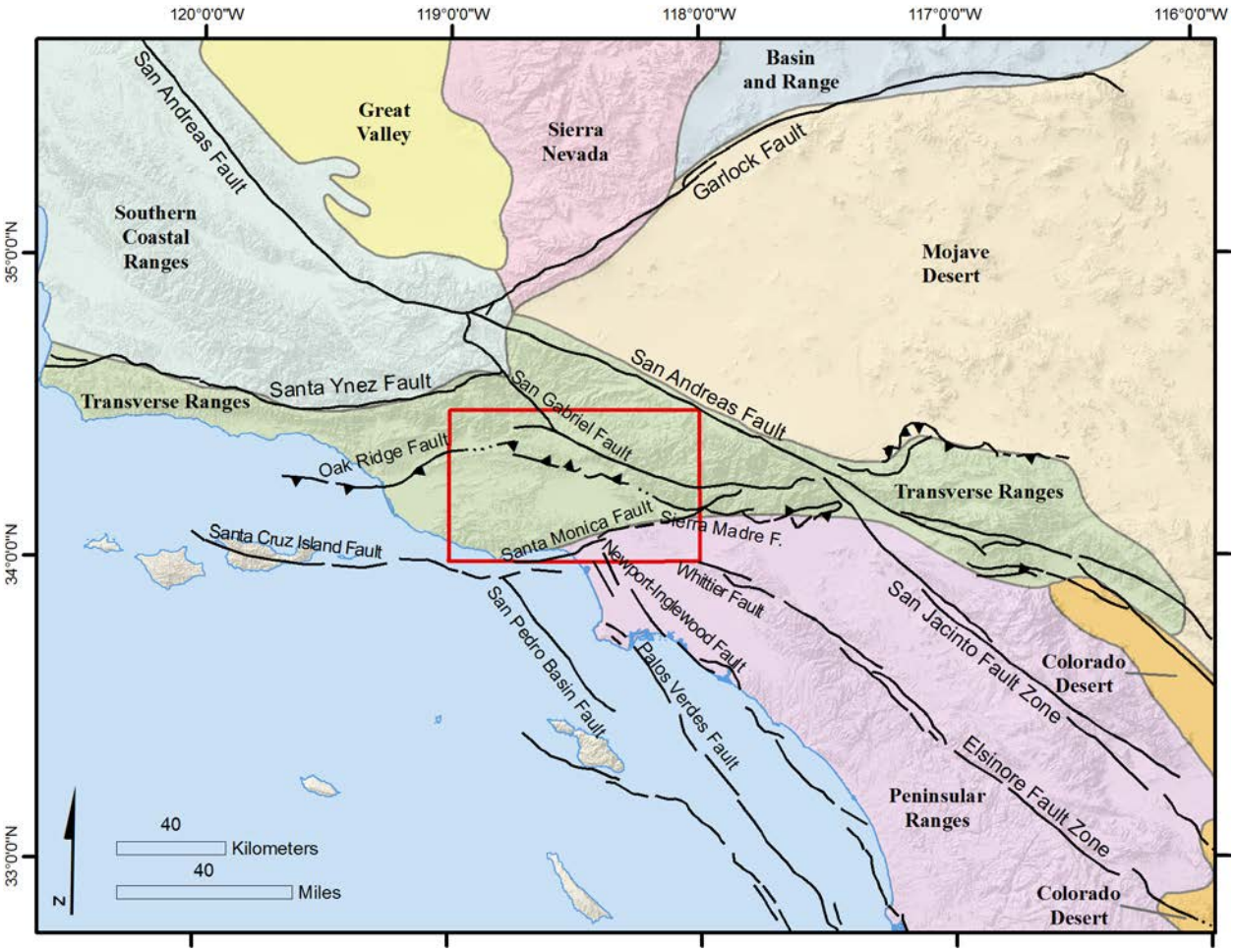


Figure 2. Area of the Los Angeles 30' x 60' quadrangle in reference to geomorphic provinces of southern California.

Major basement rock boundaries are not confined to the margins of the Transverse Ranges, but are also found within the province. For example, the northwest-trending Verdugo Fault separates the cratonic Precambrian to Cretaceous crystalline basement of the San Gabriel Mountains from the oceanic Jurassic metasedimentary basement of the Santa Monica Mountains. Similarly, the Raymond-Cucamonga segment of the southern frontal fault system of the Transverse Ranges approximates the boundary between the San Gabriel Mountains crystalline basement and the oceanic Jurassic basement in the Santa Ana Mountains (northern Peninsular Ranges). The Santa Monica Slate resembles similar Jurassic rocks in the Santa Ana Mountains. Although Jones and others (1976) note that sparse Jurassic fossils from the Santa Monica Mountains are younger than Jurassic fossils from the Santa Ana Mountains, both sections are very thick and represent millions of years of accumulation of pelitic sediment in abyssal to bathyal environments, and they are probably broadly correlative. This relatively simple pattern is further complicated by evidence that the cratonic rocks of the San Gabriel Mountains have been thrust over the Pelona Schist, for which the protolith is inferred to be Jurassic oceanic crust (Ehlig, 1981).

Many workers have attempted to reconstruct the rock distribution in the region as it was before the middle Miocene beginning of major structural deformation (e.g., Campbell and Yerkes, 1976; Crouch, 1979; Hornafius and others, 1986; Powell, 1993; Wright, 1991; Yeats, 2004) using recognized

translations and rotations of fault-bounded blocks. The paleomagnetic evidence that the western Transverse Ranges were rotated approximately 60 degrees clockwise in Miocene time (Kamerling and Luyendyk, 1979) should be kept in mind with regard to descriptions of pre-Pliocene sedimentary and structural trends. For example, northeasterly-trending faults that are truncated by the base of the Modelo and older units have been rotated from initial northwesterly orientations after their last movements. Similarly, north-trending shorelines and pinch-outs in Paleogene and Miocene strata (Yerkes and Campbell, 1976) have been rotated from westerly trends (McCulloh and others, 2002; McCulloh and Beyer, 2004). It seems logical that reconstruction should result in an unbroken western margin for the North American Continent that connects the rocks and structure to the north with those to the south of the Transverse Ranges. However, the pre-middle Miocene positions of individual fault blocks have not been comprehensively established. Partial reconstructions using extensive subsurface data, precise age dating, and well-established minimum fault movements and rotations have demonstrated the difficulty in accurately modeling the early Miocene margin of the North American continent (McCulloh and Beyer, 2004).

The San Andreas Fault crosses the Transverse Ranges Province with an east-southeasterly trend, in sharp contrast to its northwesterly trends to the north, in central California, and to the south, along the east side of the Salton Sea and the Imperial Valley. From Tejon Pass to Wrightwood, the San Andreas approximates the northern boundary of the Transverse Ranges (San Gabriel Mountains), and a short segment of the fault crosses the extreme northeastern corner of the Los Angeles quadrangle. Farther east it separates the San Gabriel Mountains from the San Bernardino Mountains, emerging from the south side of Cajon Pass to mark (approximately) the southern boundary of the Transverse Ranges (San Bernardino Mountains), and continues on that trend for another 45 km (approximately) southeasterly to the vicinity of North Palm Springs.

The presently recognized trace of the San Andreas Fault was probably not a single continuous fault before the end of the (Miocene-Pleistocene) tectonism that resulted in the modern Transverse Ranges Province. Some segments that are now connected show displacements that probably predate the late Miocene. The San Gabriel Fault probably was a major strand of the San Andreas in late Miocene through early Pliocene time that is now much less active (Crowell, 1952). The modern through-going San Andreas Fault consists of connected segments of varying ages and tectonic origins, and may be linked by fault segments that did not exist before the opening of the Gulf of California in the late Pliocene. Although the San Andreas Fault is seen only in the extreme northeast corner of the Los Angeles quadrangle, it is an important component of the geologic structure in the quadrangle, and is probably the principal control for the north-south compressive stress field presently imposed on the central Transverse Ranges. The ongoing deformation and associated earthquakes (Working Group on California Earthquake Probabilities, 2008) are generally considered to be the result of the northwest-trending right-lateral movement of the North American Plate relative to the Pacific Plate as constrained in upper crustal rocks by the geometry of the modern San Andreas Fault.

GEOLOGIC UNITS IN DEPOSITIONAL BASINS AND STRUCTURAL BLOCKS

The geologic map units are divided into several columns in the explanation and brief description of map units on the map sheet, reflecting different sequences of units in different depositional basins. The

units are arranged in a single sequence in the “Description of Map Units” below. The designations of different units in different areas is partly semantic; that is, different authors may have used different names for correlative strata in different parts of the quadrangle; or have used the same names for map units that may be only partly correlative. However, real differences in lithologic character are also represented by the use of different names for strata of correlative ages. We have not been able to identify all the map unit names that should be extended and those that should be restricted. However, it seems clear that the present distribution of rock units is the result of the convergence of tectonic elements of diverse geologic histories. The subdivision of the unit abbreviations and brief descriptions into different columns on the map sheet is our attempt to illustrate the spatial diversity as objectively as possible, while retaining the stratigraphic elements shared in common.

Rocks of the Transverse Ranges Province are subdivided into geographic areas where similar rock sequences are exposed, these geographic areas reflect, at least in part, fault-bounded structural blocks: (1) Topatopa Mountains and the eastern Santa Ynez Range, (2) Oak Ridge, Santa Susana Mountains, Simi Hills, and Santa Monica Mountains, (3) Castaic Valley-Soledad Canyon and western San Gabriel Mountains (Figure 3). The rocks of the northern Peninsular Ranges Province are described in a frame of two middle Miocene and older structural blocks: (1) eastern Los Angeles basin, and (2) western Los Angeles basin. Within the Oak Ridge, Santa Susana Mountains, Simi Hills, Santa Monica Mountains block, middle Miocene and older strata are described separately for the Santa Susana Mountains-Simi Hills area and the central and western Santa Monica Mountains, chiefly because of large changes in thickness of the Conejo Volcanics and nomenclatural differences that represent relatively minor facies changes in the middle Miocene and older rocks. In the central Santa Monica Mountains, the strata in the upper plate of the Malibu Bowl Detachment Fault include a number of tongues of the Conejo Volcanics that have not been specifically correlated with the lithologic subdivisions of that unit in the lower plate. The eastern and western Los Angeles basin blocks correspond to the Northwestern and Central structural blocks of Yerkes and others (1965).

The bedrock units of the area are commonly described in two principal groups: 1) Basement rocks – early Cretaceous and older, crystalline metamorphic and igneous rocks; and 2) The superjacent sequence of late Cretaceous and Tertiary strata. The greatest contrast in basement character is at the boundaries of the San Gabriel Mountains-Soledad basin block. The San Gabriel Mountains form a basement massif that includes components of Proterozoic, Paleozoic, and pre-middle-Cretaceous Mesozoic metamorphic and plutonic rocks. These are the oldest basement rocks in the Los Angeles quadrangle and appear to represent old continental crust at the western margin of the North American craton that has been thrust over Jurassic oceanic crust of a different metamorphic facies than is found in adjacent blocks. In the eastern Los Angeles basin, to the south of the San Gabriel Mountains, and in the Santa Monica Mountains, to the west of the San Gabriel Mountains, the basement rocks are metasedimentary and metavolcanic rocks of Jurassic age that were probably deposited on a Jurassic oceanic crust and accreted to the margin of the North American craton. They have been intruded by early Cretaceous granitic bodies of the same age as similar rocks in the San Gabriel Mountains, but the relationship between these granite bodies is not clear. The basement rocks of the western Los Angeles basin also are associated with a Jurassic oceanic crust; however, their metamorphic character is significantly different, including blueschist facies schists that represent metamorphism in a subduction zone. The basement in the Topatopa Mountains block is unknown, but in the Santa Ynez Mountains, a

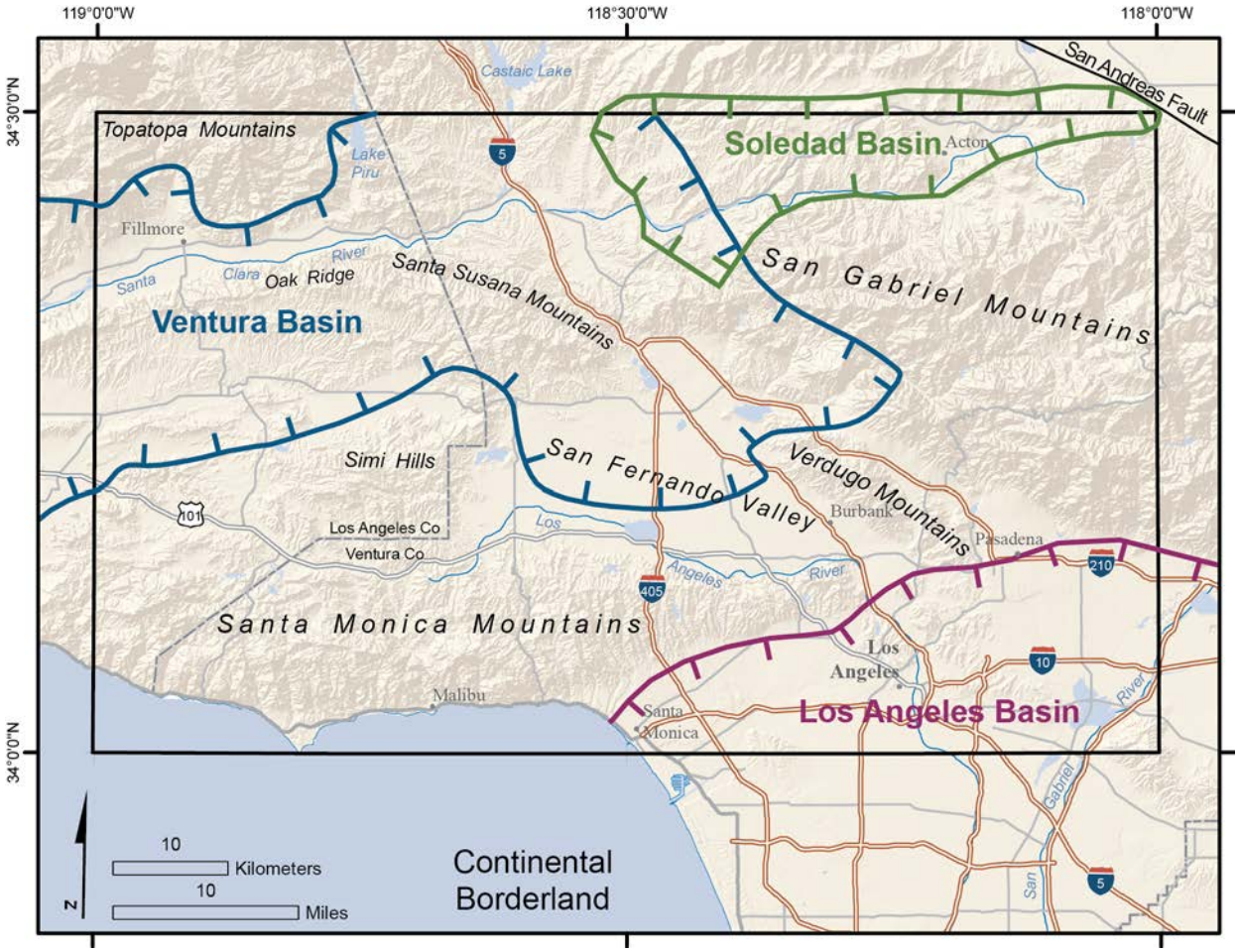


Figure 3. Principal late Tertiary to Quaternary depositional basins and upland areas where bedrock units are exposed within the Los Angeles 30'x60' quadrangle. The Soledad basin is represented by Miocene strata, which are truncated to the southwest by the San Gabriel Fault and subsequently overlapped by Pleistocene deposits of the Ventura basin; the Ventura and Los Angeles basin boundaries represent the limits of associated Pliocene and Pleistocene formations.

few miles to the west, the basement is Franciscan Formation, including schists very much like those of the western Los Angeles basin basement rocks.

The superjacent sequence consists of Upper Cretaceous and Tertiary sedimentary and volcanic strata that rest unconformably on the crystalline basement. The regional unconformity at the base of the Upper Cretaceous is expressed only in the central Santa Monica Mountains, where the Trabuco Formation overlies basement rocks. Another regional unconformity, at the base of the Paleogene section, can be seen in the western Santa Monica Mountains and the Simi Hills where the Simi Conglomerate overlies the Upper Cretaceous sequence. The middle Miocene disruption of the pre-middle Miocene sequence and the formation of more localized basins is expressed by more restricted unconformities at the bases of late-middle Miocene and younger strata and extreme variations in thickness of late Miocene and younger units.

DESCRIPTION OF MAP UNITS

The arrangement of map unit descriptions on the map sheet illustrates the correlation of map units among different depositional basins. The map area straddles two major physiographic provinces, the Transverse Ranges and the Peninsular Ranges, and the southwest margin includes rocks commonly associated with the Southern California Borderland. The modern provinces are largely the products of Neogene tectonics, volcanism, and sedimentation, but each province contains fault-bounded blocks of Paleogene and older rocks that correlate over a larger area.

Similarities and differences among rock units are incompletely reflected in the nomenclature and labeling of the rock units, which evolved from many geologic investigations over the past century. The majority of the units on this map have been adopted from the source maps used in compilation. Named Formations of sedimentary strata are made up of multiple episodes of individual depositional events and each event need not be distributed over exactly the same area. This can lead to significant differences in the age range of a rock stratigraphic unit from one area to another.

Map labels are abbreviations that indicate age and origin of surficial deposits, or age and formally recognized names of formations and members. Where stratigraphic assignment is tentative, a query (?) is added to the label in the database. Where informal subunits are represented by subscripted numbers, numbers increase with decreasing age (i.e., of subunits 1-4, 4 is the youngest and 1 is the oldest). Quaternary deposits are found in all provinces and subareas; however they are relatively local in extent, and deposits are commonly associated with distinctive geomorphic features such as fans, flood plains and terraces. For a complete listing of geologic units and the 7.5’ quadrangles on which they occur, refer to Appendix B.

af **Artificial fill (late Holocene)—**Deposits of sand silt and gravel resulting from human construction, mining or quarrying activities; includes compacted engineered and noncompacted nonengineered fill. Only large deposits are shown. Fills emplaced after source maps were completed are generally not shown.

Qa **Alluvium (late Holocene)**—Unconsolidated gravel, sand and silt in active or recently active floodplains, locally including related alluvial fans and streambeds where those are not mapped separately; chiefly stream deposited, but includes some debris-flow deposits. Locally corresponds with or encompasses areas of historic flooding, including deposits behind flood-control structures.

Qw **Wash deposits (late Holocene)**—Unconsolidated gravel, sand and silt in active or recently active streambeds; chiefly stream deposited, but includes some debris-flow deposits; episodes of bank-full stream flow are frequent enough to inhibit growth of vegetation.

Qb **Beach deposits (late Holocene)**—Loose fine- and medium-grained sand of active beaches chiefly between elevations of lower-low water and storm strands).

Qe **Eolian deposits (late Holocene)**—Loose, fine- to medium- grained sand, silty sand and silt; forms transitory dunes against beach-facing cliff.

Qf **Alluvial fan (Holocene)**—Unconsolidated bouldery, cobbly, gravelly, sandy, or silty alluvial deposits on active and recently active alluvial fans and in some connected headward channel segments.

Qls **Landslide deposits (Holocene and late Pleistocene?)**—Only selected landslide deposits shown on this map as described below. Deposits represent rock detritus from bedrock and surficial materials, broken in varying degrees from relatively coherent large blocks to disaggregated small fragments, deposited by landslide processes. Most deposits are Holocene, some dissected landslides may be as old as late Pleistocene. Landslide deposits shown on this map were compiled primarily from landslide inventories prepared by CGS for the Seismic Hazard Zonation Program. For this map, only landslides described as definite or probable and larger than 50,000 square meters are shown to preserve the clarity of the underlying bedrock geology. Selected historically active landslides between 10,000 and 50,000 square meters are shown, but no landslides smaller than 10,000 square meters are shown on this map. Exceptions to these rules include small or questionable landslides surrounded by larger probable or definite landslides.

Qya **Young alluvium, undivided (Holocene and late Pleistocene)**—Unconsolidated, generally friable, stream-deposited silt, sand and gravel on flood plains, locally including related alluvial fans and streambeds where those are not mapped separately. Deposits are clearly related to depositional processes that are still on-going. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qya_4 **Young alluvium, Unit 4 (Holocene)**—Youngest of as many as 4 subunits of Qya that can be distinguished in some areas.

Qya_3 **Young alluvium, Unit 3 (Holocene and late Pleistocene)**—Older young alluvium, older than Unit 4, younger than Unit 2.

Qya_2 **Young alluvium, Unit 2 (late Pleistocene)**—Older young alluvium, older than Unit 3, younger than Unit 1.

Qya_1 **Young alluvium, Unit 1 (late Pleistocene)**—Oldest young alluvium.

Qyf **Young fan deposits, undivided (Holocene and late Pleistocene)**—Unconsolidated gravel, sand and silt, bouldery along mountain fronts; deposited chiefly from flooding streams and debris flows. Deposits are clearly related to depositional processes that are still on-going. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qyf_5 **Young alluvial-fan deposits, Unit 5 (Holocene)**—Youngest of four subunits of Qyf that can be distinguished in some areas. Designated Qyf_5 because of continuity with young alluvial fan designated Qyf_5 on map of San Bernardino 30’x60’ quadrangle to east.

Qyf_3 **Young alluvial-fan deposits, Unit 3 (Holocene to late Pleistocene)**—Young fan deposits, older than Unit 5, younger than Unit 2.

Qyf_2 **Young alluvial-fan deposits, Unit 2 (Holocene to late Pleistocene)**—Older young fan deposits, older than Unit 3, younger than Unit 1.

Qyf_1 **Young alluvial-fan deposits, Unit 1 (Holocene to late Pleistocene)**—Oldest of as many as four subunits of Qyf that can be distinguished in some areas.

Qoa **Old alluvium undivided (late to middle Pleistocene)**—Unconsolidated to moderately indurated gravel, sand and silt deposited on flood plains, locally including related alluvial fans and streambeds where those are not mapped separately. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Surfaces may be dissected in varying degrees; and can show moderately to well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qoa_3 **Old alluvium, Unit 3 (late Pleistocene)**—Youngest of as many as three subunits of Qoa that can be distinguished in some areas.

Qoa_2 **Old alluvium, Unit 2 (late Pleistocene)**—Intermediate of as many as three subunits of Qoa that can be distinguished in some areas.

Qoa_1 **Old alluvium, Unit 1 (middle Pleistocene)**—Oldest of as many as three subunits of Qoa that can be distinguished in some areas.

Qof **Old fan deposits, undivided (late to middle Pleistocene)**—Slightly to moderately consolidated silt, sand and gravel deposits on alluvial fans. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Morphology of original alluvial fan surface usually well preserved, though dissected in varying degrees; surfaces can show moderately to well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation. Includes:

Qof_4 **Old fan deposits, Unit 4 (late Pleistocene)**—Youngest of as many as four subunits of Qof that can be distinguished in some areas.

Qof_3 **Old fan deposits, Unit 3 (late Pleistocene)**—Intermediate subunit of Qof that can be distinguished in some areas, older than Qof_4 and younger than Qof_2.

Qof_2 **Old fan deposits, Unit 2 (late Pleistocene)**—Intermediate subunit of Qof that can be distinguished in some areas, older than Qof_3 and younger than Qof_1.

Qof_1 **Old fan deposits, Unit 1 (late Pleistocene)**—Oldest of at least four subunits of Qof that can be distinguished in some areas.

Qoft **Alluvial fan deposits on wave-cut surface (late Pleistocene to Holocene)**—Unconsolidated to moderately indurated, clay, silt, sand, and angular gravel including clasts to boulder size; chiefly debris-flow deposits, but probably includes some stream-deposited material; surfaces can show slight to moderate pedogenic soil development. Overlies elevated wave-planed bedrock and marine terrace deposits along the coast.

Qom **Old shallow marine deposits on wave-cut surface (late Pleistocene)**—Unconsolidated (but with small areas locally calcite-cemented) sand, silty sand and gravel; commonly overlies wave-cut bedrock surfaces at two or more altitudes above present sea level; surfaces can show slight to moderate pedogenic soil development; locally carries molluscan fauna referred to the late Pleistocene (Addicott, 1964).

Qoab **Old alluvium and breccia (late Pleistocene to Holocene)**—Deposit of angular shale chips and colluvium derived from Modelo Fm. Mapped adjacent to San Fernando Fault, age relationships with other alluvial units unknown.

Qob **Old breccia, (late Pleistocene to Holocene)**—Fine to coarse sand with well-rounded pebble gravel and shale chips and colluvium derived from Modelo Fm. Mapped adjacent to San Fernando Fault, age relationships with other alluvial units unknown.

Qvoa **Very old alluvium, undivided (middle to early Pleistocene)**—Slightly to moderately consolidated silt, sand and gravel deposits. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Environment of deposition may include axial valley, floodplain or alluvial fan, but morphology of original deposit may not be preserved. Surfaces may be significantly dissected and show well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation.

$Qvoa_2$ **Very old alluvium, (middle to early Pleistocene)**—Younger subunit of Qvoa that can be distinguished in some areas.

$Qvoa_1$ **Very old alluvium, (middle to early Pleistocene)**—Older subunit of Qvoa that can be distinguished in some areas.

Qvof **Very old alluvial-fan deposits (middle to early Pleistocene)**—Slightly to moderately consolidated silt, sand and gravel deposits on alluvial fans. Deposits have been uplifted or otherwise removed from the locus of recent sedimentation. Morphology of original alluvial fan surface preserved to some extent. Surfaces may be significantly dissected and show well-developed pedogenic soils. Subunits are distinguished by relative ages based on geomorphic relationships, relative degree of surface dissection and soil formation.

$Qvof_2$ **Old alluvial-fan deposits, Unit 3 (late Pleistocene)**—Subunit of Qvof with distinct alluvial fan morphology, overlies and is therefore younger than $Qvoa_1$.

Qpa **Pacoima Formation (middle Pleistocene)**—Fanglomerate or sedimentary breccia with a dark-brown to reddish-brown clayey sand matrix; weakly indurated; crudely bedded; poorly sorted with angular, pebble- to boulder-size clasts composed primarily of crystalline rock locally derived from the San Gabriel Mountains, as described in the type area at the mouth of Pacoima Canyon. The Pacoima Formation exposed in the Mint Canyon quadrangle contains more rounded clasts than the type area and the color varies to light yellowish brown; farther west in the Newhall quadrangle the overall clast size decreases and clast composition varies as a result of facies changes associated with greater distance from the San Gabriel Mountain source area and influx of sedimentary clasts shed from the uplifting Santa Susana Mountains to the south (Treiman and Saul, 1986). The Pacoima Formation is an unconformity bounded unit deposited in the eastern Ventura basin that is typically gently inclined; distinguished from the underlying Saugus Formation by poorer bedding and sorting, clast angularity, and angular discordance in most areas; distinguished from younger terrace deposits and overlying older alluvium primarily by degree of erosion and weathering, and the occurrence of locally intense folding and faulting.

The maximum thickness is about 500 to 1,000 ft. (152 to 305 m). The Pacoima Formation was initially described by Oakeshott (1952) and subsequently mapped by Oakeshott (1958) and Barrows and others (1974) in the northern San Fernando Valley and south of the San Gabriel Fault in the eastern Santa Clarita Valley area. Saul (1979, 1990) and Saul and Wootton (1983) followed this usage in mapping of the Mint Canyon quadrangle, and Treiman (1986, 1987a) extended the formation into the Newhall quadrangle in place of older alluvial deposits mapped by Kew (1924) and Winterer and Durham (1962). The Pacoima Formation is younger than about 0.4 Ma based on the estimated youngest age of the underlying Saugus Formation studied in the Santa Clarita Valley by Levi and others (1986) and Treiman and Saul (1986) estimated that deposition of the Pacoima Formation was essentially completed by about 0.3 Ma.

Eastern Ventura Basin, including San Fernando Basin

QTs/Qs **Saugus Formation, undivided (late? Pleistocene to late Pliocene)**—Weakly to moderately cemented, medium- to coarse-grained, light-gray to yellowish-gray sandstone and pebble conglomerate and light greenish-gray sandy siltstone deposited in the Ventura basin; moderately sorted; commonly cross bedded and channeled; interbedded with moderate-brown to reddish-brown poorly sorted sandy mudstone and local claystone seams in the type area and other portions of the eastern Ventura basin, reflecting overbank deposits and paleosols; fluvial near the basin axis, transitioning to alluvial fan environment near the basin margins; interfingers with shallow marine sands to the west. The Saugus Formation is chiefly nonmarine as defined by Hershey (1902b) and Winterer and Durham (1962), but mapping compiled herein may locally include shallow marine interbeds. Transitional to brackish water deposits at the base of the section observed in the eastern Ventura basin are assigned to the Sunshine Ranch Member. This formation has a gradational to interfingering conformable contact with underlying shallow marine strata of the Pico Formation near the axis of the Ventura basin, but the contact is time transgressive and is progressively younger to the west. Near the basin margins, the base is unconformable with the Pico Formation and locally overlaps older strata and basement rock. The upper contact shows distinct angular discordance with the overlying Pacoima Formation in most areas, but discordance is more subtle west of Valencia and middle Pleistocene deposition in this area may be nearly continuous. The thickness varies greatly across the Ventura basin; Kew (1924) reports a thickness of 2,000 ft. (610 m) but Winterer and Durham (1962) report that up to 12,000 ft. (3,660 m) of Saugus strata were encountered in a well southeast of San Fernando Pass; a thickness of 2,000 m is reported in the western Ventura basin below the Santa Clara River, but DeVecchio and others (2012b) report a thickness of only 40 to 60 m in the Camarillo area near the southwest margin of the basin. In the eastern Ventura basin, the base of the Saugus is estimated at about 2.3 Ma west of Valencia and in the Mission Hills (Levi and Yeats, 1993) to about 2.6 Ma near Gold Canyon in the northern San Fernando Valley (Beyer and others, 2009). Unfossiliferous deltaic deposits mapped as Saugus in the Elsmere Canyon area by Dibblee (1991d, 1992c) and Squires (2012) may be significantly older based on their position below Sunshine Ranch strata and mapped interfingering relationships with older Pico and Towsley Formation strata. The top of the Saugus in the eastern Ventura basin is estimated at about 0.5 Ma by Levi and Yeats (1993) and is younger to the west. North

of Ventura, Lajoie and others (1982) report an age of 0.2 Ma in marine sands underlying the Saugus and an age of 85 ka in overlying marine terrace deposits. In the Moorpark area, Wagner and others (2007) report an age of 780 to 850 ka at a Mammoth fossil site. In the Camarillo and Las Posas Hills area, DeVecchio and others (2012a, 2012b) report that Saugus strata overlie marine sands as young as about 125 ka and may be as young as 25 ka south of the Camarillo Hills based on OSL dating. Based on reported ages, Saugus strata west of Fillmore and west of the Tapo Canyon area are considered post-Pliocene in age and therefore mapped as Qs rather than QTs. Clasts within the Saugus Formation are typically plutonic, metamorphic and volcanic rocks, derived primarily from the San Gabriel Mountains, and transported westward by the ancestral Santa Clara River; however, distinctive clast assemblages have locally been recognized and mapped as informal members or facies by various workers. These include upper Saugus (QTsu); volcaniclastic breccia-conglomerate (Qsv) and Camarillo member (Qsc); additional facies are defined by Weber (1982) in the Santa Clarita area based on the presence or absence of San Francisquito Formation sandstone, Pelona Schist, or anorthosite clasts. The Saugus Formation was initially defined by Hershey (1902b) as the "Saugus division" for continental strata exposed in railroad cuts east of Bouquet Junction near Saugus (type area). These deposits were subsequently lumped into the Fernando Formation by Eldridge and Arnold (1907). Kew (1923, 1924) formally adopted the term Saugus Formation for the upper section of the Fernando Group and extended usage into the western Ventura basin. Kew generally followed Hershey's nonmarine definition except that he also included underlying coarse-grained shallow marine deposits within the Saugus Formation. The unit was redefined and remapped by Winterer and Durham (1962) in the eastern Ventura basin, who reassigned most of the shallow marine strata to the Pico Formation, conforming to Hershey's nonmarine definition of the Saugus. This nonmarine definition has been adopted by most workers in the eastern Ventura basin (e.g. Saul, 1975, 1979; Weber, 1982; Yeats and others, 1985; Saul and Wootton, 1983; Treiman, 1986, 1987a; Dibblee Foundation maps; Squires and others, 2006; Squires, 2012). Maps covering areas south and west of the area mapped by Winterer and Durham commonly include marine deposits as part of the Saugus based on Kew's definition (e.g. Weber and others, 1973; White, 1985; Squires and White, 1983; Groves, 1991). The restricted usage of Winterer and Durham (1962) in the type area is adopted herein and shallow marine strata formerly assigned to the Saugus Formation in the Santa Susana Mountains and Oak Ridge located east of, and down section of, the Grimes deltaic unit (QTpg) are reassigned as an upper informal member of the Pico Formation (QTpcu) (see Appendix A for details). Nonmarine strata of similar age are mapped as the La Habra Formation in the Los Angeles basin (Eckis, 1934), and as the Casitas Formation in the Santa Barbara basin (Upson, 1951). Mapped members include:

QTsu **Saugus Formation, upper member (middle Pleistocene)**—On the south flank of the Santa Susana Mountains this unit consists of nonmarine sandstone and conglomerate with clasts composed primarily of shale and sandstone derived from the Modelo and Towsley Formations (Oat Mountain 7.5' quadrangle); the most representative section is at Horse Flats. This clast assemblage is interpreted to represent uplift, emergence and initial erosion of the Santa Susana Mountains, as described in Saul (1975), Shields (1977a), Saul (1979), and Levi and Yeats

(1993); Qt of Bishop (1950) and Jennings (1957). Strata mapped as upper Saugus west of Valencia and southwest of Castaic Junction consist of moderately sorted, yellowish-gray to light yellowish-brown sandstone, conglomerate and silty sandstone, and poorly sorted sandy mudstone beds; the conglomerate beds also contain clasts derived from the Santa Susana Mountains; less lithified and sorted than underlying Saugus Formation strata. Most of this section was assigned to the Saugus Formation by Winterer and Durham (1962) and by Dibblee (1996d), but was assigned to the Pacoima Formation by Treiman (1986). This unit appears to be a transitional facies between the two formations, both structurally and lithologically; angular discordance with the underlying Saugus varies from locally distinct along the southeastern portion of the contact, where it coincides with a monoclinal warp, to negligible to the northwest at the Santa Clara River. The contact with the overlying Pacoima Formation is a subtle angular unconformity or disconformity. This unit may correlate with the upper Saugus strata on the south flank of the Santa Susana Mountains based on the appearance of clasts derived from the newly emergent Santa Susana Mountains.

Qsc **Saugus Formation, Camarillo member (late Pleistocene)**—Thickly bedded, reddish, pebble-bearing siltstone; paleosols with carbonate-cemented rhizoliths common; clasts are dominantly composed of locally derived Miocene shale and volcanic clasts, with subordinate granitic and metamorphic clasts. Defined informally by DeVecchio and others (2012b) for their chronostratigraphic units Qs_2 and Qs_3 exposed in the Camarillo and Las Posas Hills area; locally derived clast assemblage distinguishes this member from older sections of the Saugus Formation to the north and is interpreted by DeVecchio and others (2012b) to indicate that uplift of South Mountain and Oak Ridge had diverted the ancestral Santa Clara River to the north, thereby preventing crystalline clasts derived from the San Gabriel Mountains from reaching this area; DeVecchio and others (2012b) report IRSL dates of 78 ± 6 ka to 125 ± 9 ka for this member; thickness 40 to 60 m.

Qsv **Saugus Formation, volcaniclastic breccia-conglomerate (Pleistocene)**—Massive to crudely bedded, breccia-conglomerate composed of angular to subrounded, pebble- to boulder-size, weathered and fresh clasts of Conejo Volcanics in a poorly consolidated matrix of caliche, clay, silt and sand. Amount of matrix material is variable; some exposures consist only of angular, monolithologic volcanic clasts coated with caliche and contain little or no other matrix material. Previously mapped as part of the Conejo Volcanics. May represent remnants of debris shed from Conejo Volcanics highland into local basin during deposition of Saugus Formation (T. F. Blake, pers. com., 1993). (Dibblee, 1992a and 1992b; Irvine, 1995).

QTsg **Saugus Formation, conglomerate (early Pleistocene)**—Conglomerate mapped at the base of the formation. Clasts are predominantly crystalline igneous and metamorphic rocks recognizable as presently exposed in the northwestern San Gabriel Mountains. (Saul and Wootton, 1983).

QTsr **Saugus Formation, Sunshine Ranch Member, undivided (early Pleistocene to late Pliocene)**—Sulfur-yellow to light-brown and light-gray sandstone, conglomerate and silty sandstone, greenish-gray sandy siltstone and mudstone, and local limestone beds; sandstone and conglomerate commonly cross bedded or channeled; considered primarily paralic

nonmarine or transitional brackish lagoon or estuary deposits with local interfingering marine beds; the greenish-gray fine-grained interbeds are considered the most characteristic lithologic type of the member (exposed in the Oat Mountain, San Fernando, Newhall, and Mint Canyon 7.5' quadrangles). The thickness of the Sunshine Ranch Member is estimated to be about 3,000 ft. (915 m) in the type area. This member is primarily late Pliocene in age based on fossil horse teeth, but likely early Pleistocene in part based on revised time scale of Gibbard and others (2010). It was initially named informally by Hazzard (1940) in an unpublished report as the "Sunshine Ranch formation" for distinctive transitional strata at Sunshine Ranch in the Mission Hills area of the northern San Fernando Valley. Oakeshott (1950, 1958) published formal descriptions and mapping of this unit, which he assigned as an upper member of the Pico Formation; subsequently reassigned as a lower member of the Saugus Formation by Winterer and Durham (1958, 1962) and this usage has been adopted by most subsequent workers in the area (e.g. Barrows and others, 1974; Saul, 1975; Treiman 1987b; Dibblee Foundation maps); Saul and Wootton (1983) excluded all fossiliferous marine beds and subdivided the Sunshine Ranch into an upper and lower facies. Diagnostic greenish-gray mudstone and peaty siltstone occur locally in the lower Saugus Formation south and east of Newhall, leading Treiman (1987b) and Dibblee (1991d, 1992c) to map these outcrops as the Sunshine Ranch Member. The diagnostic beds are uncommon and laterally discontinuous, however. Winterer and Durham (1962) concluded that it is not practical to delineate this member in this area. These possible areas of the Sunshine Ranch Member are shown as queried.

QTsru **Saugus Formation, Sunshine Ranch Member, upper facies**—Nonmarine, poorly consolidated grayish-green clayey sandy siltstone and mudstone, light-brown silty sandstone, light-gray to yellowish-gray pebbly arkosic sandstone and sandy conglomerate, and thin beds of white sandy and nodular limestone; thickness as much as 300 m. Saul and Wootton (1983) note that this facies best characterizes the member and is mapped by them north of the San Gabriel Fault (southwest part of Mint Canyon 7.5' quadrangle).

QTsrl **Saugus Formation, Sunshine Ranch Member, lower facies**—Nonmarine sulfur-yellow, brown or gray arkosic sandstone, silty sandstone, pebbly sandstone, and conglomerate (Saul and Wooton, 1983); thickness about 120 m; occurs on both sides of the San Gabriel Fault (southwest part of Mint Canyon 7.5' quadrangle).

QTse **Saugus Formation, Elsmere Canyon delta plain facies (Pliocene)**—Sandstone and conglomerate with subordinate siltstone and sandy siltstone interbeds; typically weathers light gray and gray to light greenish gray but is locally brown on fresh surfaces due to oil impregnation; light-brown to brown iron-oxide staining locally common; clasts pebble to local boulder size, subrounded to rounded, and composed primarily of crystalline rock derived from the adjacent San Gabriel Mountains; small-scale, low-angle to larger-scale trough cross bedding and channels with erosive bases common (Squires, 2012); foreset beds locally apparent; commonly forms resistant exposures and cliffs in the Elsmere Canyon area; over 450 m thick. Squires (2012) interprets this unit as a braid delta where a braided river flowing from the ancestral San Gabriel Mountains entered the ocean; strata in the Elsmere Canyon area are interpreted as braided river deposits on the delta plain that interfinger to the southwest with

delta front and offshore marine deposits of the Pico and Towsley Formations west and south of the Antelope Valley (14) Freeway. This facies may interfinger with Sunshine Ranch-like mudstone beds northeast of Whitney Canyon and is overlain to the northwest by possible Sunshine Ranch member strata per Treiman (1987b). Squires (2012) notes a possible marine transgression at the top of this unit. This section previously mapped as Pico Formation by Winterer and Durham (1962) and Treiman (1987b), but assigned to the Saugus Formation by Dibblee (1991d, 1992c) and by Squires (2012) based primarily on the lack of marine fossils. This unit is assigned here to the Saugus Formation following the definitions of Winterer and Durham (1962) based on the lack of marine fossils and interpreted nonmarine depositional environment (Squires, 2012); however, differentiation of the lateral transition from marine to nonmarine aspects of the delta is problematic in this area and some unfossiliferous marine delta front deposits may be included west of Highway 14. This facies is mapped because of the unique combination of its nonmarine character and stratigraphic position below Sunshine Ranch member strata; based on this position and interfingering relationships with the Pico and possibly even the Towsley Formations, this unit is likely entirely Pliocene in age.

Qlp **Las Posas Formation (middle to late early Pleistocene)**—Shallow marine, light-gray to light yellowish-gray, fine- to locally coarse-grained sandstone, silty sandstone and pebbly sandstone with greenish-gray mudstone and subordinate conglomerate interbeds in the type area; invertebrate fossils and bivalve-dominated hash beds locally common; sands commonly quartz rich; pebbles composed of well-rounded plutonic, metamorphic and volcanic clasts derived primarily from the San Gabriel Mountains; moderately well sorted; medium bedded to locally laminated; poorly cemented. The Las Posas Formation crops out on either side of the Las Posas Valley in the Las Posas Hills and on the south side of South Mountain/Oak Ridge west of Long Canyon, and west of Fillmore on the north side of the Santa Clara River (western Ventura basin). A prominent basal conglomerate is commonly present in the South Mountain area (Lung, 1958) and northwest of the Santa Clara River at Adams Canyon (basal Saugus of Driver, 1928; Irvine, unpublished mapping 1991). It overlies or interfingers with the Mudpit shale north of the Santa Clara River. In the South Mountain area, it conformably overlies or locally interfingers with upper Pico Formation siltstone and is distinguished from older shallow marine strata of the upper Pico Formation (QTpcu) to the east by its stratigraphic position above the Grimes Canyon deltaic unit (QTpg), whereas QTpcu is generally below QTpg; to the south, it unconformably overlies the Sespe Formation and Conejo Volcanics in the Las Posas Hills. The Las Posas Formation is up to 300 m thick below Las Posas Valley (Dibblee, 1992g). Its age is estimated at 450 ka to 750 ka based on amino acid racemization (Wehmiller, 2010 in DeVecchio and others, 2012b), but DeVecchio and others (2012b) report an OSL date of 141 ± 10 ka near the base of the section in the Las Posas Hills. Sarna-Wojcicki and others (1984) estimate the base of the shallow marine sands (their “San Pedro”) is at about 1.0 Ma in the South Mountain area, but also report an age of about 0.4 Ma in the Ventura area. This unit was originally mapped as Fernando Formation by McLaughlin and Waring (1914) after the definition of Eldridge and Arnold (1907) and subsequently assigned to the Saugus Formation by Kew (1924). The Las Posas “formation” was coined by Pressler (1929) for sands in the Las Posas Hills type area, and nearby South Mountain, Oak Ridge and Camarillo Hills that are

stratigraphically above the “Santa Barbara horizon” and contain warm water “Saugus” fauna of Kew (1924) and Waterfall (1929). Pressler subdivided this unit into a lower Kalorama member (which Bailey, 1935 subsequently included in his Santa Barbara Formation) and an upper Long Canyon member. Subsequent workers referred to this section either as a marine member of the Saugus following Kew, 1924 (e.g. Pasta, 1958; Lung, 1958; Jakes, 1979), as the San Pedro Formation (e.g. Grant and Gale, 1931; Bailey, 1943, 1951;State Water Resources Board, 1953; Weber and others, 1973), or as the Las Posas Sand or Formation (e.g. Dibblee Foundation Maps; DeVecchio and others, 2012a and b); the term Las Posas Formation is adopted because the term San Pedro is restricted to the Los Angeles basin and the term Saugus Formation is restricted to nonmarine deposits following the original definitions of Hershey (1902b) and Winterer and Durham (1962).

Los Angeles Basin

Qsp **San Pedro Formation (middle Pleistocene)**—Unconsolidated sand with local gravelly sand, silty sand and silt interbeds; shallow marine invertebrate fossils common. Woodring and others (1946) report a maximum stratigraphic thickness of about 300 ft. (90 m). The San Pedro Formation has an estimated age range of 200 to 500 ka, as summarized in Jacobs, (2007). The San Pedro Formation was defined at San Pedro Hill (Palos Verdes Peninsula) and extended to other portions of the Los Angeles basin. Fossils were noted at San Pedro Hill by early workers (e.g. Trask, 1855b; Lawson, 1893) but Dall (1898) is credited as the first to use the term “San Pedro beds” (Wilmarth, 1938). Arnold and Arnold (1902) and Arnold (1903) distinguished a “lower” and “upper” San Pedro series and the “lower series” was subsequently assigned the name San Pedro “formation” by Kew *in* Tieje (1926). Terminology for the San Pedro Formation was formalized by Woodring and others (1946) and their usage is adopted herein. This term was extended into the subsurface by Poland and others (1956, 1959) and additional background is summarized by Powell and Ponti (2007). The term San Pedro has also been extended by some workers in the past to granular Pleistocene strata in the western Ventura basin based on molluscan fauna (e.g. Grant and Gale, 1931; Bailey, 1935); however, this extended usage is not used here, as suggested by Ponti (pers. comm., 2012), based on the presence of an intervening depositional basin boundary.

Qi **Inglewood Formation (early Pleistocene)**—Shallow marine, well-consolidated clay-siltstone and interbedded very fine-grained sandstone, commonly with calcareous, limonitic concretions; relatively dense and moderately expansive where weathered. This unit is now recognized as one from which most of the landslides in the Baldwin Hills are derived (Hsu and others, 1982).

QTms **Sedimentary rocks of the Pacific Palisades area (early Pleistocene to late Pliocene)**—A few small exposures of marine siltstone and very fine-grained silty sandstone; very soft and slightly indurated, locally very fossiliferous, fossils referred to the late Pliocene or early Pleistocene; maximum thickness about 120 m (Hoots, 1931; McGill, 1989).

Soledad Basin and San Andreas Fault Zone

QTjh **Juniper Hills Formation (early Pleistocene to late Pliocene) undifferentiated**—Pink, buff', light-brown, or red, pebbly to cobbly, coarse, arkosic sandstone, silty sandstone, lesser conglomerate, and thin-bedded shale. Mapped by Barrows and others (1985) in the San Andreas Fault zone. Sandstone and conglomerate represent fluvial and other continental deposits. Sandstone is poorly to moderately indurated, typically well bedded and poorly sorted. Clasts are sub-angular to well-rounded and include abundant yellow-brown sandstone and a variety of very well-rounded. tough metavolcanic cobbles recycled from the San Francisquito Fm.; abundant volcanic rocks probably recycled from the Punchbowl fm.; leucocratic granitic rocks; silver, gray and spotted Pelona Schist; ferruginous syenite; and medium- to coarse-grained blue-Quartz granite and leucogneiss. This unit is typically folded and internally deformed.

QTjhc **Juniper Hills Formation (early Pleistocene to late Pliocene) Clay shale member**—Greenish-gray, light brown, and black silty clay shale with very thin maroon sandstone layers. Mapped by Barrows and others (1985) in San Andreas Fault zone. Shale is thin-bedded, gypsiferous, with local iron oxide stained bedding. Also contains minor beds of finely laminated gray- to light grayish-brown silty sandstone, white arkose, and white chalky calcareous beds. Clay shale member probably represents lake deposits that are interbedded with other continental deposits. This unit is typically folded and internally deformed. Clay rich units are locally expansive with typical “popcorn” weathering.

QTjhr **Juniper Hills Formation (early Pleistocene to late Pliocene) Red arkose member**—Red to dark-red pebbly arkose and minor white and gray silty sandstone. Localized along Northern Nadeau Fault and is stained, deformed, crushed, and contains fractured clasts. Clasts are predominantly subrounded, light-colored granitic rocks and lesser varicolored volcanic rocks. Strongly resembles Punchbowl Fm. and may have been derived exclusively from a Punchbowl terrane.

QTjhm **Juniper Hills Formation (early Pleistocene to late Pliocene) Mixed clast member**—White to buff, coarse, poorly sorted and locally chaotic, pebbly, arkosic sandstone· and angular cobble to boulder conglomerate with abundant, rounded, leucocratic granitic-rock cobbles; subangular to subrounded clasts of gray mica schist, thinly laminated quartzite, and white quartz from Pelona Schist; yellowish rusty-brown, rounded sandstone cobbles and recycled, tough, metavolcanic clasts from San Francisquito Fm.; and scarce, maroon, fine-grained sandstone pebbles from Vasquez Fm. (?). Volcanic clasts (other than recycled San Francisquito Fm. cobbles) not seen. The presence of abundant (locally 80-90%) large clasts of Pelona Schist is distinctive.

Ventura Basin, including San Fernando Basin

QTp **Pico Formation (middle Pleistocene to Pliocene)**—Thick marine sequence composed of siltstone, sandstone and subordinate conglomerate deposited in the Ventura basin; coarser-grained sediments deposited primarily by turbidity currents and are commonly the dominant lithology along the axis of the basin, in feeder channels on the adjacent basin slopes (Yeats,

1979a; Sylvester and Brown, 1988), and at the eastern margin of the basin south of Newhall (Winterer and Durham, 1962); hemipelagic clayey siltstone is interbedded or interfingering with the turbidity deposits and is locally the dominant lithology; deposited primarily at bathyal depths exceeding 4,500 ft. (1400 m) at the base of the section (Natland, 1967), but grades or interfingers up section into upper bathyal to neritic mudstone (see Mudpit shale - QTpms) and shallow water shelf and delta sandstone, conglomerate, and siltstone, with locally prominent fossil hash beds (see QTpcu and QTpg). The siltstone is typically bluish gray where fresh and olive gray with limonite stains or nodules where weathered; coarse-grained units range from light olive gray to light gray and light brown; compact but typically not well cemented. Siltstone beds typically contain abundant foraminifers and local invertebrate fossils. The upper shallow water deposits also contain locally abundant molluscan fossils and ostracodes. The Pico Formation is widely exposed in the eastern Ventura basin; it is exposed in the central Ventura basin on either side of the Santa Clara River Valley, but is thickest below this valley along the Ventura basin axis, where it is largely concealed by alluvium and faulting. Winterer and Durham (1962) report a maximum thickness of about 5,000 to 6,000 ft. (1500 to 1800 m) in the eastern Ventura basin; however, Bailey (1952) reports a thickness of about 13,900 to 15,400 ft. (4200 to 4700 m) west of the map area in the Ventura area. The lower basinal section pinches out to the south and Pico deposits along the northern margin of the Ventura basin are missing in the upper reaches of the mountains on the north due to uplift and erosion. The basal portion of the formation was reportedly deposited during the Repettian stage in both the western and eastern Ventura basin (e.g. Dibblee, 1988; Beyer and others, 2009), and overlies the Modelo Formation to the west and overlies or interfingers with the Towsley Formation to the east in the type area. The top of the formation is time transgressive and is progressively younger to the west. Near the type section west of Valencia, the Pico Formation is reportedly older than about 2.5 Ma, the age of the base of the Saugus Formation estimated by Levi and others (1986). However, Winterer and Durham (1962) report the presence of the benthic foraminifera *Uvigerina peregrina* and *Bulimina subacuminata* within Pico siltstone, which characterize the early Pleistocene Wheelerian and Venturian stages respectively (Natland, 1952; Squires and others, 2006). McDougall and others (2012) report that these species also occur in the upper Repettian stage. In the western Ventura basin the upper Pico Formation includes early to middle Pleistocene ash beds, and alternatively underlies or includes the 0.6 Ma Lava Creek ash (see QTpms). This section was initially assigned to the Fernando Formation as defined by Eldridge and Arnold (1907) and as mapped by McLaughlin and Waring (1914). Kew (1924) subsequently assigned the lower, marine strata of the Fernando to the Pico Formation (except for coarse-grained shallow marine deposits), with the type section at Pico Canyon. Winterer and Durham (1962) remapped and redefined the formation in the type area and assigned the coarse-grained shallow marine units to the Pico Formation. This usage has been adopted by most workers in the eastern Ventura basin and is adopted here and extended to the Santa Susana Mountains and Oak Ridge. Strata in the Ventura basin containing Repettian-age fauna that are lithologically similar to the type Pico section are included within the Pico Formation. The term Repetto is abandoned entirely as a lithologic formation per the recommendation of Durham and Yerkes (1964). The term Pico is abandoned as a lithologic

formation in the Los Angeles basin following the recommendation of Durham and Yerkes (1959, 1964). The term Fernando Formation is not used in the Ventura basin based on differences in lithologic facies reported between the type Pico section and Pliocene strata in the Los Angeles basin (Durham and Yerkes, 1959, 1964) (see Appendix A for details). Lithologic facies have been mapped locally, including:

QTpg **Pico Formation, Grimes Canyon deltaic facies**—Medium- to coarse-grained sandstone, pebbly sandstone, and pebble conglomerate; cross bedding common to pervasive and foreset beds locally apparent; channeling common as well; weakly cemented to uncemented, clasts typically crystalline and derived from the San Gabriel Mountains, and rounded to well-rounded and smooth; moderately to well sorted; conglomerate locally clast supported; typically light gray; light-brown iron-oxide staining varies from local to prominent; generally unfossiliferous; uncommon greenish-gray sandy siltstone to rare thin claystone interbeds with local invertebrate fossils. This unit is well exposed along Grimes Canyon road and at quarries to the east and west of the road (Moorpark and Simi Valley West quadrangles). It is equivalent to a unit interpreted by Dibblee (1992b) as a delta deposit from west-flowing streams and expanded eastward into Happy Camp Canyon on this map based on additional field mapping. It interfingers with and is underlain by Pico siltstone to the west; underlain by and likely grades into or interfingers with fossiliferous shallow marine sands to the east that are assigned here to the upper coarse-grained marine member of the Pico Formation (QTpcu). Overlain by Las Posas Formation or undifferentiated Saugus Formation. Maximum thickness is about 315 m per Dibblee (1992b) cross section. This section historically assigned either to the Saugus or San Pedro Formations; designated herein as an informal member of the Pico Formation based on the definition of Winterer and Durham (1962) and the interpretation that most of this unit is marine; This interpretation is based on mapped interfingering relationships with offshore marine siltstone of the Pico Formation to the west, the presence of uncommon fossiliferous interbeds, the presence of marine sands up section of this unit near Grimes Canyon Road, the prevalence of well-rounded and nearly polished clasts indicative of extensive abrasion in a littoral environment, and foreset bedding suggestive of a delta front environment; however, differentiation of unfossiliferous marine sands from nonmarine sands is problematic in some areas and some nonmarine paralic strata are likely included in the unit as currently mapped. This unit stratigraphically separates and distinguishes older, shallow marine sands to the east, assigned herein as an informal upper facies of the Pico Formation (QTpcu), from younger, shallow marine sands to the west assigned herein to the Las Posas Formation.

QTpcu **Pico Formation, coarse-grained upper facies**—Sandstone, conglomerate and locally prominent fossil hash/coquina beds overlying Pico offshore deposits; locally cross bedded and channeled; gradational with or underlying the Grimes deltaic unit (QTpg); onlaps older formations to the south; overlain conformably or unconformably by nonmarine Saugus or transitional Sunshine Ranch Member strata in most areas; invertebrate fossils locally common. This facies is interpreted as shallow marine shelf, delta or embayment deposits (White, 1983, 1985; Groves, 1991). This section was initially mapped as the lower portion of the Saugus Formation by Kew (1924), but was reassigned to the upper Pico Formation in the eastern Ventura basin by Winterer and Durham (1962). Shallow marine strata previously assigned to

the lower marine Saugus Formation in the Santa Susana Mountains are reassigned here to this facies following the usage of Winterer and Durham and subsequent workers in the type localities of the Saugus and Pico Formations (see Appendix A for details).

QTpms **Pico Formation, Mudpit shale member (middle to early Pleistocene)**—Marine mudstone and siltstone with locally common sandstone interbeds and conglomerate lenses and rare, thin ash beds; conglomerate beds with hard siliceous clasts common at base; foraminifers common; local invertebrate fossils; typically bluish gray when fresh, weathering to olive gray; poorly bedded to locally laminated; 3,500 ft. (1067 m) thick north of Ventura (Natland, 1967). This member was deposited in the western Ventura basin (Fillmore quadrangle) at bathyal to neritic depths (Natland, 1967). Lower contact is conformable with the underlying Pico Formation. Correlative strata in the South Mountain/Balcom Canyon/Oak Ridge area are not lithologically distinctive relative to typical Pico Formation strata (Lung, 1958) and therefore the Mudpit shale member is not distinguished in this area. The upper contact is reportedly time transgressive and interfingers with shallow marine (Las Posas) sands to the east of Ventura (Bailey 1935; Hopps, 1995). Natland (1967) reports this unit contains lower Hallian and upper Wheelerian benthic foraminifers. Contains the 0.73 to 0.78 Ma Bishop ash and 0.8 to 1.1 Ma Glass Mountain ashes and spans the 0.78 Ma transition from reverse (Matuyama) to normal (Brunhes) polarity. The base occurs in proximity to the 1.2 Ma Bailey ash and the top is alternatively shown either above or below the 0.6 Ma Lava Creek ash (Wehmiller and others, 1978, Lajoie and others, 1982; Sarna-Wojcicki and others, 1984). Mudpit shale strata were originally assigned to the Fernando Formation of Eldridge and Arnold (1907), as mapped by McLaughlin and Waring (1914). These strata were subsequently included in the Pico Formation by Kew (1924) and described as upper Pico Formation by Cartwright (1928) and Driver (1928). Waterfall (1929) noted the similarity of molluscan fauna in this section with the fauna at Bath House beach in Santa Barbara and many subsequent workers assigned this section to the Santa Barbara Formation based on this faunal criteria (e.g. Bailey, 1935, 1951; usage adopted by Weber and others, 1973). Early workers in the Ventura Avenue/Rincon/San Miguelito oil fields referred to this section more informally as the Mudpit shale and Dibblee (1990) assigned it to the informal Mudpit shale member of the Pico Formation. This usage is adopted here (see Appendix A for details).

QTpc **Pico Formation, sandstone and conglomerate**—Sandstone and conglomerate interbeds within typical Pico siltstone (Val Verde quadrangle and Moorpark 7.5’ quadrangles).

Los Angeles Basin

Durham and Yerkes (1964) described two members, upper and lower, in the Puente Hills:

QTfu **Fernando Formation, Upper Member (early Pleistocene to Pliocene)**—In general, the Fernando Formation consists of massive light-gray siltstone, light yellowish-brown fine- to medium-grained sandstone, and light-brown to reddish-brown pebbly conglomerate in the Los Angeles basin; primarily marine but nonmarine conglomerate beds are reportedly included in the upper part of the section (Lamar, 1970); exposed primarily in the Los Angeles and El Monte quadrangles. Name introduced by Eldridge and Arnold (1907) based on unpublished

mapping of Homer Hamlin in the San Fernando Valley and initially extended to Pliocene strata from southern Los Angeles County to Santa Maria. The term Fernando was elevated to group status by Kew (1923, 1924), but was subsequently reclassified back to formational rank to name Pliocene strata of the Los Angeles basin by Durham and Yerkes (1964). See Appendix A for nomenclature details. Locally contains Repettian-Wheelerian (early Pleistocene to early Pliocene per McDougall and others, 2012) foraminiferal zone boundary (Lamar, 1970).

The upper member on this map includes Fernando Formation members 2 and 3 of Lamar (1970): **QTfuc**—pebbly sandstone and conglomerate; **QTfuf**—fossiliferous.

QTfl **Fernando Formation, Lower Member (Pliocene)**—Interbedded silty sandstone and massive pebble conglomerate of the Los Angeles basin. Includes Fernando Formation member 1 of Lamar (1970). See QTfu above and Appendix A for discussion of nomenclature **QTflc**—conglomerate.

Ventura Basin

Tw **Towsley Formation, undivided (early Pliocene to late Miocene)**—Interbedded sandstone, conglomerate, and sandy siltstone and mudstone; the coarse-grained facies is light-colored and commonly lenticular, and is interpreted as turbidity current deposits in a submarine fan; the fine-grained facies is characteristically brown weathering and represents deposition between the fan lobes (Fritsche, pers. comm. 2011). Winterer and Durham (1962) report the presence of numerous transported fossil invertebrates that suggest a depositional water depth in excess of 600 ft. (180 m), and possible depths of 3,000 ft. (900 m) or more based on foram assemblages Strata, up to 4,000 ft. (1200 m) thick, form widespread exposures in eastern Ventura County; overlies Modelo Formation strata in the Topatopa Mountains. The Towsley Formation overlies and interfingers with the Modelo Formation in the Santa Susana Mountains and overlaps Modelo strata to rest directly on basement rocks near and east of San Fernando Pass. Its base is distinguished from the Modelo Formation at the first thick bedded pebbly sandstone. The generally conformable, locally interfingering upper contact with the Pico Formation is chosen at the transition from diagnostic brown-weathering siltstone of the Towsley to olive-gray siltstone with common limonite nodules typical of the Pico. The Towsley Formation is early Pliocene to late Miocene (Winterer and Durham, 1962; Squires and others 2006, fig. 2). This section was initially included in the Modelo Formation by Kew (1924); the section in the Elsmere Canyon area was assigned to the “Repetto formation” by Oakeshott (1950); a new, unnamed formation was proposed by Winterer and Durham (1951), was subsequently named the Towsley Formation in Winterer and Durham (1954), and was formally described and mapped by Winterer and Durham (1962) based on the type section at Towsley Canyon, southwest of Valencia. In the northern San Fernando Valley, east of Pacoima Canyon, a band of strata was shown as Pico Formation by Yerkes and Campbell (2005); Hill (1930) also mapped this section as Pico, but Oakeshott (1958) mapped it as “Repetto formation” and several early Caltech theses note the presence of brown weathering siltstone, which is typical of the Towsley Formation of Winterer and Durham (1962); Barrows and others (1974) mapped it as undifferentiated Towsley/Pico Formation; Dibblee (1991e) maps it as Towsley Formation. This

unit is mapped here as Towsley Formation based on Dibblee and the noted lithology, but is queried due to the possible inclusion of undifferentiated Pico Formation strata. Mapped subunits and members include:

Tws **Towsley Formation, siltstone**—Brown mudstone and siltstone, locally carries foraminifera referred to the Mohnian Stage (late Miocene) of Kleinpell (1938).

Twc **Towsley Formation, conglomerate**—Pale pebble conglomerate and sandstone in lenticular beds.

Twhc **Towsley Formation, Hasley Conglomerate Member**—Basal conglomerate member.

Los Angeles Basin

Tpn **Puente Formation, undivided (early Pliocene and late Miocene)**—Marine siltstone, sandstone, and shale; mostly a Los Angeles basin temporal equivalent of the Modelo Formation, but partly younger; named by Eldridge (*in* Eldridge and Arnold, 1907) from exposures in the Puente Hills; strata are associated with the Los Angeles basin (El Monte, Los Angeles and Hollywood 7.5' quadrangles) as contrasted with Modelo strata, which are associated with the eastern Ventura basin. In the Los Angeles and Hollywood 7.5' quadrangles Lamar (1970) mapped four non-sequential, interbedded, informal lithologic subunits, which have not been specifically correlated with the formal members recognized by Shoellhamer and others (1954).

Tpsl **Puente Formation, siltstone (early Pliocene)**—Well-bedded, light gray siltstone; thickest beds at top of section, also interbeds lower in section (Lamar, 1970, fig. 14).

Tpsh **Puente Formation, siliceous shale (early Pliocene)**—Well-bedded, light gray, siliceous shale and siltstone; regularly interbedded with thin, fine- to coarse-grained sandstone beds; most common in a few discontinuous zones, chiefly in upper-central part of formation (Lamar, 1970, fig. 14).

Tpds **Puente Formation, diatomaceous shale (early Pliocene)**—Well-bedded, dull white diatomaceous shale; a discontinuous single zone in central part of formation (Lamar, 1970, fig. 14).

Tpss **Puente Formation, sandstone (late Miocene)**—Well-bedded, very fine- to very coarse-grained sandstone; medium to light brown and light gray; mostly well cemented but less so in uppermost parts; local discoidal concretions; most abundant in lower part of formation (Lamar, 1970, fig. 14).

Tpnsc **Puente Formation, Sycamore Canyon Member (late Miocene)**—Predominantly sandstone and pebble conglomerate, laterally variable; sandstone is thick-bedded to massive, medium- to coarse-grained, friable; siltstone is massive- to thin-bedded, siliceous; conglomerate is massive, contains pale to brownish-gray pebbles and cobbles; siltstone locally contains bathyl-depth foraminiferal faunas; **Tpnscc** - conglomerate bed. Member named by Schoellhamer and others (1954).

Tpny **Puente Formation, Yorba Member (late Miocene)**—Predominantly siltstone, with sandstone interbeds; named for Yorba Bridge over the Santa Ana River, east of Atwood; white to gray, thin-bedded, micaceous and siliceous siltstone; upper part contains large boulders "floating" in much fine-grained material – interpreted to be a turbidity current deposit. Named by Schoellhamer and others (1954).

Tpnsq **Puente Formation, Soquel Member (late Miocene)**—Predominantly sandstone, minor interbedded siltstone; sandstone is gray to yellowish-gray, massive- to well-bedded, medium- to coarse-grained, poorly sorted; interbedded pebbly sandstone; many such beds are graded, locally pebbly to cobbley conglomeratic; lower part of unit contains ellipsoidal, calcite-cemented boulders as large as 1.5 m. Named by Schoellhamer and others (1954).

Eastern Ventura Basin

Tcs **Castaic Formation, undivided (late Miocene)**—Marine tuffaceous or diatomaceous shale, interbedded pebbly sandstone, sparse limestone concretions with well-preserved foraminifera. Named by Winterer and Durham (1954) for marine sandstone strata of late Miocene age (equivalent in age to the Modelo Formation), north of the San Gabriel Fault and east of Newhall; name extended to north for late Miocene shale with interbedded sandstone and minor pebble conglomerate in Soledad-Ridge basin area by Crowell (1954).

Tm **Modelo Formation, undivided (late and middle Miocene)**—Predominantly gray to brown thin-bedded mudstone, diatomaceous clay shale, or siltstone, with interbeds of very fine-grained to coarse-grained sandstone; proportion and thickness of sandstone interbeds allows lithofacies to be mapped in some areas; generally unconformable on older rocks around northern, eastern and southern margins of the Ventura basin. The base of the Modelo is generally unconformable on middle Miocene and older rocks. The name, Modelo, was introduced by Eldridge and Arnold (1907) for strata exposed in the Topatopa Mountains, north of Piru and further described in the Santa Susana Mountains and San Fernando Pass areas by Winterer and Durham (1962); extended to the eastern Santa Monica Mountains and described in detail by Hoots (1931) where further noted for turbidite features indicating submarine fan deposition (Sullwold, 1960); Along the north flank of the Santa Monica Mountains the unconformity mapped by Hoots (1931) in the eastern part of the range, where Modelo locally overlies Santa Monica Slate, has been mapped continuously westward (Yerkes and Campbell, 1980; Weber, 1984; and unpublished 1:12,000-scale mapping by Yerkes and Campbell, 1965-1974, in the Canoga Park and Calabasas 7.5' quadrangles) as far as the north side of the Ventura Freeway (U.S. 101) at the west side of Las Virgenes Creek, to the west of which it becomes accordant with (and apparently conformable on) subjacent strata of the Calabasas Formation (Weber, 1984); further west, the Modelo and subjacent parts of the Calabasas appear to grade progressively westward into more diatomaceous, clayey, Monterey-like lithofacies. Many of the sandstone and shale beds below (south of) the unconformity (and its westward conformable extension) and above (north) of the Conejo Volcanics are lithologically similar to the Modelo but more intensely folded and faulted; these have been assigned to the Calabasas Formation by Yerkes and Campbell (1979). Fellbaum and Fritsche (1993) include them in the

Modelo Formation; however, their stratigraphic position below the unconformity mapped by Hoots (1931) as the base of the Modelo, and the predominance of middle Miocene foraminifera (Luisian or Relizian?) in the Calabasas, suggests their correlation with Modelo strata is questionable. In the eastern Santa Monica Mountains the Modelo was mapped and described in detail by Hoots (1931), and Kleinpell (1938) used the unconformity at the base, well exposed near Mohn Springs in Topanga Canyon, where it is underlain by predominantly middle Miocene Topanga strata, as the base for his type Mohnian (foraminiferal) Stage (late Miocene). Widespread in eastern Ventura basin; locally extended to include some strata along the south flank of the Santa Monica Mountains in the Pacific Palisades-Westwood area. Five members were described by Cemen (1977) in the Topatopa Mountains and four of them have been mapped as far south as the north flanks of Oak Ridge and the Santa Susana Mountains. Age-correlative strata in the Los Angeles basin are generally referred to the Puente Formation or, west of the Newport-Inglewood zone, to the Monterey Shale. Mapped facies of the Modelo Formation include:

Tmsu **Modelo Formation, upper sandstone unit at Laskey Mesa**—Weber (1984) assigned strata at Laskey Mesa to the Towsley Formation, as shown by Yerkes and Campbell (2005); Truex and Hall (1969) previously assigned most of this section to the Modelo Formation and the uppermost portion to the Santa Margarita Formation, and Brown (1957) mapped it as Modelo Formation; Dibblee (1992b) mapped this section as Tertiary unnamed shale and sandstone; Yeats (1979) reported that Towsley Formation does not occur south of the Santa Susana Fault. Field review of this area did not reveal any brown mudstone or coarse-grained turbidite beds typical of the Towsley Formation and this unit has been reassigned to the upper Modelo Formation herein based on lithologic similarity to Modelo strata to the west and previous usage.

Tm_5 **Modelo Formation, member 5**—Upper shale and siltstone unit; dark brown to gray, moderately to well compacted, thin-bedded to laminated silty shale and siltstone, locally siliceous near base; contains foraminifera assigned to the upper Mohnian and lower Delmontian Stages of Kleinpell (1938); thickness locally exceeds 458 m. (Cemen, 1977) Includes units mapped as Sisquoc Formation by Dibblee (1991).

Tm_4 **Modelo Formation, member 4**—Upper sandstone unit; white to gray, fine to coarse-grained arkosic sandstone, with subordinate thin partings and lenticular interbeds of silty clay shale, locally siliceous; thickness variable, locally as much as 825 m. (Cemen, 1977).

Tm_3 **Modelo Formation, member 3**—Middle shale unit; porcelaneous and calcareous shale and porcelaneous mudstone, brown to buff, thin-bedded to laminated, moderately to well indurated, with thick lenses of gray calcareous sandstone locally; thickness variable but may exceed 763 m.; foraminifera referred to lower part of the Mohnian Stage of Kleinpell (1938) (Cemen, 1977).

Tm_2 **Modelo Formation, member 2—**Lower sandstone unit; grayish white to dark brown, fine to medium-grained sandstone, locally interbedded with dark brown siltstone and claystone; locally as much as 915 m. thick, thins westward and pinches out between the middle and lower shale units (Cemen, 1977).

Tm_1 **Modelo Formation, member 1—**Lower shale unit; cherty to porcelaneous shale and mudstone, locally calcareous, locally diatomaceous, moderately to well indurated, thin-bedded to laminated, generally dark gray to brown; contains foraminifera referred to the Relizian and Luisian Stages of Kleinpell (1938), indicating the unit is age-correlative with the Calabasas Formation and, possibly the upper part of the Topanga Canyon Formation in the Santa Monica Mountains; thickness 214-794 m. (Cemen, 1977).

Tmd **Modelo Formation, diatomaceous shale**—Diatomaceous shale; includes outcrops on the south side of the San Fernando Valley at Pierce College shown as Pico Formation by Yerkes and Campbell (2005), based on the presence of Repettian stage benthic foraminifers (Ingle, 1967; Yerkes and Campbell, 1993); previously assigned to the Modelo Formation by Hoots (1931). Review of these exposures indicates that much of this unit is lithologically more consistent with the Modelo Formation than the Pico Formation. This section is assigned here to the Modelo Formation based on the noted lithology and presence of Modelo Formation mapped on strike to the east and west, but is queried based on the reported presence of Repettian stage fauna.

Tms **Modelo Formation, sandstone**—Sandstone and conglomerate.

Tmb **Modelo Formation, "burnt shale"**—Unusual slag and scoriaceous- to obsidian-like material found within the upper part of the Modelo Formation in the Grimes Canyon area, Big Mountain/Happy Camp Canyon, and upper Las Virgenes Canyon area. It is composed of red, yellowish-orange, purple, brown, and black mudstone, siltstone, and diatomite that has been altered by in-situ combustion of natural gas in layers containing abundant organic material, as described and mapped by Irvine (1995), Brown (1957), and Jestes (1958).

Soledad Basin and San Andreas Fault Zone

Tpbc **Punch Bowl Formation, clay shale member (late Miocene)**—Gray, poorly indurated clayey shale with local gypsum. (Dibblee, 2001).

Tpbv **Punch Bowl Formation, volcanic clast member (late Miocene)**—White to pink, coarse, pebbly to cobbly, arkosic sandstone, thin-bedded silty sandstone, and minor thin-bedded, white, nodular limestone. Si1ty layers range from yellowish tan through greenish brown to red. Sandstone is well-indurated, well-stratified and was probably deposited in alluvial fan and floodplain environments. Clasts are predominately light-colored granitic rock pebbles and cobbles with lesser (up to 40%) tuffaceous and porphyritic volcanic .rocks ranging in composition from rhyolite to andesite. (Barrows and others, 1985).

Tmc **Mint Canyon Formation, undivided (late and middle Miocene)**—First described by Hershey (1902b), named by Kew (1924), mapped in detail by Saul and Wootton (1983) and Saul (1985), who recognized three intertonguing lithofacies. Includes a variety of semi-consolidated nonmarine sediments deposited in fluvial and lacustrine environments. Jahns and Muehlberger (1954) describe two informal members: a lower member including reddish-brown basement rock breccia, conglomerate, sandstone, siltstone and mudstone (thickness ~ 335 m); and an

upper member consisting of thin-bedded brownish or greenish siltstone and interbedded tuff (thickness ~ 790 m).

Tmcd **Mint Canyon Formation, Lacustrine deltaic (foreset) facies**—Predominantly fine- to coarse-grained, sparsely-concretionary, cross-bedded, arkosic sandstone, interbedded with conglomeratic sandstone, gray to brown sandy siltstone and claystone; tuff and tuffaceous sedimentary beds; marly and nodular carbonate. Sparsely fossiliferous: small clam and snail shells, vertebrate bones and teeth. (Saul and Wootton, 1983).

Tmcl **Mint Canyon Formation, Lacustrine bottomset facies**—Interbedded sandstone, silty sandstone, siltstone, claystone and thin beds and lenses of limestone; a few lenses of turbidite sandstone and coarse conglomerate; tuffaceous beds; ostracod shells; bedding planes commonly darkened by finely divided lignite; graded beds common. (Saul and Wootton, 1983).

Tmcm **Mint Canyon Formation, Lacustrine and lake-marginal fluvial facies**—Deposits of arkosic sandstone and conglomeratic sandstone, with interbedded siltstone and mudstone; some nodular carbonate in siltstone; thin beds of limestone common in mudstone. (Saul and Wootton, 1983).

Ttk **Tick Canyon Formation, undivided (middle to early Miocene)**—Reddish, fluvial and lacustrine sandstone, siltstone and claystone, and gray, tan, and reddish, well-cemented and well-bedded conglomerates (Mint Canyon, Agua Dulce and San Fernando 7.5’ quadrangles; Oakeshott, 1958). Named by Jahns (1940), and separated from the overlying lower part of the Mint Canyon Formation on the basis of a distinctively older vertebrate fauna. Includes area east of Tick Canyon and in upper Agua Dulce Canyon mapped by Oakeshott (1958) as Mint Canyon Formation but shown by Jahns and Muehlberger (1954) and Dibblee (1996b,c) as Tick Canyon Fm. Ehlert (2003) found no lithologic differences or unconformity between Tick Canyon and overlying Mint Canyon Formations and suggests that units mapped as Tick Canyon Formation should be considered basal sediments of the Mint Canyon Formation. Original usage retained, but question regarding validity of Tick Canyon Formation noted.

Ttkc **Tick Canyon Formation, conglomerate (middle to early Miocene)**—Dark gray, coarse, poorly-bedded conglomerate, Oakeshott, 1958), Dibblee (1996b,c).

Los Angeles Basin and Continental Borderland

Tmt **Monterey Shale, undivided (late, middle, and early Miocene)**—Marine clay shale, thin interbedded siltstone, minor sandstone and pebble conglomerate, and glassy tuff; siltstone is commonly diatomaceous, locally bituminous, siliceous, or dolomitic; sandstone is commonly quartz arenite; some conglomerates contain clasts of glaucophane schist. Shale is gray to dark brownish gray where fresh, weathers quickly to chalky white; contains foramifera referred to the Relizian, Luisian, or Mohnian Stages (early middle, late middle, or early late Miocene respectively) of Kleinpell (1938). Monterey strata are exposed only south of the Malibu Coast Fault and west of the Newport-Inglewood zone of faulting and folding; rocks of equivalent age north of the Malibu Coast Fault are referred to the Topanga Group and the Modelo Formation; east of the Newport Inglewood zone, strata of equivalent age are referred to the Puente Formation and the Topanga Group. The Monterey is generally considered a distal, deep-basin

facies of the more-proximal Modelo, Puente and other formations of the equivalent age range. Name extended into southern California from type area in Monterey County, central California (Woodring and others, 1936). The upper part of the unit in some areas (chiefly along the Pacific Coast Highway) is late Mohnian in age and locally overlies the early Miocene Trancas Formation unconformably; its relation to middle Miocene Monterey strata on Point Dume is obscured, but could be an intraformational unconformity. The (mostly middle Miocene) section exposed on Point Dume is about 1000 m thick. The Monterey Shale in the northern Los Angeles basin is unconformably overlain by unconsolidated Pliocene, Pleistocene and Holocene deposits; *includes*:

Tmtd **Monterey Shale, deformed (middle and early Miocene)**—Intensely deformed shale, siltstone, and sandstone, commonly dolomitic, locally siliceous, locally very cherty; contains foraminifera referred to the Relizian or Luisian (middle Miocene) Stages of Kleinpell (1938). In upper plate of Escondido thrust fault beds are tightly folded, with vertical limbs and gently east-plunging axes; thickness across folded beds is at least 650 m.

Ventura Basin and Los Angeles Basin

Tt **Topanga Group, undivided (middle and early Miocene)**—First called the Topanga Formation by Kew (1923) for exposures in the central Santa Monica Mountains that include the type locality for the "Topanga Canyon fauna" (about 50 molluscan species) of Arnold (1907a). Durrell (1954) recognized that the three subdivisions identified by Kew (1923) are contiguous westward with extensive units of formation rank, labeling them the Lower Topanga, Middle Topanga and Upper Topanga Formations. Subsequent publication of the North American Stratigraphic Code led Yerkes and Campbell (1979) to change the names to conform, and designated the set of three formations as the Topanga Group, consisting of the Calabasas Formation, the Conejo Volcanics, and the Topanga Canyon Formation, each with two or more members. Elsewhere, middle Miocene strata with similar lithologic and biologic facies have been informally divided: in the eastern Ventura basin and the northern Los Angeles basin beds containing Luisian BFZ foraminifera (late middle Miocene), that are labeled **Tt** are chiefly age-equivalent to the Calabasas Formation; beds containing a "Temblor" or "Topanga" molluscan fauna have also been labeled **Tt**. Middle Miocene volcanic rocks that may be related to the Conejo Volcanics, but are spatially separated, are labeled **Ttb**. The distribution and nomenclature history of the Topanga Group has been reviewed by Campbell and others (2007).

In the Santa Susana Mountains, informal subunits include:

Tt_4 **Topanga Group, Oat Mountain unit 4**—Upper sandstone with interbedded siltstone and local pebble conglomerate; sandstone, medium- to coarse-grained arkose, locally contains *Amusium lompocensis*; thickness about 140 m; (Saul, 1979).

Tt_3 **Topanga Group, Oat Mountain unit 3**—Shale, foram-bearing siltstone, and mudstone, about 122 m thick (Saul, 1979).

Tt_2 **Topanga Group, Oat Mountain unit 2**—Sandstone, fine- to coarse-grained, arkosic, well indurated, massive, about 244 m thick (Saul, 1979).

Tt_1 **Topanga Group, Oat Mountain unit 1**—Shaly siltstone, massive- to well-bedded, minor lenses of conglomeratic sandstone; siltstone locally contains microfauna assigned to the Luisian Stage of Kleinpell (1938) suggesting it is an age-correlative of the Calabasas Formation (Saul, 1979).

In the eastern Santa Monica Mountains informal subunits include:

Ttss **Topanga Group, sandstone**—Sandstone, medium- to coarse-grained, well-bedded, light brown and gray (Lamar, 1970).

Ttsl **Topanga Group, siltstone**—Siltstone, well bedded, medium to dark brown, with interbedded sandstone, shale and chert (Lamar, 1970).

Ttcg **Topanga Group, conglomerate**—Conglomerate, massive- to well-bedded, light brown; includes basal breccia locally (Lamar, 1970).

Ttb **Intrusive and extrusive volcanic rocks**—Chiefly basaltic, interlayered with sandstone and shale assigned to the Topanga Group. In part, may be correlative with Conejo Volcanics of central and western Santa Monica Mountains and adjacent areas to the northwest; but includes rocks that are dated as older than the oldest contiguous Conejo (McCulloh and others, 2002). (eastern Santa Monica Mountains, Hoots, 1931; Santa Susana Mountains, Evans and Miller, 1978; northeastern Verdugo Mountains, Oakeshott, 1958).

In the central and western Santa Monica Mountains divisions include:

Tcb **Calabasas Formation, undivided (early late Miocene and late middle Miocene)**—Interbedded impure, clayey to silty sandstone and silty shale, with local beds of sedimentary breccia; sandstone is thin-, medium- and thick-bedded, mostly medium to coarse grained, poorly sorted, commonly with wacke texture, commonly shows graded bedding; shale, locally diatomaceous; may have small phosphatic pellets, locally abundant fish scales, sparse Foraminifera and rust-colored plant casts, some thicker beds contain zones of large ovoid dolomitic concretions; sedimentary breccia, olistostromes incorporating cobble- to large boulder-size clasts of recognizable older Tertiary strata, some as fossil-bearing clasts of Paleocene, Eocene, early Miocene, and middle Miocene strata. Many of the sandstones are lithologically similar to those in the overlying, less-deformed Modelo Formation. Total thickness is about 1,200 m in the type area. The Modelo is unconformable on the Calabasas in the name area, however, west of Malibu Junction and north of the Ventura Freeway the two formations are accordant, the Calabasas is greatly thinned, and grades westward into finer-grained clayey siltstone and shale much like that of the Modelo in the area, and the two formations are distinguished only by differences in foraminiferal fauna. (The Calabasas there contains foraminifera referred to the Luisian Stage of Kleinpell, 1938; the Modelo contains foraminifera referred to the Mohnian Stage of Kleinpell, 1938). The contact relationships with the underlying Conejo Volcanics are marked by extreme variability, ranging from unconformable to accordant and intertonguing, apparently reflecting marine sedimentation, at least partly contemporaneous with the development of a submarine volcanic edifice and associated tectonic disturbance. Intraformational deformation west of Liberty Canyon, the

angular unconformity east of Medea Creek, and the abruptly thinner Calabasas section near and west of Agoura reflect local tectonic activity during deposition; and the volcanic conglomerate is probably significantly younger than most of the Calabasas section to the east. In the west-central Santa Monica Mountains the Calabasas Formation and older strata are involved in major pre-Modelo deformation that includes detachment faulting. Well-defined upper-plate ramps in Trancas and Topanga Canyons show offsets exceeding many hundreds of feet on faults that bend to follow bedding planes, along which intervening beds are missing or thinned, and establish a style of younger-over-older faulting as a significant structural feature. Outcrops where contact relations can be observed in macroscopic detail, and confirm depositional or shear-surface relations, are extremely rare, but where found indicate little discordance at stratigraphic hiatus or local unconformity contacts between pre-Conejo Tertiary Formations. The Paleogene sequence is similar to that in the adjacent Simi Hills and the more distant Santa Ana Mountains, where variations in depositional environments appear to represent epeiric transgressions and regressions. Therefore, we conclude that contacts lacking local exposures of diagnostic depositional character, where significant parts of the section are missing or dramatically thinned, are one or more of a set of detachment faults. The alternative is to infer Paleogene orogenic deformation on a scale not recognized elsewhere in southern California.

Tcbvc **Calabasas Formation, Volcanic conglomerate (late middle Miocene)**—Volcanic conglomerate, mapped by Weber (1984) as basal Calabasas Formation where it rests unconformably on the Chatsworth Formation (Cretaceous) along the south flank of the Simi Hills, and extends northwestward across the Cretaceous-Paleogene sequence at the west end of the Simi Hills. This conglomerate is probably correlative with volcanic conglomerates that locally forms the base of the Calabasas Formation sandstone and shale exposed along and north of the Ventura Freeway in the Agoura area (Blackerby, 1965), and overlying volcanic strata in the Thousand Oaks area (Weber, 1984). In addition to the informal volcanic conglomerate member, five members were named by Yerkes and Campbell (1979).

Tcbs **Calabasas Formation, Stokes Canyon Breccia Member (late middle Miocene)**—Sedimentary breccia consisting of angular boulders and cobbles of redeposited well-cemented sandstone with molluscan faunas diagnostic of the "Martinez" (Paleocene) and "Domengine" (middle Eocene) Stages; the breccia bed is locally as thick as 60 m; underlain and overlain conformably by Calabasas sandstone and siltstone; locally overlain unconformably by basal conglomerate of the Modelo Formation. Thinner, less continuous breccia beds are present at two other horizons nearby. (Stokes Canyon area, northern Malibu Beach and southern Calabasas 7.5’ quadrangles; Yerkes and Campbell, 1979, p. E22; Yerkes and Campbell, 1980).

Calabasas subunits in the upper plate of Malibu Bowl Detachment Fault include:

Tcbmp **Calabasas Formation, Mesa Peak Breccia Member**—Sedimentary breccia consisting of angular boulders and cobbles of volcanic rock in a very coarse-grained sandstone matrix; maximum thickness approximately 288 m. Overlies the Newell Sandstone Member of the Calabasas Formation in the upper plate of the Malibu Bowl Detachment Fault, west central

Malibu Beach 7.5' quadrangle (Yerkes and Campbell, 1979, p. E23; Yerkes and Campbell, 1980).

Tcbn **Calabasas Formation, Newell Sandstone Member**—Poorly sorted turbidite sandstone and interbedded shaly siltstone with large dolomitic concretions; overlies and wedges out westward into Malibu Bowl Tongue of the Conejo Volcanics; maximum thickness approximately 244 m. (Yerkes and Campbell, 1979, p. E23; Yerkes and Campbell 1980).

Tcbd **Calabasas Formation, Dry Canyon Sandstone Member**—Sandstone (proximal turbidites) and subordinate interbedded siltstone, many thin turbidites, locally prominent dolomitic concretions in siltstone; overlies and tongues eastward into Solstice Canyon Tongue of the Conejo Volcanics; underlies and intertongues westward into Escondido Canyon Shale Member of the Calabasas Formation; overlain by, and locally intertongues with, the Malibu Bowl Tongue of the Conejo Volcanics, and locally overlain by the Newell Sandstone member of the Calabasas Formation; locally overlain by Latigo Canyon Breccia Member of the Calabasas Formation; underlain by Ramera Canyon Tongue of Conejo Volcanics; approximate maximum thickness 686 m (Campbell and others, 1996; Yerkes and Campbell, 1979, p. E24; Yerkes and Campbell, 1980).

Tcbl **Calabasas Formation, Latigo Canyon Breccia Member**—Sedimentary breccia, large angular boulders of Sespe Sandstone and fossiliferous Vaqueros sandstone in sandy, tuffaceous or volcanic breccia; intertongues with epiclastic volcanic breccia; approximate maximum thickness 91 m; underlies the Solstice Canyon Tongue of the Conejo Volcanics and overlies the Escondido Canyon shale member of the Calabasas formation (Yerkes and Campbell, 1979, p. E23; Campbell and others, 1996).

Tcbe **Calabasas Formation, Escondido Canyon Shale Member**—Siltstone, mudstone, shale and minor interbedded thin sandstone turbidites; locally prominent dolomitic concretions; tongues eastward into Dry Canyon Sandstone Member of the Calabasas Formation; westward laps onto and intertongues with Ramera Canyon Tongue of the Conejo Volcanics; approximate maximum thickness 276 m; (Yerkes and Campbell, 1979, p. E24; Campbell and others, 1996).

Tco **Conejo Volcanics, undivided (middle Miocene)**—Basalt, andesitic basalt, basaltic andesite, andesite, and dacite in a thick sequence of extrusive volcanic flows, flow-breccias, agglomerates, and epiclastic volcanic breccias, volcanic sandstones and siltstones; thickest (probably in excess of 3 km) where it underlies the north flank of the western Santa Monica Mountains, and thinning eastward to as little as 200 m of interbedded flows and volcaniclastic sedimentary rocks on the nose of the Topanga Anticline; further east the volcanic rocks are thin and discontinuous, and the name has not been extended eastward for more than a mile east of Topanga Canyon Road. The thick sequence shows a crude compositional layering: pillow basalts, pillow breccias, aquagene tuffs, black volcanic sandstones and interbedded black siltstones are common in the basal part of the Conejo, associated with basalt, andesitic basalt, and basaltic andesite flows, breccias, and agglomerates; andesite and basaltic andesite predominate in the central part of the sequence with interlayered andesitic basalt; and an upper zone, dominated by andesitic and basaltic andesite but including dacite flows in some areas as

well as epiclastic volcanic conglomerates containing andesite and dacite clasts. The map by Durrell (1954) called the volcanics that intervene between lower Miocene and upper-middle Miocene sedimentary strata the “Middle Topanga Formation”; but his students Sonneman (1956) and Blackerby (1965) adopted the name "Conejo Formation” and “Conejo Volcanics", following the usage of Taliaferro (1924) for rocks in the Conejo Mountain area. This usage was formalized by Yerkes and Campbell (1979). In the vicinity of boundary between the Triunfo Pass and Point Dume quadrangles the contact with the upper part of the underlying Topanga Canyon and Vaqueros Formations is a buttress unconformity against a degraded half graben or caldera wall that laps eastward conformably onto shelf sediments at a higher stratigraphic level. Weigand and Savage (1993) have summarized the geochemistry of the Conejo Volcanics, comparing them with other southern California Miocene volcanic suites. The range in initial $^{87}Sr/^{86}Sr$ is reported as 0.60294-0.70320, indicating parent magmas derived from the upper mantle without important crustal rock contamination (Weigand and Savage, 1993, p. 105,106). K-Ar ages on plagioclases from basalt and andesite, reported by Turner and Campbell (1979), range from 15.5±0.8 m.y. near the base of the Conejo to 13.9±0.4 m.y. near the top. McCulloh and others (2002, p. 3) have recalculated the older date using updated decay constants to yield a 15.9±0.8 m.y. age.

Along the north flank of the Santa Monica Mountains, lithologic subunits include:

Tcode **Conejo Volcanics, dacite-bearing epiclastic lenses**—Epiclastic volcanic rocks, but including basalt, andesite and dacite pyroclastic flows and flow breccia; forms relatively thin layers and lenses interbedded in lower part of Calabasas Formation, which locally includes volcanic sandstone and volcanic conglomerate (north of Ventura Freeway, Thousand Oaks 7.5’ quadrangle; after Blackerby, 1965).

Tcod **Conejo Volcanics, dacite-bearing upper zone**—Interlayered dacite (including trachytic dacite), andesite and basalt flows and pyroclastics; minor volcanic sandstone. Malibu Junction Member of Conejo Volcanics of Blackerby (1965) (south of Ventura Freeway, Thousand Oaks 7.5’ quadrangle).

Tcoa **Conejo Volcanics, andesitic central zone**—Interlayered porphyritic and microporphyritic andesite, andesitic basalt, and basaltic andesite flows, agglomerates and flow breccias; includes some crystal tuff, vesicular andesite, pyroclastics and volcanic sandstone; includes Ladyface Member and Medea Member of Blackerby (1965), as well as Potrero and Triunfo Members of Sonneman (1956) and Guynes (1959). (Blackerby, 1965 and unpublished mapping 1965-1973; Campbell and others, 1996, and unpublished mapping 1962-1976; Sonneman, 1956; Guynes, 1959; and Weber, 1984). Lithologically recognized subunits, which occur at various stratigraphic levels, and do not form a consistent stratigraphic sequence, include:

Tcoaf **Conejo Volcanics, andesitic central zone, andesitic flows**—Andesite flows, mapped as Potrero Member of the Conejo Formation by Sonneman (1956) and Guynes (1959).

Tcoaa **Conejo Volcanics, andesitic central zone, andesitic agglomerate**—Andesite agglomerate and tuff, mapped as part of Potrero Member of the Conejo Formation by Guynes (1959).

Tcoab **Conejo volcanics, andesitic central zone, andesite breccia**—Andesitic and basaltic breccia and some agglomerate; mostly equivalent to rocks mapped as the Triunfo Member by Sonneman (1956) and Guynes (1959), and includes rocks mapped as Medea Member by Blackerby (1965). (Yerkes and Campbell, 1980; Campbell and others, 1970; Sonneman, 1956; Guynes, 1959; Weber, 1984; and unpublished 1:12,000-scale mapping by R. H. Campbell and B. A. Blackerby, 1967-1972).

Tcob **Conejo Volcanics, basaltic lower zone, basalt and andesitic basalt**—Chiefly basalt, olivine basalt, basaltic andesite, and andesitic basalt; ranges from trachytic olivine basalt to porphyritic quartz andesite; as flows, breccias, agglomerates, pillow basalts, pillow breccias, and basaltic sand and silt; includes Olivine Basalt and Seminole Members of Blackerby (1965); (Malibu Beach, Point Dume, Triunfo Pass, and Thousand Oaks 7.5' quadrangles; Yerkes and Campbell, 1980; Campbell and others, 1996; Blackerby, 1965; Sonneman, 1956; Guynes, 1959; Weber, 1984; and unpublished 1:12,000-scale mapping by R. H. Campbell and B. A. Blackerby, 1962-1976). Lithologically recognized subunits (flows and breccias) are interlayered at various stratigraphic levels in the upper part of the zone, and do not form a consistent stratigraphic sequence; however pillow basalt, pillow breccia, and volcanic sand predominate in the lower part of the zone. Subunits include:

Tcobf **Conejo Volcanics, basaltic lower zone, basalt and andesitic basalt, basalt flows**—Basalt, andesitic basalt and basaltic andesite flows (Blackerby, 1965; Yerkes and Campbell, 1979, 1980; Campbell and others, 1996; Weber, 1984).

Tcobb **Conejo Volcanics, basaltic lower zone, basalt and andesitic basalt, basaltic breccia**—Basalt, andesitic basalt and basaltic andesite breccias; can include some pillow breccia; in part, mapped as Serrano member of Conejo Volcanics by Sonneman (1956) and Guynes (1959). (Sonneman, 1956; Guynes, 1959; Blackerby, 1965; Yerkes and Campbell, 1980; Weber, 1984; Campbell and others, 1996).

Tcop **Conejo Volcanics, basaltic lower zone, pillow basalt**—Basalt pillow lavas, pillow breccias and probable aquagene tuffs; included in Seminole Member mapped by Blackerby, 1965, and Serrano Member mapped by Sonneman, 1956, and by Guynes, 1959. (Sonneman, 1956; Guynes, 1959; Blackerby, 1965; Yerkes and Campbell, 1980; Campbell and others, 1996).

Tcobz **Conejo Volcanics, basaltic lower zone, basaltic sand**—Black basaltic sand and siltstone; included in Seminole Member of Blackerby, 1965. (Blackerby, 1965; Yerkes and Campbell, 1980; Campbell and others, 1996).

In the upper plate of Malibu Bowl Detachment Fault, three stratigraphically distinct tongues of volcanic rocks are interbedded with members of the Calabasas Formation:

Tcom **Conejo Volcanics, Malibu Bowl Tongue**—Andesitic and basaltic flows and flow breccias; underlies and tongues eastward into the Newell Sandstone Member of the Calabasas Formation and overlies the Dry Canyon Sandstone Member of the Calabasas Formation; as much as 143 m thick (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980).

Tcos **Conejo Volcanics, Solstice Canyon Tongue**—Basaltic and andesitic flows, breccias, and tuffs; local water-laid volcanic sandstone; underlies and intertongues eastward into the upper part of the Dry Canyon Sandstone Member of the Calabasas Formation, overlies Latigo Canyon Breccia Member of the Calabasas Formation; as much as 143 m thick (Campbell and others, 1970; Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Campbell and others, 1996).

Tcor **Conejo Volcanics, Ramera Canyon Tongue**—Basaltic and andesitic breccias, tuff-breccias, and flows(?); minor volcanic sandstone; underlies, and upper part intertongues with lower part of Escondido Canyon Shale Member of the Calabasas Formation; underlain in some areas by shallow marine strata of the Topanga Canyon Formation which is cut out locally by the Malibu Bowl Detachment Fault; as much as 518 m thick. (Campbell and others, 1970; Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Campbell and others, 1996).

Ti **Intrusive rocks, undivided (middle Miocene)**—Dikes, sills and irregularly shaped intrusive bodies of diabase, basalt, and andesite; commonly pervasively altered and easily eroded, undercutting slopes and, therefore, commonly spatially associated with toes of landslides; sills are larger and more abundant in the Topanga Canyon Formation at shallow stratigraphic depths below the base of the Conejo Volcanics; intrusive along the Malibu Bowl Detachment Fault only where Topanga Canyon Formation and younger strata are carried in the upper plate; (widespread in central and western Santa Monica Mountains; Yerkes and Campbell, 1980; Campbell and others, 1996; Yerkes and Campbell, 1994. In the central and western Santa Monica Mountains these are related to the Conejo Volcanics; however, in the eastern Santa Monica Mountains and elsewhere they may be related to other volcanic centers of roughly the same age (for example, small dikes mapped by Saul (1976) in the Mount Wilson 7.5' quadrangle).

Tid **Intrusive rocks, dacite (middle Miocene)**—Dacite dikes, irregular intrusive bodies in older Conejo rocks, and a plug intrusive into Topanga Canyon Formation; (Dibblee and Ehrenspeck, 1993, p. 89).

Tia **Intrusive rocks, andesitic (middle Miocene)**—Andesitic dikes, sills and irregular intrusive bodies, chiefly sills in Topanga Canyon and Vaqueros Formations, and dikes in older rocks.

Tib **Intrusive rocks, basaltic (middle Miocene)**—Basaltic, diabasic, and gabbroic dikes, sills and irregular intrusive bodies, chiefly sills in Topanga Canyon Formation and following detachment faults, and dikes in older rocks.

Tim **Mixed rocks (middle Miocene and early or early middle Miocene)**—Very fine- to fine-grained basalt, pervasively intrusive into black siltstone and very fine-grained sandstone of the Topanga Canyon Formation on a spacing too intimate to map separately at 1:12,000-scale; (Campbell, unpublished mapping, 1967-1976).

Ttc **Topanga Canyon Formation (middle and early Miocene)**—Marine sandstone, commonly arkosic, with interbedded siltstone, pebbly sandstone and pebble-cobble conglomerate; generally well indurated; recognized only in the central and western Santa Monica Mountains, where it is overlain unconformably by the Conejo Volcanics, and conformably overlies lithologically similar older Miocene and Oligocene strata of the Vaqueros Formation;

elsewhere, correlative strata are included in the undivided Topanga Group, **Tt**. Yerkes and Campbell (1979) formalized the name “Topanga Canyon Formation” and described as members lithologic facies that indicate an eastward shoaling of depositional environments from deeper shelf on the west to shoreface, estuarine, and fluvial deposits, wedging out just east of Santa Ynez Canyon. (Note that the deposition precedes post-volcanic tectonic rotation, so in early middle Miocene time the direction of shoaling was nearly north). North of Castro Peak, where the formation is undivided (**Ttc**), it is as much as 1,070 m thick. West of Santa Ynez Canyon to Malibu Canyon three members are recognized: the Cold Creek (**Ttcc**), Fernwood (**Ttcf**), and Saddle Peak (**Ttcs**) Members (Yerkes and Campbell, 1960). The Fernwood Member represents an estuarine and fluvial depositional environment, and separates shelf marine strata of the underlying Saddle Peak and overlying Cold Creek Members, both of which pinch out west of Topanga Canyon. The Fernwood Member wedges out westward and the two nearshore marine members coalesce just east of Malibu Canyon; therefore, the Formation is undivided from Malibu Canyon west to Zuma Canyon. Interbeds of siltstone and mudstone, suggestive of deepening offshore shelf depositional environments, become progressively thicker westward, and siltstone strata of the Encinal Canyon Member (**Ttce**) predominate west of Zuma Canyon. In and west of Arroyo Sequit some thick sandstone beds become prominent in the upper part of the Topanga Canyon Formation, and are here called the Big Sycamore Member (**Ttcb**).

Ttcc **Topanga Canyon Formation, Cold Creek Member**—Marine sandstone, siltstone, and minor pebbly sandstone; sandstone commonly medium grained, moderately to well sorted arkosic arenite, in laminated and graded beds as much as two meters thick, and locally biotitic. About 707 m thick in the northeast corner of the Malibu Beach 7.5’ quadrangle. Locally abundant molluscan fauna referred to "Temblor Stage" of Weaver and others (1944), including the locality for the “Topanga Canyon fauna” (about 50 molluscan species) of Arnold (1907a); named as a member of the Topanga Canyon Formation by Yerkes and Campbell (1979). Conformably overlies the Fernwood member of the Topanga Canyon formation; overlain, in most places conformably, by Conejo Volcanics. In a few localities in upper Topanga Canyon the Conejo is missing and the Cold Creek Member is accordantly overlain by the Calabasas Formation. Foraminifera from siltstone in upper part assigned to Relizian BFZ. (Yerkes and Campbell, 1980; Campbell, unpublished 1:12,000-scale mapping, 1965-1972).

Ttcf **Topanga Canyon Formation, Fernwood Member**—Paralic, fluvial, estuarine, and marine sandstone, pebbly sandstone, and mudstone, with minor tuff and limestone; interbedded with grayish-red or olive-gray mudstone and, locally, minor vitric rhyolite tuff and algal(?) limestone; fluvial sandstone forms thick lenticular ledge-forming beds and is complexly channeled and crossbedded; locally abundant closely spaced borings normal to sandstone bedding (ophiomorpha?), and rare fragments of bone occur; the shallow-water gastropod Melongena, known only from the provincial middle Miocene, occurs in sandstone on a ridge west of Topanga Canyon (in the Fernwood area) (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980). The Fernwood is overlain conformably by and intertongues into the Cold Creek Member of the Topanga Canyon Formation. The Fernwood overlies the Saddle Peak Member conformably and may intertongue with it. In several parts of the Topanga Canyon drainage area Fernwood strata are cut off down dip by Sespe Formation redbeds along the

Malibu Bowl Detachment Fault or by basalt and diabase intrusive into the fault. Fritsche (1993) and Flack (1993) propose that the Fernwood member should be assigned to the Sespe Formation. However, the Fernwood has nowhere been observed to be in direct depositional contact with Sespe strata (even though short segments of approximately located contact are shown on the map, there is no outcrop exposure of unfaulted contact relationships). Nor does the Fernwood contain any red sandstone, which is characteristic of (though not always present in) the Sespe Formation. Therefore, the usage of the source maps is retained. (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Yerkes and Campbell, 1994).

Ttcs **Topanga Canyon Formation, Saddle Peak Member**—Thick-bedded to massive, medium-to coarse grained marine sandstone, pebbly sandstone, and hackly fracturing sandy siltstone, over a 1/2-m-thick basal pebble conglomerate; conformably overlain by the Fernwood Member of the Topanga Canyon Formation; conformably overlies the Piuma Member of the Sespe Formation or its' marine correlative Vaqueros Formation; in places faulted against Sespe and older rocks, or strata of the Calabasas Formation, chiefly along the Malibu Bowl Detachment Fault. A resistant sandstone near the base of the Saddle Peak Member contains an abundant "Temblor" megafauna that includes the gastropod *Antillophos dumbleanus* (Anderson), that is apparently restricted to the middle Miocene; immediately above this bed is a 10-cm thick layer of well-preserved, in part articulated valves of the giant pectinid *Vertipecten nevadanus* (Conrad) (also called *V. bowersi*); the entire fauna is referred to the middle Miocene "Temblor" provincial Stage. Fritsche (1993) has proposed that the Saddle Peak Member be included with the Vaqueros Formation because some elements of the fauna are long ranging and are also found in the Vaqueros, and because closely similar lithofacies are found in both units. However, detailed mapping can carry continuous and overlapping stratigraphic horizons in most areas where the Saddle Peak Member is in contact with underlying Vaqueros, and the two units are mappable separately. Therefore, the usage of the source maps is retained. The unit is about 220 m thick along Piuma Road on the west shoulder of Saddle Peak. (Yerkes and Campbell, 1979; Yerkes and Campbell, 1980).

Ttcb **Topanga Canyon Formation, Big Sycamore Member**—Alternating gray sandstone and dark gray siltstone or silty mudstone, commonly platy to shaly; chiefly mudstone with interbedded thin- to thick-bedded lenticular sandstone in sets that locally coalesce to massive beds; sandstone grain size variable, with local rip-up clasts of shale, and pebbly sandstone with polished, rounded chert pebbles; mudstone interbeds commonly thin-bedded to shaly. A rare occurrence of detrital glaucophane in sandstone is the earliest known north of the Malibu Coast Fault. Sonneman (1954) estimated a total thickness of 2,400 ft. (732 m) to 3,500 ft. (1,066 m). Mapped as the "Upper Member of the Sycamore Formation" by Sonneman (1956); mapped as individual sandstone beds in the "Undivided Topanga Canyon Formation" by Dibblee and Ehrenspeck (1990); here called "Big Sycamore Member of the Topanga Canyon Formation" to follow rules of the North American Code. Fossils include: locally common *Vertipectin Nevandus* at Point Mugu; rare *Turritella Temblorensis* (Sonneman, 1954); and Relizian foraminifera (Sonneman, 1954).

Ttce **Topanga Canyon Formation, Encinal Member**—Chiefly dark gray siltstone or silty mudstone, commonly platy to shaly, but at many localities bedding fissility is obscured by a dominant conchoidal fracture, possibly indicating bioturbation; lenticular dolomitic concretions locally abundant, particularly along locally restricted stratigraphic zones as thick as 60 cm; rare medium-and fine-grained sandstone beds in the Encinal Canyon area (western Point Dume 7.5' quadrangle) increase in abundance somewhat westward in the Triunfo Pass 7.5' quadrangle. The siltstone rests conformably on sandstone of the underlying San Nicholas Member of the Vaqueros Formation, but there is apparent discordance in some places where lack of exposure prevents clear discrimination. The Encinal Canyon Member intertongues with and is overlapped conformably by the Big Sycamore Member of the Topanga Canyon Formation, and unconformably overlain by Conejo Volcanics (see discussion of base of Conejo, above). Poorly preserved foraminifera in two collections from the Encinal Canyon Road exposures reported by Yerkes and Campbell (1979) are assigned to the Relizian(?) stage and Saucesian or Relizian stages of Kleinpell (1938), respectively. Further west, in the Triunfo Pass and Point Mugu quadrangles Sonneman (1956) reports that the "Lower Member of the Sycamore Formation", which is contiguous with the Encinal Canyon Member of the Topanga Canyon Formation (Yerkes and Campbell, 1980), also contained foraminifera assignable to the Relizian Stage. A subsequent collection reported by Flack (1993) is also assigned a late Saucesian to early Relizian age. Flack (1993, p. 46) considers the Encinal Member, as well as the entire Topanga Canyon Formation, to be late early Miocene rather than early middle Miocene. (Campbell and others, 1996; Campbell, unpublished 1:12,000-scale mapping, 1965-1975; Sonneman, 1956; Dibblee and Ehrenspeck, 1990).

Western Los Angeles Basin-Continental Borderland

Tr **Trancas Formation, undivided (middle and early Miocene)**—Marine mudstone, silty shale, claystone, sandstone, and locally prominent sedimentary breccia on Lechusa Point and Point Dume; the breccias are distinctive for their abundant detritus of the Mesozoic Catalina Schist, including glaucophane schist (San Onofre breccia of Woodford and Bailey, 1928). The Trancas has been much deformed in the zone south of the Malibu Coast Fault, and no complete section is known. The Sovereign Oil Company Malibu 1 exploratory well on Point Dume drilled through 290 m of marine sandstone, mudstone, claystone, and sedimentary breccia (San Onofre Breccia) between the base of the Monterey Shale and the underlying Zuma Volcanics, assigned to the Trancas formation by Yerkes and Campbell (1979); (Point Dume and Triunfo Pass 7.5' quadrangles; Campbell and others, 1996; Campbell, 1965-1975, unpublished 1:12,000-scale mapping). The siltstones locally contain abundant foraminiferal assemblages assigned to the Saucesian (lower Miocene) and Relizian or Luisian (middle Miocene) stages of Kleinpell (1938). **Tra**—quartz-bearing calcarenites in the western part of the Point Dume 7.5' quadrangle and eastern part of the Triunfo Pass 7.5' quadrangle are distinctive for the pervasive intergranular disruption that causes original bedding to be completely masked; further west, at Sequit Point, the sandstones are seen to be coarse-grained, cross-laminated calcarenites, composed chiefly of barnacle plates and oyster fragments, with significant areas intruded by sandstone of similar composition but in which the original fabric is no longer visible (inferred

to be a result of liquefaction). An exposure of San Onofre Breccia overlying Zuma Volcanics on the tip of Point Dume, south of the Point fault, is assumed to represent the base of the Trancas Formation in that area. The Trancas may intertongue with both the Zuma Volcanics and the lower part of the Monterey Shale, but is locally unconformably overlain by upper (late Miocene) beds of the Monterey Shale.

Tz **Zuma Volcanics (middle and early Miocene)**—Basaltic, andesitic and dacitic flows, flow breccias, pillow lavas, aquagene tuffs, mudflow breccias, volcanic sand and interbedded mudstone, siltstone, sandstone, minor breccia-conglomerate; all probably deposited in a marine environment; no igneous rocks south of the Malibu Coast Fault are recognizably intrusive into the associated sedimentary rocks; sedimentary interbeds carry foraminifera referred to the Relizian or Luisian Stages (middle Miocene) of Kleinpell (1938). Weigand and Savage (1993), from a study of major element analyses, showed that most of the analyzed samples of Zuma Volcanics fall in the dacite field of the classification of LeBas and others (1986). Plagioclase phenocrysts from basalt near the tip of Point Dume have been dated at 14.6 ± 1 my (Berry and others, 1976). Base not exposed, but an equivalent section in the exploratory well, Sovereign Malibu 1 on Point Dume, is about 430 m (stratigraphic) thick above probable metamorphic basement (Catalina Schist). Although the Zuma and Conejo Volcanics fall within the same range of ages, the overlying and underlying sedimentary strata, and the basement rocks, are significantly different, suggesting that they could be related to different extrusive centers. (Campbell and others, 1970, 1996; Yerkes and Campbell, 1980; and Campbell, unpublished 1:12,000-scale mapping, 1967-1971).

Soledad Basin and San Andreas Fault Zone

Tvz **Vasquez Formation, undivided (early Miocene to Oligocene?)**—Yellowish and reddish sandstone, conglomerate, and interbedded andesite-basalt, lying on pre-Tertiary crystalline basement rocks and unconformably below strata of Tick Canyon Formation; total thickness as much as 3,810 m (Jahns and Muehlberger, 1954). Includes numerous beds and lenses of megabreccia, many monolithologic. Named by Sharp (1936); further described by Jahns (1939). (Dibblee, 1996a,b).

Tvza **Vasquez Formation, andesitic volcanic rocks (early Miocene? to late Oligocene)**—Dark-gray to dark reddish-brown andesite and basaltic andesite, hard, very fine-grained matrix with fine- to medium euhedral phenocrysts of plagioclase feldspar. Occasional flow banding, conglomeratic layering, and some silica-filled amygdules. Outcrops locally exhibit sub-parallel sheet jointing.

Tvzb **Vasquez Formation, basaltic volcanic rocks (early Miocene? to late Oligocene)**—Dark-gray, basaltic to andesitic volcanic rocks. Unit contains small phenocrysts of augite and olivine. Outcrop exposures are highly jointed and resistant, with weathered surfaces dark-gray to dark-brown.

Tvzc **Vasquez Formation, non-marine conglomerate (early Miocene? to late Oligocene)**—Pebble- to cobble fluvial conglomerate and red clayey siltstone. Unit consists of sub-rounded to

rounded clasts of gray, tan, pink, and lavender volcanic rocks. Also contains quartz monzonitic to granodioritic clasts.

Tvzs **Vasquez Formation, sedimentary rocks (early Miocene? to late Oligocene)**—Pebble- to cobble fluvial conglomerate and red clayey siltstone. Unit consists of sub-rounded to rounded clasts of gray, tan, pink, and lavender volcanic rocks. Also contains quartz monzonitic to granodioritic clasts.

Topatopa Mountains and eastern Santa Ynez Range

Trn **Rincon Formation (early Miocene and late Oligocene)**—Marine shale and mudstone with dolomitic and limonitic concretions as much as 0.65 m in diameter (Fillmore 7.5’ quadrangle); foraminiferal faunas referred to the Zemorrian and Saucesian Stages (early Miocene) of Kleinpell (1938); thickness about 275 m. Overlain, apparently accordantly, by shale and mudstone assigned to the lower part of the Modelo formation (which, in this area, is designated middle and upper Miocene), and conformably overlies Vaqueros Formation strata. The type section for the Rincon Formation is approximately 30 mi. to the west in the vicinity of Rincon Point where the name, Rincon Shale, was suggested by Kerr (1931) (south flank of Santa Ynez Mountains, Fillmore and Piru 7.5’ quadrangles; Eschner, 1969). Fritsche (1993) proposed that similar rocks within a similar age-range in the western Santa Monica Mountains (the Encinal Member of the Topanga Canyon Formation and the Danielson Member of the Vaqueros Formation) should be termed "tongues" of the Rincon Formation; however, we have retained the nomenclature of the source maps

Western Santa Monica Mountains, Oak Ridge and eastern Ventura Basin

Tv **Vaqueros Formation, undivided (early Miocene and Oligocene)**—A heterogeneous sequence of thick- and medium-bedded sandstone and interbedded siltstone and mudstone; sandstone ranges from coarse- to very fine-grained, chiefly biotitic arkosic arenites and wackes; siltstone and mudstone interbeds commonly dark gray, but can be greenish or reddish in color; commonly carries *Turritella inezana* and other elements of the "Vaqueros fauna". Although the name was first used in central California (Hamlin, 1904) and subsequently extended on the basis of faunal elements, it has long been used in coastal Southern California, and is used consistently throughout intervening areas, to refer to a well-recognized and widespread, predominantly marine sequence that contains a distinctive molluscan fauna (Loel and Corey, 1932). Since Addicott (1972) noted that the range of the Temblor fauna included the range of the Vaqueros fauna in the Temblor Range type area, some authors (Fritsche, 1993; Dibblee, 1989a) have proposed abandoning the name, Vaqueros, and combining the pre-Conejo post-Sespe strata into a single unit. However, in nearly all the problematical areas there are sufficient continuous or overlapping beds, as well as differences in fauna, to provide a realistic basis for mapping separate formations. In the Santa Monica Mountains a complete section in the vicinity of Castro Peak, where the Vaqueros accordantly overlies the nonmarine Sespe formation, is as much as 760 m thick; east of Malibu Canyon however, shoreface facies intertongue with nonmarine strata of the Sespe Formation, and Vaqueros strata are not present in and east of Topanga Canyon. Along the north side of Simi Valley, Vaqueros strata about 600 m thick lie

accordantly above Sespe redbeds and are overlain by Conejo Volcanics; the Vaqueros wedges-out to the east in the Simi Valley West 7.5' quadrangle. In the Simi Valley area, Squires and Filewicz (1983, Fig. 2) show the Vaqueros as approximately 310 m in thickness, intertonguing with and overlying the Sespe Formation; it pinches out eastward beneath the unconformably overlying Conejo Volcanics. North of Fillmore, the easternmost Vaqueros is about 183 m thick. (Cemen, 1977; Eschner, 1969; Bailey, 1951). Oborne (1993) has described the several interbedded lithofacies that are present to the west of Topanga Canyon and interprets them to represent deposition during a rapid marine transgression from west to east over nonmarine strata of the Sespe. This compilation retains the usage and nomenclature of Yerkes and Campbell, 2005. (western Santa Monica Mountains, western Topatopa Mountains, and north side of Simi Valley; Yerkes and Campbell, 1979; Yerkes and Campbell, 1980; Campbell and others, 1996; Eschner, 1969; Bailey, 1951; Cemen, 1977; Squires, 1983a; Sonneman, 1956; Durrell, 1954). Includes:

Tvn **Vaqueros Formation, San Nicholas Member**—Very thick bedded to massive cliff- and ledge-forming marine sandstone, generally very light gray to pale bluish gray; rare interbeds and partings of siltstone and shale, commonly dark gray. Sandstone, very fine- to very coarse-grained arenite, locally pebbly; thick beds show internal cross lamination, parallel, lamination, and disturbed (burrowed?), laminations; local common barnacle detritus. Generally conformably underlain by the Danielson Member of the Vaqueros Formation; however, locally thinned where it rests on older rocks beneath the Zuma Detachment Fault, as in Encinal Canyon. Conformably overlain by the Encinal Member of the Topanga Canyon Formation. Mapped as "Nicholas Formation" by Sonneman (1956), named for exposures in the vicinity of San Nicholas Canyon (Triunfo Pass 7.5' quadrangle); formalized as a member of the Vaqueros Formation by Yerkes and Campbell (1979). (Campbell and others, 1996; Campbell, unpublished 1:12,000-scale mapping, 1967-1975).

Tvd **Vaqueros Formation, Danielson Member**—Grayish black, very fine-grained, marine sandy siltstone or mudstone, in medium and thin beds, generally with indistinct parallel lamination; fractures commonly conchoidal or irregularly subparallel to bedding, but locally platy or shaly. In San Nicholas Canyon, several prominent interbeds, 1/3 to 1 m thick, of calcareous very fine-grained sandstone and sandy mudstone contain fossil remains of *Turritella inezana* Conrad in such numbers as to locally form biostromes (Yerkes and Campbell, 1979, p. E12). Mapped as "Danielson Formation" by Sonneman (1956), named for exposures on the Danielson Ranch in Big Sycamore Canyon (Triunfo Pass 7.5' quadrangle); formalized as a member of the Vaqueros Formation by Yerkes and Campbell (1979). (Sonneman, 1956; Campbell and others, 1996; Campbell, unpublished 1:12,000-scale mapping, 1967-1975).

Western Santa Monica Mountains, Oak Ridge and eastern Ventura Basin

Ts **Sespe Formation, undivided (early Miocene, Oligocene, and late Eocene)**—A nonmarine "redbed" sequence of sandstone, pebbly sandstone, varicolored mudstone, and pebble-cobble conglomerate; sandstone beds commonly very thick to massive, with strong internal cross lamination; and rare thin interbeds varicolored reddish, greenish and grayish mudstone. The

sandstone beds are characteristically red in color, chiefly as a result of intergranular hematized biotite; several sections include beds that lack the characteristic red color. The only complete section of the Sespe exposed in the Santa Monica Mountains is in the Solstice Canyon-Castro Peak area, where about 1000 m of the nonmarine strata are in depositional contact on (and accordant with) the underlying marine Llajas Formation, and accordantly beneath the overlying marine Vaqueros Formation. Elsewhere in the Santa Monica Mountains, both to the east and to the west, the Sespe is in fault contact with underlying older strata, chiefly along the Zuma Detachment Fault. At the west end of the Simi Hills about 1365 m of Sespe strata lie accordantly above the marine Llajas and unconformably below Conejo Volcanics. Along the north side of Simi Valley, Sespe exposures total as much as 1656 m in thickness in the west (Simi Valley West 7.5' quadrangle), but wedges out to the east, north of Santa Susana Pass (Simi Valley East 7.5' quadrangle). Along the north flank of Oak Ridge the Sespe can be as much as 2135 m thick, based in part on drill-hole data. In the western Topatopa Mountains, north of Fillmore, the Sespe is about 430 m thick between the underlying marine Coldwater Formation and overlying marine strata assigned to the Vaqueros Formation (Fillmore 7.5' quadrangle). The name, Sespe Formation, was introduced by Watts (1897) and further described by Bailey (1947) for exposures in the vicinity of Sespe Creek, north of Fillmore, and has been extended over large parts of coastal southern California by various workers. Generally, it has been applied to a thick nonmarine sandstone, conglomeratic sandstone and siltstone sequence that is underlain by marine Eocene strata and overlain by marine Miocene beds.

Tsp **Sespe Formation, Piuma Member (early Miocene)**—In contrast to the thicker bedded, more coarsely grained sandstone and conglomerate of the undivided Sespe Formation below, the Piuma Member is distinguished by thinner individual beds, sandstone of generally finer grain size, absence of pebble and cobble conglomerate, and greater abundance of interbedded lacustrine or lagoonal siltstone. The member name was formalized by Yerkes and Campbell (1979) for the upper of two tongues of the Sespe that can be easily distinguished where strata of the marine Vaqueros Formation separate them; the Vaqueros wedges out eastward, but the contact between the Piuma Member and the undivided Sespe below can be carried some distance eastward beyond the Vaqueros wedge-out. (Yerkes and Campbell, 1980).

Topatopa Mountains and eastern Santa Ynez Range

Tcw **Coldwater Formation (late Eocene)**—Marine arkosic sandstone and shale, with lenses of pebble conglomerate and oyster reefs; thickness about 390 m. Earliest use of "Coldwater Sandstone Member" by Kew (1924); referred to "Coldwater Formation" by Bailey (1947). (Eschner, 1969).

Tcz **Cozy Dell Formation (late to middle Eocene)**—Well-bedded brown clay shale and mudstone; thickness as much as 600 m. Earliest use of "Cozy Dell Shale " member of the Tejon Formation by Kerr and Schenk (1928); described as "Cozy Dell Shale" by Dibblee (1950). (Eschner, 1969).

Tma **Matilija Formation, undivided (middle to early Eocene)**—Marine sandstone, arkosic, very well indurated, and interbedded mudstone and siltstone. Conformable beneath Cozy Dell Formation; base not exposed in the map area; total thickness exceeds 1 km. Molluscan fossils are of the Tejon Stage (late Eocene); however, interbedded shale contains foraminifera referred to the Ulatisian and Narizian (early to middle Eocene) Stages of Mallory (1959). "Matilija sandstone" member of the Tejon Formation defined by Kerr and Schenk (1928), described as Matilija Sandstone by Dibblee (1950). (Eschner, 1969). Includes:

Tmasl **Matilija Formation, siltstone and shale**—Micaceous shale with thin sandstone interbeds; Foraminifera referred to the Ulatisian and Narizian (middle to early Eocene) Stages of Mallory (1959). (Eschner, 1969).

Santa Susana Mountains, Simi Hills and Santa Monica Mountains

Tl **Llajas Formation (middle to early Eocene)**—Shallow marine, light-gray to yellowish-gray, very fine- to medium-grained sandstone, laminated siltstone and local mollusk coquina beds; interfingers with alluvial conglomerate (Tlc) at the base; sandstone is laminated to bioturbated; moderately indurated (Irvine, 1990, 1991; Squires, 1983b); section is about 1,800 ft. (550 m) thick. Locally contains fossil mollusks assigned to the "Domengine Stage" (Weaver and others, 1944); Figure 3 of Squires (1983b) suggests the basal portion corresponds to the upper "Capay Stage". As summarized by Squires (1983b), the Llajas section in the Simi Valley area was originally assigned to the "Tejon" or "Meganos" Formations (e.g. Kew, 1919, 1924); subsequently assigned informally to the Llajas Formation by Schenck (1931) and McMasters (1933); more formally named by Cushman and McMasters (1936) for surface outcrops at the type section on the northwest side of the north branch of Llajas Canyon (now known as Chivo Canyon and formerly known as "Oil Canyon"), and from corehole data obtained from the nearby Tapo No. 42 oil well, all located on the northeast side of Simi Valley) (Simi Valley East, Oat Mountain, Thousand Oaks 7.5' quadrangles, and correlative strata in the Point Dume, Malibu Beach, and Topanga 7.5' quadrangles). Includes:

Tlc **Llajas Formation, basal conglomerate**—Alluvial to shallow marine, light-brown to reddish-brown conglomerate interbedded with subordinate, poorly sorted, generally massive sandstone (Irvine, 1990); conglomerate is typically unstratified, ungraded, clast supported, and poorly sorted; clasts are typically well rounded, cobble size, and composed dominantly of quartzite with lesser amounts of granitic, volcanic and metamorphic rocks (Squires, 1983b). Squires (1983b) interprets this facies as a coastal alluvial fan or fan delta deposit. This unit defines the base of Llajas strata relative to the underlying Santa Susana Formation in the area northeast of Simi Valley (Evans and Miller, 1978).

San Gabriel Mountains

Tj **Juncal Formation (late early Eocene)**—Marine, brown amalgamated sandstone beds with interbedded conglomeratic sandstone, conglomerate and siltstone exposed in Elsmere Canyon (San Fernando 7.5' quadrangle); moderately to well cemented; clasts include exotic purple volcanic porphyry and local large siltstone rip-up clasts, and range up to boulder size. The coarse-

grained units are interpreted as turbidity current deposits in a middle- to upper-fan submarine fan depositional environment (Squires, 2008). The Elsmere Canyon section has a measured thickness of about 520 m (Squires, 2008) and it locally contains fossil mollusks originally assigned to the "Domengine Stage" of late early to early middle Eocene age (Weaver and others, 1944); however, detailed studies by Squires (2008) suggest the section at Elsmere Canyon represents the transition from the "Domengine Stage" to the underlying "Capay" Stage, at an age of about 50.5 Ma. The Eocene strata at Elsmere Canyon were first assigned to the "Domengine formation" by Brown and Kew (1932) and this usage was followed by early workers in the area (e.g. Oakeshott, 1950, 1958), and this usage was followed on Version 1.0 of the Los Angeles 30'x60' geologic map (Yerkes and Campbell, 1995). The Elsmere section was left unnamed by Winterer and Durham (1962), Kern (1973), and Dibblee (1991). Some subsequent workers assigned the name "Llajas Formation" to this section (e.g. Seedorf, 1983 and Yeats and others, 1994). Squires (2008) re-evaluated the past nomenclature and conducted additional field studies, and concluded the Elsmere Eocene section is more consistent lithologically with exposures of Juncal Formation mapped to the northwest in the Piru Creek area (Squires, 1987) rather than the type Llajas section, and the Piru and Elsmere sections may have originally been contiguous (Yeats and others, 1994).

The term "Martinez Formation" was previously retained on Version 1.0 of the Los Angeles 30x60' sheet for coarse-grained marine greenish-black to light olive-gray sandstone, with thin interbeds of black shale, and lenticular beds of well-cemented conglomerate of Eocene or Paleocene age mapped as fault-bounded slivers along the San Gabriel Fault between Bear Divide and Tujunga Canyon on the Sunland and San Fernando 7.5' quadrangles (Oakeshott, 1958; Yerkes and Campbell, 2005); clasts reportedly include exotic volcanic porphyry. The term "Martinez Formation" was imported from a type locality in the San Francisco Bay area; the term "Martinez" now generally refers to a Paleocene molluscan stage. Assignment of this section to the "Martinez Formation" was reportedly based on lithologic similarity with "Martinez" strata mapped in the Tejon quadrangle (Oakeshott, 1958) and on the discovery of the age-diagnostic fossil *Turritella pachecoënsis* (Clements and Oakeshott, 1935); however, use of the term "Martinez" has generally been abandoned as a lithologic formation name in southern California. Squires (pers. comm. 2014) notes that the reported specimens of fossil *Turritella* cannot be located for review and additional specimens could not be found during recent field studies; based on field observations of the stratigraphy and presence of exotic volcanic porphyry clasts, Squires suggests that the fault-bounded slivers may actually be part of the Juncal Formation; the fault-bounded slivers are therefore queried as Juncal Formation herein.

Santa Susana Mountains, Simi Hills and Santa Monica Mountains

Tss **Santa Susana Formation (early Eocene to late Paleocene)**—Marine clay shale and conchoidally fractured mudstone and siltstone with interbeds of fine- to medium-grained sandstone and lenses of pebble-cobble conglomerate; gray limestone concretions common in shale; locally contains foraminifera; locally abundant mollusks diagnostic of the "Meganos" and "Martinez" Stages (Saul, 1983); thickness as much as 1,000 m in the Simi Hills; unit thickness varies laterally and rapid lateral facies changes are common across map area. Named by Nelson (1925) for exposures in the Simi Hills near the town of Santa Susana. As

summarized by Parker (1983, 1985), lower Tertiary strata in the Simi Hills were originally correlated and assigned to the "Martinez and/or Meganos Formations" by early workers, including Waring (1914, 1917), Kew (1919, 1924), and Clark (1921). Nelson (1925) raised the "Martinez Formation" to group status and subdivided it into the Simi Conglomerate, Las Virgenes Sandstone, and the Martinez marine member, overlain by the Santa Susana Formation. Most literature published to date follows some form of Nelson's terminology, but the placement of contacts varies considerably among different authors. Parker (1983, 1985) modified Nelson's Santa Susana Formation to include the underlying Martinez marine member, thereby encompassing all strata above the Simi Conglomerate and Las Virgenes Sandstone and below the Llajas Formation in the Simi Hills and northeastern Simi Valley. Parker and other authors abandoned "Martinez Group" and "Martinez marine member" because "Martinez" is a molluscan Stage name, imported from a central California type locality, and no longer considered appropriate to use as a formation name for this interval. Colburn and others (1988) and Colburn and Novak (1989) extended Parker's nomenclature to correlative rocks in the Santa Monica Mountains and included beds mapped as Coal Canyon Formation by Yerkes and Campbell (1979, 2005) in the Santa Susana Formation. Distribution of lower Tertiary strata in the Simi Valley area on this map is based on Squires (1983a), which includes Parker's nomenclature and contacts. Parker described the lower Tertiary units in terms of western and eastern facies based on the location of the stratigraphic sections relative to the "Runkle Canyon fault" (Squires, 1983a). The western facies of the Santa Susana Formation in the Simi Valley area (Simi Valley East, Calabasas and Thousand Oaks 7.5'quadrangles) overlies the Las Virgenes Sandstone with a gradational to sharp contact and is disconformably overlain by the Llajas Formation. It generally consists of a lower unit of densely bioturbated, fossiliferous, fine- to medium-grained sandstone and an upper unit dominated by poorly fossiliferous fractured mudstone and siltstone interbedded with subordinate sandstone and minor conglomerate. The lower unit represents transition zone and offshore to shelf deposits and the upper unit represents deposition within a slope environment. The eastern facies overlies the Simi Conglomerate with a gradational or sharp contact and is overlain disconformably by the Llajas Formation. The eastern facies is more variable, but generally consists of fractured mudstone and siltstone similar to the western facies with discontinuous interbeds of sandstone and conglomerate. East of Meier Canyon, mudstone and siltstone are present in the lower half and sandstone and conglomerate present in the upper half. Sandstone occurs as discontinuous lenses in conglomerate and in beds up to 20 meters thick. Near Runkle Canyon, sandstone occurs as thin interbeds within the mudstone and siltstone and in tongues up to 150 m with locally abundant megafossils occurring in layers within concretionary beds. Northeast of Simi Valley in Poison Oak Canyon, beds are dominantly mudstone interbedded with minor sandstone above two tongues of Simi Conglomerate. These beds represent inner fan deposits. Interbedded sandstone and conglomerate near Meier Canyon represent the coarse portion of an inner fan and slope deposits. The uppermost portion of the Santa Susana Formation in both the western and eastern facies consists of sandstone with megafossils and microfauna indicative of a shelf environment and may record a basin filling and shoaling event prior to the deposition of the nonmarine basal Llajas conglomerate., In the Santa Monica Mountains, Santa Susana strata

include marine sandstone, pebble conglomerate, siltstone and algal limestone. Sandstone is very fine to medium grained, poorly to well sorted, consisting of subrounded quartz and feldspar grains in a sparse clay matrix, locally biotitic; locally contains abundant mollusks; beds commonly are thick and locally have graded upper parts and sharp upper contacts. Siltstone and silty claystone are present locally in the upper part of the formation; closely jointed, conchoidal fracture, and containing abundant biotite; local partings of fine-grained silty biotitic sandstone, and calcareous beds or concretions as thick as 15 cm and as long as 1 m. Pebble-cobble conglomerate forms resistant steep slopes in Carbon and Topanga Canyons; in beds as much as 7 m thick with scattered pebbles, boulders, slabs, and interbeds of mudstone and medium-to coarse-grained sandstone. The Yerkes and Campbell (2005) map shows the Coal Canyon Formation to be about 335 m thick in Solstice Canyon, the only complete section exposed in the Santa Monica Mountains. The thickness summed from incomplete sections in the Carbon Canyon-Topanga Canyon area is as much as 450 m. Commonly carries a molluscan fauna that includes the Martinez-Stage gastropods *Turitella pachecoensis* and *Mesalia martinezensis* (Gabb, 1869). Colburn and others (1988) and Colburn and Novak (1989) prepared five stratigraphic columns and detailed geologic maps of the section localities along the axis of the Santa Monica Mountains from Solstice Canyon in the west to Runyon Canyon near Hollywood and correlated Simi Conglomerate, Las Virgenes Sandstone, and Santa Susana Formation strata. The Las Virgenes Sandstone and Simi Conglomerate are not separately delineated on the current version of the Los Angeles compilation map in the central and eastern Santa Monica Mountains (Malibu Beach, Topanga, Beverly Hills, and Hollywood 7.5’ quadrangles) and Simi Conglomerate and Las Virgenes Sandstone strata mapped by Colburn and Novak (1989) are included in Santa Susana Formation in these areas. Yerkes and Campbell (1979) mapped the Simi Conglomerate in Solstice Canyon (Point Dume 7.5’ quadrangle), but did not recognize the Las Virgenes Sandstone in the Solstice Canyon section, and included most of that interval in the Simi Conglomerate. In the Santa Monica Mountains, the Santa Susana Formation overlies and interfingers with the nonmarine Las Virgenes Sandstone (included in Simi Conglomerate on this map) or overlies the late Cretaceous Tuna Canyon Formation; the relations are generally accordant but locally unconformable. In Solstice Canyon, the Santa Susana Formation is overlain disconformably(?) by marine strata of Eocene age. (Squires, 1983a; Yerkes and Campbell, 1980; Campbell and others, 1996). Includes:

Tssl **Santa Susana Formation, limestone**—Algal limestone occurs as scattered lenses and pods in siltstone sequences east of Topanga Canyon, most prominently in the eastern wall of Santa Ynez Canyon.

Santa Susana Mountains, Simi Hills and Santa Monica Mountains

Tlv **Las Virgenes Sandstone (early(?) Paleocene)**—Nonmarine to marine light-gray to yellowish orange, predominantly medium- to coarse-grained weakly to moderately indurated sandstone with green interbedded mudstone and red-bed mudstone, and minor pebble conglomerate; megafossils and burrows are present in the upper part of the section at Bus Canyon; thin sequence, locally as thick as 195 m near Bus Canyon in the Simi Hills, but thins westward to zero; originated as sandy, braided alluvial and meandering stream deposits on a coastal plain;

upper part represents nearshore marine deposits (Parker, 1983); conformably overlies Simi Conglomerate and is overlain by and interfingers with the Santa Susana Formation. Named by Nelson (1925) for exposures near Las Virgenes Canyon in the Simi Hills. Colburn and others (1988) and Colburn and Novak (1989) correlated Las Virgenes Sandstone from the Simi Hills to five localities in the Santa Monica Mountains. These strata are included in the Santa Susana Formation on the current Los Angeles compilation map in the central and eastern Santa Monica Mountains (Malibu Beach, Topanga, Beverly Hills, and Hollywood 7.5' quadrangles). Yerkes and Campbell (1979, 2005) did not recognize the Las Virgenes Sandstone in the Solstice Canyon section (Point Dume 7.5' quadrangle), and included most of that interval in the Simi Conglomerate, including distinctive pisolite-bearing beds that Colburn assigned to the Las Virgenes Sandstone. Pisolite-bearing red beds are also mapped in the Bus Canyon section in the Simi Hills by Parker (1985), but he included the beds in the Simi Conglomerate. (Squires, 1983a).

Tsi **Simi Conglomerate, undivided (Paleocene)**—Thin, predominantly nonmarine cobble-boulder conglomerate mapped at the base of the Tertiary sequence in the Simi Hills, the Santa Monica Mountains, and northeast of Simi Valley. The conglomerate is poorly bedded, weakly to moderately indurated and contains abundant well-rounded, polished cobbles and boulders of quartzite, granitic, rhyolitic, and gneissic rocks in conglomeratic, coarse-grained sandstone. Distribution of lower Tertiary strata in the Simi Valley area shown on this map is based on Squires (1983a), which includes Parker's (1983, 1985) nomenclature and contacts. Parker described the lower Tertiary units in terms of western and eastern facies based on the location of the stratigraphic sections relative to the "Runkle Canyon fault" (Squires, 1983a). According to Parker, Simi Conglomerate west of the Runkle Canyon fault (Squires, 1983a) represents alluvial fan and braided river deposits and Simi Conglomerate east of the Runkle Canyon fault in Runkle and Meier Canyons and northeast of the Simi Valley represents channel and inner fan facies of a deep-sea fan, based on observed sedimentary structures and microfaunal studies summarized by Parker (1983, 1985). The marine conglomerate included by Parker in the Simi Conglomerate is considered by other authors to be part of the Santa Susana Formation or an unnamed Paleocene marine unit (Hanson, 1981).Yerkes and Campbell (1979) tentatively correlated beds described in the Simi Hills by Nelson (1925) as the Simi Conglomerate with lithologically similar beds in the Solstice Canyon area of the Santa Monica Mountains, and the correlation is supported in subsequent detailed petrographic work by Colburn and Novak (1989). In Solstice Canyon (eastern Point Dume 7.5' quadrangle) the conglomerate includes a 1-m-thick bed of brick-red pisolitic clayey sandstone, which Colburn and Novak (1989) include in the Las Virgenes Sandstone. Simi Conglomerate beds mapped by Colburn and Novak (1989) in the central and eastern Santa Monica Mountains (Malibu Beach, Topanga, Beverly Hills, and Hollywood 7.5' quadrangles) are included in the Santa Susana Formation on the current Los Angeles compilation map. Correlative strata in the Santa Susana Mountains, mapped as "Martinez Formation" by Evans and Miller (1978), are here included with the Simi Conglomerate. Evans and Miller (1978) recognized three local lithologic members.

Tsic **Simi Conglomerate, conglomeratic member**—Massive, yellowish brown pebble to cobble conglomerate with numerous brownish sandstone lenses as much as 1 m thick and continuous

for a few tens of meters along strike. Locally contains molluscan fauna referred to the Martinez Stage (Paleocene) (Evans and Miller, 1978).

Tsis **Simi Conglomerate, shale member**—Light olive gray micaceous siltstone, silty shale, and shale with local thin interbeds of brown, medium- to coarse-grained sandstone. Dark gray limestone occurs in the shale as thin, discontinuous beds as well as small pods and lenses (Evans and Miller, 1978).

Tsia **Simi Conglomerate, sandstone member**—Massive, gray to brownish, coarse- to very coarse-grained sandstone, cemented by silica and hydrous iron oxides, with thin interbeds of micaceous siltstone and lenses of boulder, cobble and pebble conglomerate; locally strongly cemented by calcite (Evans and Miller, 1978).

Santa Susana Mountains, Simi Hills and central and western Santa Monica Mountains

Kc **Chatsworth Formation (late Cretaceous)**—Dominantly turbidite sandstone, massive, thick-bedded, medium- to coarse-grained, well-cemented; conglomeratic sandstone with rounded, polished clasts of quartzite, porphyry and granitic rocks; with minor siltstone and conglomerate. Molluscan faunas include the ammonite *Metaplacenticeras californicum* and the gastropod *Tuttitella pescaderosensis*, referred to the Campanian or Maestrictian (late Cretaceous) Stages (Popenoe, 1973; Saul and Alderson, 1981); benthic foramifera from mudstones in the lower-middle part of the sequence are referred to the late Campanian. Exposed thickness exceeds 1830 m; base not exposed nor drilled; overlain with slight unconformity by Paleocene strata along north side of the Simi Hills, elsewhere, as along the south flank of the Simi Hills, unconformably overlain by Miocene beds. The name, Chatsworth Formation was introduced and defined by Colburn and others (1981) for rocks in the eastern Simi Hills near Chatsworth, that were previously mapped as “Chico Formation” or as unnamed “Upper Cretaceous Rocks” (“Chico” is a molluscan Stage name imported from central California). (Weber, 1984).

Central and western Santa Monica Mountains

Kt **Tuna Canyon Formation, undivided (late Cretaceous)**—Marine sandstone, siltstone and conglomerate. Sandstone, thick-bedded to very thick-bedded, laminated and graded arkosic wacke (turbidite); locally containing abundant fragments of black slate(?); convolute lamination in some beds, load casts, low-angle cross-lamination, or concentrations of carbonized plant fragments or mica. Fossiliferous sandstone and siltstone are present locally as interbeds or thick lenses; in Las Flores Canyon, contains several beds of olive-gray siltstone that locally contain foramifera. The Tuna Canyon Formation is nowhere completely exposed in the Santa Monica Mountains; the maximum exposed thickness, in the Pena Canyon-Tuna Canyon area, is nearly 800 m. East of Santa Ynez Canyon rests on nonmarine red conglomerate (Trabuco Formation, late Cretaceous) and the Santa Monica Slate (late Jurassic). The formation is overlain disconformably (?) by the Simi Conglomerate in Solstice Canyon, and elsewhere by a basal conglomerate of the Coal Canyon Formation (Paleocene). In several places it contains the Campanian ammonite *Metaplacenticeras sp.*; foramifera faunas are referred to zones D-2, E, and F-1 (Maestrictian or Campanian - late Cretaceous) of Goudkoff (1945). Named by Yerkes

and Campbell (1979) to replace the name “Chico”, which was imported from central California and used on earlier maps in the Santa Monica Mountains. (central and eastern Santa Monica Mountains; Campbell and others, 1996; Yerkes and Campbell, 1980; Alderson, 1988; Hoots, 1931). East of Santa Ynez Canyon the formation was subdivided by Alderson (1988) into four informal members:

Kte **Tuna Canyon Formation, informal member 'e'**—Greenish-gray shale with interbedded coarse-grained sandstone in the upper part.

Ktd **Tuna Canyon Formation, informal member 'd'**—Fine-grained, thick-bedded, fossiliferous sandstone.

Ktc **Tuna Canyon Formation, informal member 'c'**—Pebble-cobble conglomerate and minor sandstone.

Ktb **Tuna Canyon Formation, informal member 'b'**—sandstone with minor conglomerate and black shale, carrying Turonian and Coniacian ammonites.

Ktr **Trabuco Formation (late Cretaceous)**—Conglomerate with well-rounded, polished pebbles, cobbles and boulders of varicolored quartzite, porphyry, granite, basalt, and with angular chips of black slate in a matrix of soft, clayey, coarse-grained to pebbly grit. Thickness estimated at 225 m; unconformably overlies Santa Monica Slate. Name applied by Durrell (1954) for rocks of similar composition and stratigraphic position in the type area in the Santa Ana Mountains, where it was named by Packard (1916); correlation reiterated by Colburn (1973). (Yerkes and Campbell, 1980; Hoots, 1931).

Kgr **Granitic rocks (late Cretaceous)**—Includes a variety of plutonic igneous rocks ranging from quartz monzonite and granodiorite to tonalite, quartz diorite, and diorite; chiefly quartz diorite: intrudes Santa Monica Slate in the eastern Santa Monica Mountains (Durrell, 1954).

San Gabriel and Verdugo Mountains

Kgl **Granitic rocks, leucocratic granodiorite (late Cretaceous)**—Light gray to buff, fine- to medium- grained granodiorite; intrudes all other crystalline rocks in area south of south branch of the San Gabriel Fault (Smith, 1982).

Kgd **Granodiorite (Cretaceous)**—Light-gray to dark-gray, medium-grained granodiorite. Unit includes well-foliated, gneissic mafic enclaves. In thin section, samples have some hornblende, apatite, euhedral zircons, and biotite although much is altered to chlorite. Some myrmekitic texture observed in plagioclase feldspars. Exposed in northeast Pacifico Mountain quadrangle. Mapped as qd by Barrows and others (1985) and Dibblee (1997); described by Olson and Hernandez (2013) on map of adjacent Palmdale quadrangle.

Kto **Tonalite (late Cretaceous)**—Mapped by Jahns and Muehlberger (1954) as “granite and other quartz-bearing plutonic rocks”; these rocks are compositionally tonalite (D. M. Morton, oral communication, 2003) in the IUGA classification (Streckheisen, 1973).

Ktoqd **Tonalite and quartz diorite (late Cretaceous)**—Mapped by Morton (1973) as predominantly quartz diorite, grading to granodiorite, quartz monzonite and diorite; compositionally mostly

tonalite (D. M. Morton, oral communication, 2003) in the IUGA classification (Streckheisen, 1973).

Ktowd **Tonalite (Wilson Diorite of Miller, 1934) (late Cretaceous)**—Designated granodiorite and quartz diorite on source maps; identified as mostly tonalite (D. M. Morton, oral communication, 2003) in the IUGA classification (Streckheisen, 1973).

Kgrd **Granodiorite**—Gray medium to coarse grained granodiorite with quartz diorite and granite. Described as Granodiorite by Oakeshott (1958). Includes rocks mapped as the Mt Josephine Granodiorite by Carter (1980). Mostly massive, but commonly gneissoid near contacts with older rocks; locally carries large inclusions and pendants of gneiss and Placerita metasediments. (Oakeshott, 1958, Carter, 1980).

Kp **Pelona Schist (Late Cretaceous to Paleocene?)**—Greenish-gray chlorite-albite, actinolite-albite, quartz-albite, and albite-talc schists, locally interbedded with metavolcanics and brown to black quartzites; a thick, isoclinally(?) folded sequence. The protolith of the Pelona and its correlative Orocopia Schist was presumably deposited during the mid-Mesozoic, recrystallized during burial to depths of 25-35 km, and later thrust beneath western North America at rates > 4 mm/y on the Vincent thrust. Named by Hershey (1902a) for outcrops on the Sierra Pelona ridge. (Ehlig, 1981, p. 266; Jacobson, 1990; northern Mint Canyon 7.5' quadrangle, map after Jahns and Muehlberger, 1954).

Jeg **Echo granite (Jurassic)**—Coarse-grained, pinkish-orange granite and monzogranite; medium-grained, xenomorphic, inequigranular, and showing protoclastic granulation in thin section (Miller, 1946). Determined to be Jurassic in age by Barth (2008). Named by Miller (1934). (Smith, 1986).

Eastern Santa Monica Mountains

Jsm **Santa Monica Slate, undivided (late Jurassic)**—Black slate, sheared metasiltstone, and fine-grained metagraywacke; intensely jointed, isoclinally(?) folded; intruded by Cretaceous granitic pluton forming contact auriole zones of phyllite and spotted cordierite slate; rare pelecypod fragments indicate a late Jurassic age in part (Imlay, 1963). Named by Hoots (1931, p. 88) (Hoots, 1931). Includes:

Jsms **Santa Monica Slate, spotted slate**—Spotted with large crystals of cordierite; outer zone of contact aureole with nearby granitic intrusive rocks; grades to unspotted slate through a zone in which individual spots become progressively smaller outward (Hoots, 1931).

Jsmp **Santa Monica Slate, phyllite**—Chiefly mica schist and dark gray phyllite; forms inner zone of contact aureole with adjacent granitic intrusive (Hoots, 1931).

San Gabriel and Verdugo Mountains

Mzdbh **Biotite-hornblende diorite (Mesozoic?)**—Medium- to dark-gray, medium-grained biotite-hornblende monzodiorite; includes scattered small bodies of older brownish-gray coarse-grained weakly gneissic biotite quartz monzonite; intruded by leucocratic granodiorite (Smith, 1986).

Mzdhb **Hornblende-biotite diorite (Mesozoic?)**—Medium-gray, medium-grained hornblende- biotite diorite; intruded by coarse-grained hornblende diorite and younger leucocratic granodiorite (Smith, 1986).

Mzqdb **Biotite-quartz diorite (Mesozoic?)**—Medium- to dark gray, medium grained quartz diorite; slightly gneissic. Locally contains inclusions of coarse-grained quartz diorite a few m across, and small elongate bodies of marble, quartzite, and schist of Paleozoic (?) age (Smith, 1986).

Mzmg **Biotite Monzogranite (Mesozoic)**—Light gray fine to coarse grained generally non-porphyritic monzogranite. Locally includes granodiorite. Foliated to locally gneissic. Mapped by Smith (1986) as leucogranitic and metamorphic complex. (Smith, 1986; Powell and others 1983).

Mzmgp **Porphyritic Biotite Monzogranite (Mesozoic)**—Light gray fine to coarse grained generally non-porphyritic Monzogranite. Locally includes granodiorite. Foliated to locally gneissic. Mapped by Smith (1986) as leucogranitic and metamorphic complex. (Smith, 1986; Powell and others 1983).

Mzd **Biotite-Hornblende Quartz Diorite, Diorite, and Gabbro (Mesozoic)**—Dark gray fine to coarse grained diorite. Locally includes tonalite and granodiorite. Foliated. Mapped by Saul (1976) as diorite. (Saul, 1986; Powell and others 1983).

Mzhd **Hornblende Diorite (Mesozoic)**—Gray, medium- to coarse-grained hypidiomorphic granular diorite. (Smith, 1986).

Mza **Alaskite (Mesozoic?)**—Salmon-pinkish-gray, medium-grained, mildly gneissic syenogranite. Forms long thin klippe over a much larger mass of granitic rock (Smith, 1986).

Mzh **Hornblendite (Mesozoic)**—Melanocratic coarse-grained hornbledite (Powell and others, 1983).

Mzm **Mylonite (Mesozoic)**—Gray fine-grained to microcrystalline mylonite. Mapped by Smith (1986) as siliceous metasedimentary rock. (Powell and others, 1983; Smith 1986).

Mzdg **Diorite gneiss (early to middle Mesozoic)**—Dark-colored gneisses including metadiorites, massive hornblende diorite, and amphibolite and biotite schists (60-80% plagioclase, 5-15% quartz, 5% or less potassium feldspar, locally as much as 30% biotite and locally as much as 10% brown hornblende); intrudes the Placerita Formation and intruded by Cretaceous granitic rocks; (Oakeshott, 1958).

TRlgd **Mount Lowe intrusive suite, undivided (Triassic)**—A compositionally layered pluton exposed over a large area in the western San Gabriel Mountains and northeastern Soledad basin (studied and described by Ehlig, 1981); varies from hornblende diorite and quartz diorite near the base to albite-rich granite and syenite in the upper part; large phenocrysts of hornblende, orthoclase and garnet contribute to distinctive appearance (pebbles and cobbles are readily recognizable as clasts in younger gravel deposits); metamorphosed to lower amphibolite facies and upper amphibolite facies (grade apparently varies with proximity to Cretaceous intrusive rocks); average composition 60-90% feldspar, of which plagioclase (oligoclase to albite) is

most abundant and orthoclase occurs chiefly as phenocrysts, quartz ranges from a trace to as much as 25 %, averages about 10% (Ehlig, 1981). Initially named Mount Lowe Granodiorite by Miller (1926 abstract), subsequently termed Lowe Granodiorite by Miller (1934, 1946); renamed Mount Lowe intrusion by Barth and Ehlig (1988). The common usage of most source maps has been retained in this map compilation. A U-Pb age on zircon is reported as 220 ± 10 my (Silver, 1971), and a Rb-Sr whole rock age of 208 ± 14 my reported by Joseph and others (1982). Joseph and others (1982) also report a high (800-1,100 ppm) Sr content, a low initial ^{87}Sr-^{86}Sr ratio of 0.70456 ± 0.00003, and a high alkali content ($Na_2O = K_2O \sim 10$ wt.%). More recently, Barth and others (1990) report a U-Pb zircon age of 218 my. Subunits include:

TRlgb **Mount Lowe intrusive suite, biotite-orthoclase facies**—As much as 10 percent biotite in a nearly white granular plagioclase and subordinate (less than 25 percent) quartz matrix. Has orthoclase phenocrysts; hornblende phenocrysts prominent in other subunits are absent, although a few hornblende-bearing layers occur in the lower part of this subunit (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

TRlgdp **Mount Lowe intrusive suite, Porphyritic facies**—Orthoclase phenocrysts in granular matrix of plagioclase and subordinate quartz; garnet also occurs as small crystals concentrated in veinlets (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

TRlgdh **Mount Lowe intrusive suite, orthoclase-hornblende facies**—Light gray hornblende diorite (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

TRlgm **Metamorphosed Mount Lowe intrusive suite (Cretaceous and Triassic)**—Relatively uniform light-colored orthogneiss containing porphyroblasts (relict phenocrysts) of hornblende and, less commonly, potassium feldspar in a plagioclase and quartz matrix. Parent plutonic rock is (Triassic) Lowe Granodiorite and was metamorphosed during a Cretaceous orogenic event (Morton, 1973a, p. 9; and D. M. Morton, oral communication, 2003).

TRhdg **Hornblende diorite gabbro**—dark to very dark gray, medium-grained hornblende diorite gabbro. Massive to locally foliated. (Dibblee 1996, 2001; Ehlig, 1981 and unpublished).

MzPzsp **Serpentinite (Mesozoic or Paleozoic)**—Light to dark green, well foliated, sheared and slickensided serpentinite, altered peridotite (chiefly augite and olivine); slickensided fragments up to boulder size; boundaries intensely sheared and relations to adjacent rocks obscure (Barrows and others, 1975).

Pzgn **Gneiss complex (Paleozoic?)**—Feldspathic gneisses, including granitic to granodioritic augen gneisses, gneissic intrusive rocks of granitic to dioritic composition, amphibole-rich gneiss, and local interlayered schist, quartzite, amphibolite, and marble; according to Jahns and Muehlberger (1954), many of the gneisses are of hybrid origin, and some may be parts of the Placerita Formation that have been intimately injected by younger igneous material.

Pzp **Placerita Formation (Paleozoic)**—Metamorphosed sedimentary rocks, including marble, dolomite, feldspathic gneisses, graphitic marble, quartzite, calcic pyroxene hornfels and a variety of schists including feldspar-tremolite, graphite-tremolite, graphite-biotite-feldspar, and tremolite-talc; the various schists and gneisses occur as septa and pendants of all sizes in a

granodioritic host rock, along with diorite gneisses and migmatites. The best-preserved section may be as much as 600 m thick. Named by Miller (1934), for exposures in Placerita Canyon, the type locality. The age indicated by Oakeshott (1958) is pre-Cretaceous; however, Morton (oral communication, 2003) indicates the age is Paleozoic. (Central Sunland 7.5' quadrangle, Oakeshott, 1958; southern Mint Canyon 7.5' quadrangle, Saul and Wooton, 1983).

Pgn **Gneiss (Proterozoic?)**—Alternating discontinuous dark brown biotite-rich and light-colored quartz-feldspar-rich layers and lenses; layers generally about an inch thick; sheared, as expressed by an intricate structure of gneiss lenses with common local small microscopic tight flow-type folds. Described by Morton (1973) and by Crook and others (1987) as Cretaceous or older, but recently described by Morton (oral communication, 2003) as Precambrian. (Morton, 1973; Crook and others, 1987).

Anorthosite-gabbro complex of Oakeshott (1958) probably a result of differentiation of a single parent magma. Anorthosite and gabbro are pervasively shattered, sheared and brecciated. Barth and others (1995) indicate a general age of 1,200 Ma on the basis of dated zircons and thermobarometry, substantially older than 930 ± 90 Ma and 810 ± 80 Ma lead-alpha zircon ages determined by Neuerburg and Gottfried (1954).Unit is composed of sub-units mapped and described by Carter (1980) including:

Pan **Anorthosite-gabbro complex, anorthosite (Proterozoic)**—Composed of medium- to very coarse-grained plagioclase; light gray and white; contains more than 90 percent plagioclase (andesine) and less than 10 percent mafic minerals (mostly hypersthene); grain size ranges from less than 1 mm to more than 30 cm.

Pagb **Anorthosite-gabbro complex, anorthosite with gabbro (Proterozoic)**—Composed of anorthosite as above with layers or zones of gabbro or diorite.10 to 50% mafic minerals, mostly hornblende, white to gray, medium to coarse grained (Carter, 1980, 1982).

Psy **Anorthosite-gabbro complex, syenite (Proterozoic)**—Composed of plagioclase feldspar (andesine) with lesser potassium feldspar (Microcline-perthite). Has minute black specks of magnetite which may be altered from augite. Rock is generally tan, stained rusty tan to brown by limonite where weathered. (Jahns and Muehlberger, 1954; Oakeshott, 1958; Carter, 1980, 1982).

Pfgb **Anorthosite-gabbro complex, ferro-gabbro (Proterozoic)**—Composed mostly of ferro-magnesian minerals with lesser feldspars dark greenish brown. Contains sub-metallic molecules of iron ilmenite (magnetite-titanite). Intrusive into Pan and Psy. (Carter, 1980, 1982).

Plgb **Anorthosite-gabbro complex, leucogabbro (Proterozoic)**—Light gray compositionally layered gabbro, leucogabbro and anorthosite (Carter, 1980, 1982).

Pjgb **Anorthosite-gabbro complex, jotunitic gabbro (Proterozoic)**—Light gray compositionally layered gabbro with antiperthitic andesine. (Carter, 1980, 1982).

Pjgba **Anorthosite-gabbro complex, jotunite-norite-gabbro-diorite (Proterozoic)**—Composed of hornblende, chlorite, biotite, and actinolite (altered from pyroxene) and limonite-magnetite,

dark greenish brown, locally compositionally layered, contains inclusions of anorthosite (Carter, 1980, 1982).

Pggn **Anorthosite-gabbro complex, gabbroic to anorthositic gneiss (Proterozoic)**—Rocks of the anorthosite-syenite complex that were strongly deformed and in part recrystallized during emplacement of the Triassic Mt Lowe Intrusive suite (Carter, 1980, 1982).

Pgb **Anorthosite-gabbro complex, gabbro (Proterozoic)**—Gray, mottled with greenish or brownish black, and solid dark greenish and brownish black; mafic mineral content ranges from 35 percent to 65 percent of rock; compositionally ranging from gabbroic anorthosite to norite, diorite, pegmatitic hornblende gabbro, and olivine gabbro. Chiefly xenomorphic granular texture; alternating felsic and mafic bands, from a few inches to several feet in thickness are common, but generally discontinuous. Feldspar is mostly calcic andesine (labradorite in more mafic rocks), in many places partly altered to albite or albite-oligoclase. Pyroxenes (and subordinate amphiboles) commonly altered to chlorite, antigorite and biotite (Oakeshott, 1958). (Carter, 1980, 1982, Oakeshott, 1958).

Phbgb **Anorthosite-gabbro complex, hornblende bytownite gabbro (Proterozoic)**—Fine to medium grained foliated, layered, hornblende-chlorite gabbro with labradorite to bytwonite plagioclase. Some layers of anorthosite (Carter, 1980, 1982).

Pgbla **Anorthosite-gabbro complex, anorthosite inclusion-rich gabbro (Proterozoic)**—Strongly layered gabbro with numerous inclusions of anorthosite, some of which are up to 50 feet in length (Carter, 1980, 1982).

Pmgn **Mendenhall Gneiss (Proterozoic)**—Layered migmatitic felsic gneiss and mafic granulite, having rare interlayered augen gneiss and aluminous gneiss. Gneiss is characterized by large-scale foliation, fracturing, jointing, and blocky shattering. Dikes of anorthosite and associated rocks cut gneiss, and centimeter- to meter-scale fragments of gneiss are scattered through the anorthosite. Most distinctive rock is dark gneiss with tint imparted by blue quartz (Oakeshott, 1958). Named by Oakeshott (1958, p. 21), who designated type locality on Mendenhall Peak. Age of Mendenhall Gneiss is greater than 1,200 Ma age of anorthosite sequence (Silver and others, 1963; Barth and others, 1995).

SYMBOL EXPLANATION

Contact between map units - Solid where accurately located or approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Gradational contact between map units

Fault - Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Thrust Fault - Barbs on upper plate; solid where accurately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Detachment fault - Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where identity or existence is uncertain

Syncline - Solid where accurately located; long dash where approximately located; dotted where concealed

Anticline - Solid where accurately located; long dash where approximately located; dotted where concealed

Overturned anticline - Solid where accurately located

Dike - Solid where accurately located; long dash where approximately located; dotted where concealed

Tuff marker bed

Strike and dip of sedimentary beds. Number indicates dip angle in degrees:

- Horizontal bedding
- 35 — Inclined bedding
- Vertical bedding
- 75 — Overturned bedding
- 35 — Inclined bedding where top direction of beds is known
- 75 — Overturned bedding where top direction of beds is known
- 15 — Inclined crumpled bedding
- 35 — Approximate orientation of inclined bedding
- 60 — Inclined bedding as determined from aerial photographs

35 — Strike and dip of inclined cleavage. Number indicates dip angle in degrees

60 — Strike and dip of inclined igneous foliation. Number indicates dip angle in degrees

Strike and dip of metamorphic foliation. Number indicates dip angle in degrees:

- 35 — Inclined foliation
- Vertical foliation

30 — Strike and dip of inclined igneous joints. Number indicates dip angle in degrees

ATTACHMENT B

ANALYSIS OF POTENTIAL ECOLOGICAL EFFECTS OF FLOW DIVERSIONS ON WILLOW HABITAT

TECHNICAL MEMO

From: Eric Stein and Jenny Taylor – Southern California Coastal Water Research Project (SCCWRP)

To: Marc Blain, David Jaffe - Psomas

Re: Analysis of Potential Ecological Effects of Flow Diversions on Willow Habitat

Date: September 14, 2018

Background and Approach

The ecological effects of flow diversions were assessed based on modeled relationships between hydraulic changes and probability that the resultant physical conditions can support southern willow riparian habitat conditions conducive to occupancy by least Bell's vireo.

There are two general approaches that can be used to relate physical changes (e.g. changes in streambed elevation or substrate composition) to biological effects (e.g. ability to support vireo). The first involves creating a mechanistic model that predicts species occupancy through a series of equations that relate physical changes to specific life history needs of the species. For example, predicting the expected recruitment, growth, and scour of riparian habitat based on a time series of modeled patterns of velocity and scour. The second approach involves establishing statistical relationships between physical conditions and probability of a species occurring using a combination of output of hydraulic models and presence vs. absence data of vireo over time.

For this study we used the statistical approach to estimate the probability of occurrence of vireo under physical conditions associated with flow diversion scenarios. We chose this approach because 1) it is a more efficient approach for evaluating ecological effects in a relatively small area over relatively short periods of time; 2) it can be more directly related to available species observation data; 3) it produces a probability estimate that provides flexibility in setting management thresholds (i.e. managers can select a probability of effect that triggers a management decision); and 4) the hydraulic modeling does not provide a long-enough time series of output (due to the computational complexity of the model) to support a mechanistic approach.

The probability of effects on least Bell's vireo were assessed using the following steps. Data preparation was done in ArcGIS and analysis was completed in RStudio:

1. Physical properties in the study area were based on the hydraulic model output provided by Psomas. We focused on depth, extent and duration of inundation, velocity, and shear stress as the key output variables as these are the ones most likely to influence presence or absence of willow riparian habitat preferred by the least Bell's vireo. We focus primarily on the dry year model output as the greatest differences were observed under dry conditions, and therefore, any effects, if they occur, would be under dry conditions.

2. Initially, we planned to use vireo occurrence data as an indicator of suitable habitat. However, despite a thorough literature review, we were only able to find a few instances of vireo nesting and a few confirmed absences. Therefore, we decided to use willow presence as an indicator of suitable habitat, which has been documented extensively in the literature.

3. Vegetation coverage of the study area was digitized for a representative wet year (2010) and dry year (2014) using digital aerial imagery provided through the USDA National Agriculture Imagery Program (NAIP). NAIP provides seamless georectified images with four color bands (red, green, blue and near infrared) with known vintage. NAIP imagery is acquired at a one-meter ground sample distance with a horizontal accuracy that matches within six meters of photo-identifiable ground control points, which are used during image inspection. An unsupervised object classification was used to attribute riparian trees and shrubs vs. non-target habitats, and raster images were converted to polygons. Straggler trees and shrubs were manually deleted or produced the final shape files.

4. Water velocity, percent of time inundated, water depth, shear stress, and arrival time variables were used from the *dry* year hydraulic modeling. We focused on the dry year, because results of the hydraulic modeling comparing the historical with predicted flows differed most significantly for the dry year. These hydraulic parameters were selected because they are known to influence recruitment, growth, and survival of riparian habitat. These variables were provided to us in raster format, with approximately 18,000 pixels. We converted each pixel to a point and spatially joined the hydraulic variable values to the vegetation layer. This created a dataset that related the presence of willow with each of the hydraulic variables.

5. To begin to explore the relationship between each of the hydraulic variables and the occurrence of willow, we compared the distribution of each variable for areas where willows were present and areas where willows were absent using a two-sided t-test. Arrival time showed the least difference between groups (p>0.1) and because the distributions looked so similar, we did not include this variable in further analysis. The other four hydraulic variables did display a significant difference between the two groups and were all significant at the α=0.001 level: Depth, shear stress, velocity, and percent of year inundated. A correlation matrix (
6. Figure 1) was calculated for the remaining four hydraulic variables and shear stress was removed based on its significant correlation with velocity (r=0.79).

7. Data were split randomly into 25% testing data and 75% training data. Initially a multinomial regression was used to predict vegetation classes including coast live oak, riparian herbaceous, and willow. However, this model severely overpredicted willow occurrence. Because we are concerned with the potential reduction in willow habitat, we decided this model would not provide a reliable answer to that question. Logistic regression analysis (eq. 1) was the next model used to develop relationships between the three hydraulic properties and the presences or absence of willow habitat. We used a binomial logistic regression model because it allows for estimation of the probability of a binomial response (in this case presence vs. absence of willow habitat) based on one or more predictor variables (in this case hydraulic properties). The resulting plots allow for an estimation of the probability of vireo habitat occurrence based on a continuous range of hydraulic variables (e.g. inundation time, water velocity).

Eq. (1): $\text{logit}(\text{willow presence}) = \beta_0 + \beta_1(\text{depth}) + \beta_2(\text{velocity}) + \beta_3(\text{annual inundation})$

8. The validation of the model with the testing data showed an overall accuracy of 81.9%. The model was very good at predicting areas where willows were absent (specificity=89.9%) and much less effective at predicting areas where willows are present (sensitivity = 13.5%). From an ecological perspective, this makes sense because we can accurately predict areas where we know willows are unlikely to occur. In contrast, there are other areas that are unlikely to support willows, but where absence may be explained by a variety of factors beyond channel hydraulics (See Attachment A). This suggests that our predictions of willow occurrence will be much less accurate than our predictions of willow absence.

9. The dry year logistic regression model was used to predict willow occurrence with the modelled hydraulic output under the proposed water diversion scenario. Dry wear model output was used because the greatest differences in channel conditions were observed during the simulated dry year. The same method was used to prepare the data as described above for the training data: the velocity, percent inundation, and depth variables were converted to points and joined together.

Results

All hydraulic variables tested showed significant differences ($p < 0.001$) in willow occurrence between predicted future conditions and historic flow characteristics. However, given the small sample size of vegetation polygons and the high number of hydraulic observations (>18,000), we believe the significance estimates may be overestimated.

The basic logistic regression models are provided in Figure through 4 and show the probability of willow occurrence for depth, annual percentage inundation time, and velocity, respectively. The range on the x-axes are bounded by the values observed in the data and their associated probability estimates. We see an increase in probability of willow occurrence with increasing depth and percent annual inundation. These trends in depth and annual inundation percentage suggest that the some persistent inundation is important for suitable willow habitat, which agrees with the literature. Lastly, we see a steep decline in occurrence of willow habitat as the velocity increases. This suggests that willows will not be present in active channels where velocity is highest.

Our models predict a slight decrease in probability of occurrence of willow habitat in dry years with the proposed diversion compared to without the diversion. Changes in probability of occurrence vary spatially and are most pronounced near the outlet to the spillway and at the margins of the basin (Figure 5). In general, we see exaggeration of extreme values; increases in the probability of willow occurrence in areas where occurrence was high and decreases in the probability of willow occurrence where the occurrence was low. The most pronounced decrease predicted is a 13.8% decline in probability of occurrence in the lower basin, near the spillway, associated with a slight decrease in depth and duration of inundation. This is offset by a 6.6% increase in probability of occurrence at the margins of the basin, also associated with change in depth and duration of inundation.

It is important to note that difference in velocity in the reservoir is not a driver of impacts to habitat since the velocity is essentially zero for most of the ponded areas. The biggest influencing factor appears to be the duration of inundation which is driven by a combination of hydrologic events and the operational curve of the dam. Only in a statistically dry year with high flow events that occur late in the storm season (as opposed to the average) do we see durational impacts to ponding extents in the model. This change in duration of inundation also influences change in probability of willow

occurrence along the margins of the basin. However, as stated above, net changes in probability of willow occurrence are less than 10%. As previously noted, we see no effects in the main portion of the stream channel or during wet years. Finally, it is important to note, that this analysis only speaks to the probability that willow habitat will or will not occur, it does not speak to health or vigor of the community.

Caveats of Analysis

1. Pseudoreplication is an issue when observations are not random or independent. Our observations were based on the pixel size of the hydraulic modeling, as opposed to randomly selecting plots as our samples. Consequently, pseudoreplication may have introduced additional uncertainty into our results.

2. The hydraulic variables that went into this analysis were averaged values based on wet and dry years, therefore, they do not show the true extent of water inundation. We are not considering that some areas do get inundated in dry years, or that some areas do not get inundated in dry years. This likely is the reason the model had trouble finding differences between the areas that do have willows and those that do not.

3. The presence of vegetation is a function of the current year's precipitation, which we considered, but also the precipitation and resulting hydraulics of many years prior, which we did not consider.

4. The vegetation classification was completed because the original vegetation map which was part of the EIR was too coarse (it was used in the multinomial regression which ultimately over predicted willow). This vegetation classification was not ground-truthed, and it is likely that other types of trees and shrubs, such as coast live oak, were included in what we designated willow habitat.

5. Results of the statistical analysis are limited by the small area of analysis and low data density. A regional analysis would have provided the opportunity to develop the logistic regression model using a larger more robust data set, which would have improved confidence and resolution in the model.

Figures

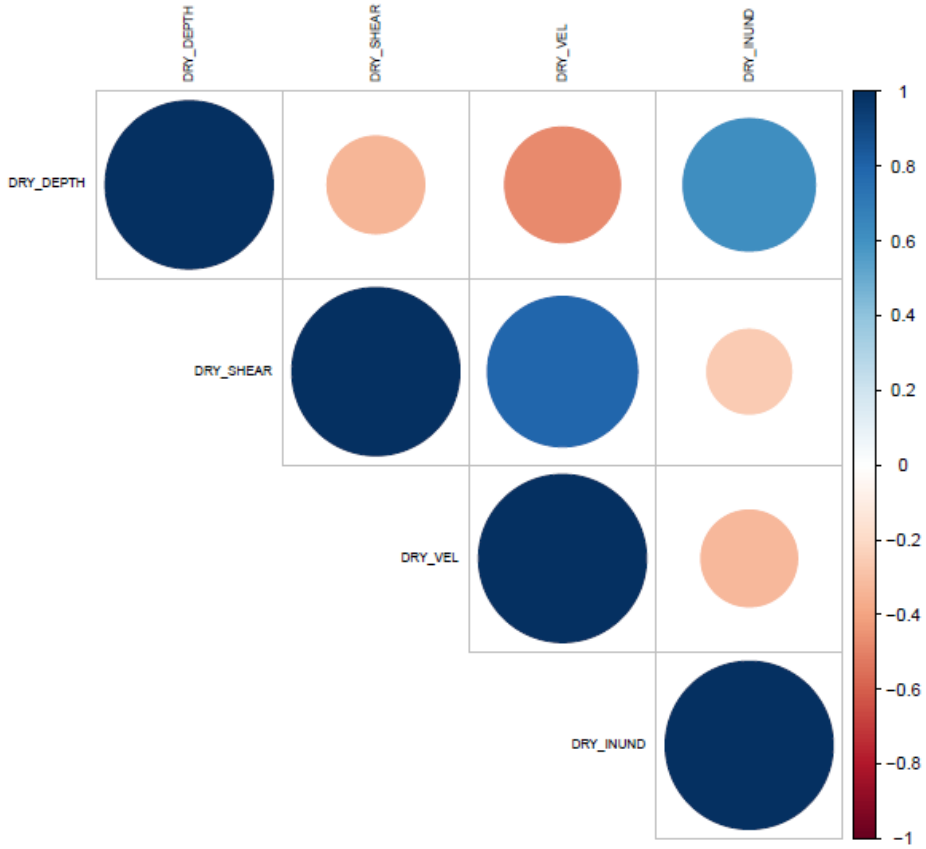


Figure 1: Dry year correlation plot of depth, shear stress, velocity, and annual inundation percentage. The correlation between shear and velocity was above 0.7.

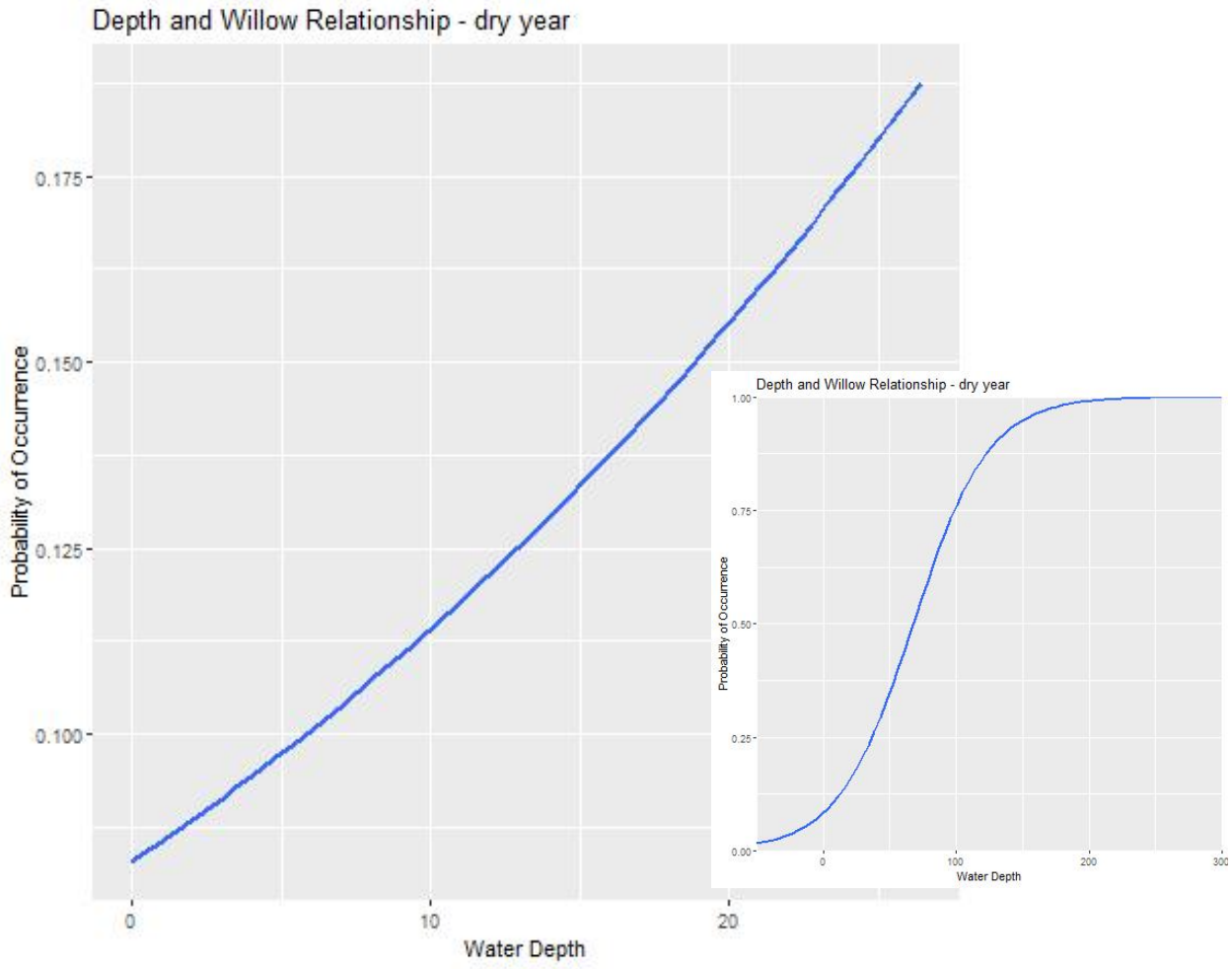


Figure 2: The relationship between water depth (ft) and the probability of occurrence of willow. Inset graph shows the full logistic regression. Larger graph focuses on the range of depth values in the dry year hydraulic data set and the associated estimates of probability of willow occurrence.

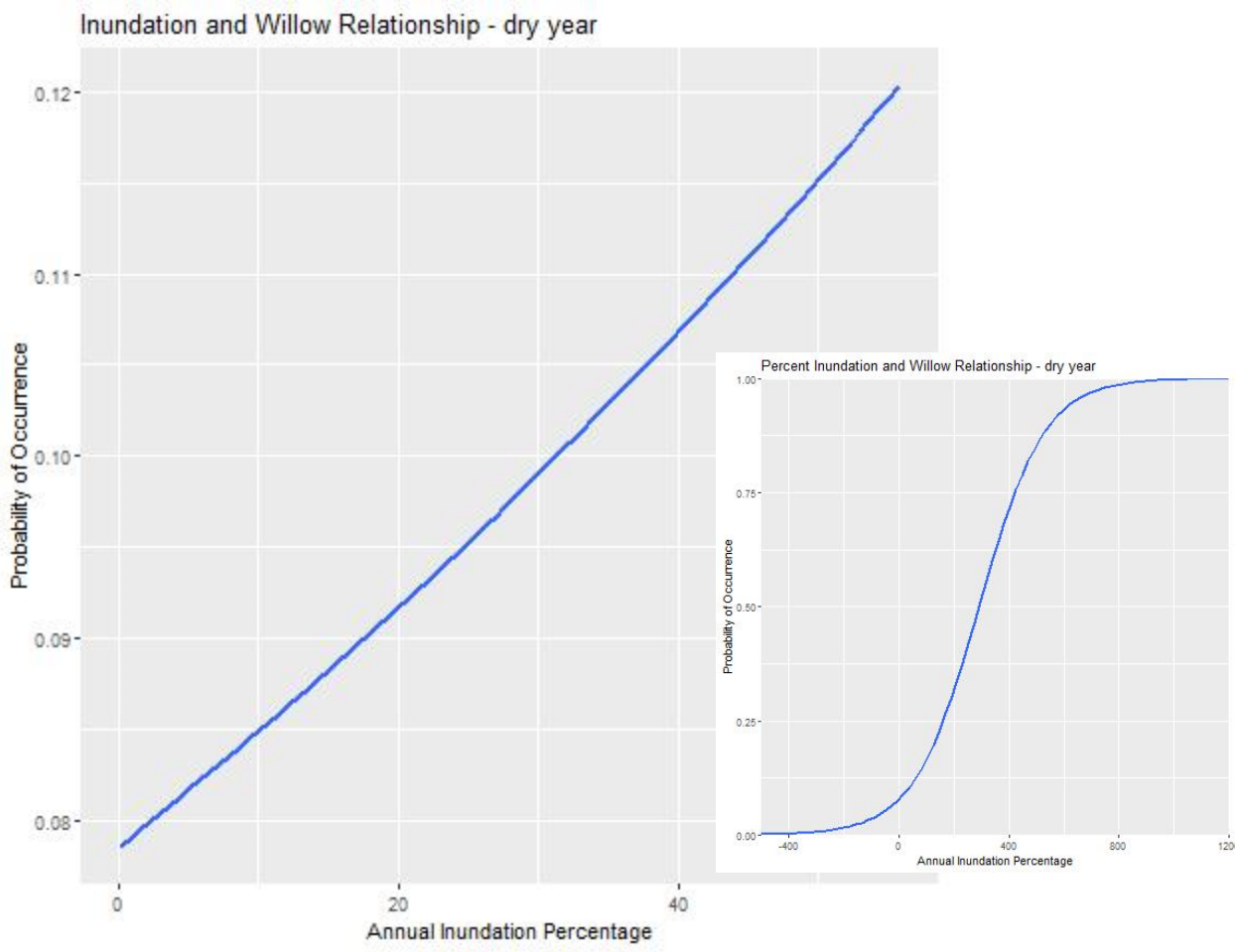


Figure 3: The relationship between average annual inundation percentage and the probability of occurrence of willow. Inset graph shows the full logistic regression. Larger graph focuses on the range of inundation values in the dry year hydraulic data set and the associated estimates of probability of willow occurrence.

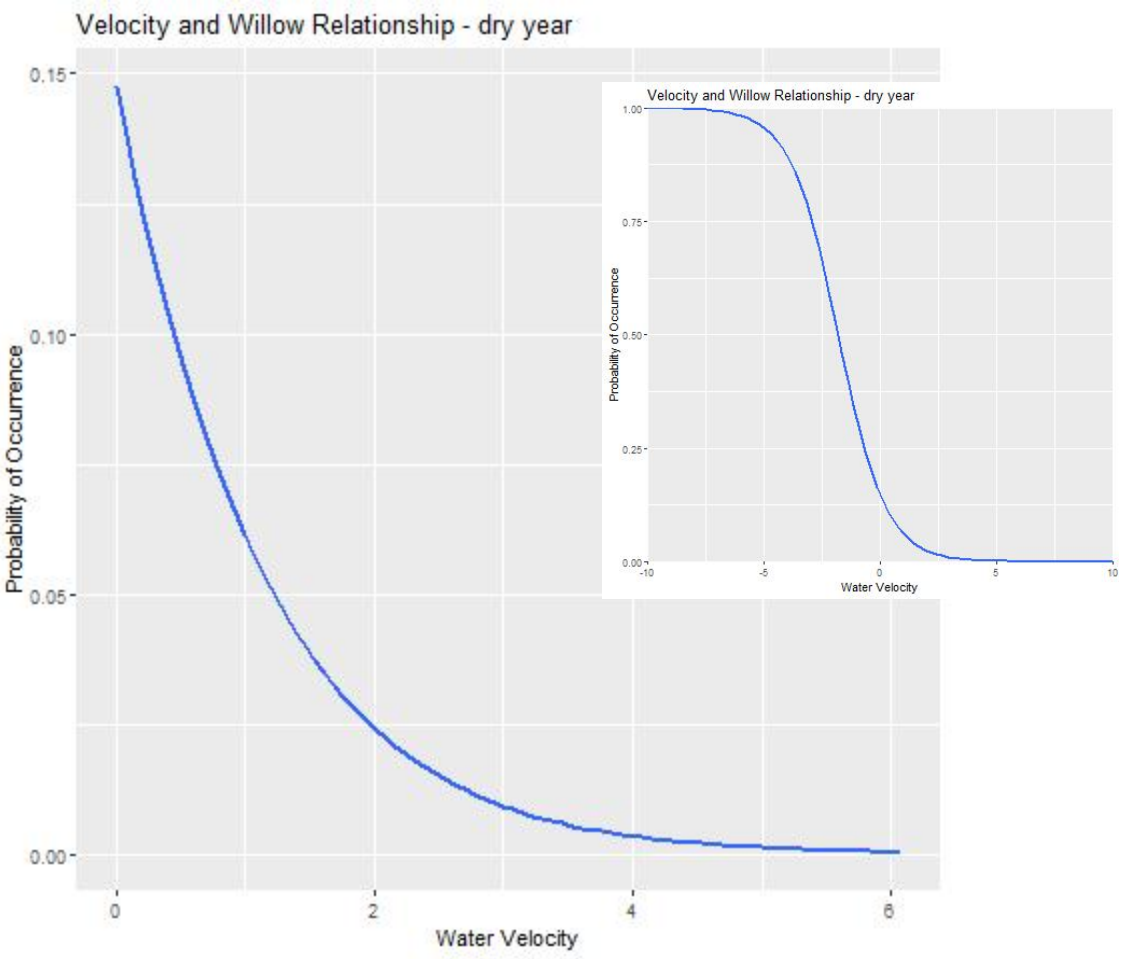


Figure 4: The relationship between water velocity (ft/s) and the probability of occurrence of willow. Inset graph shows the full logistic regression. Larger graph focuses on the velocity range in the dry year hydraulic data set and the associated estimates of probability of willow occurrence.

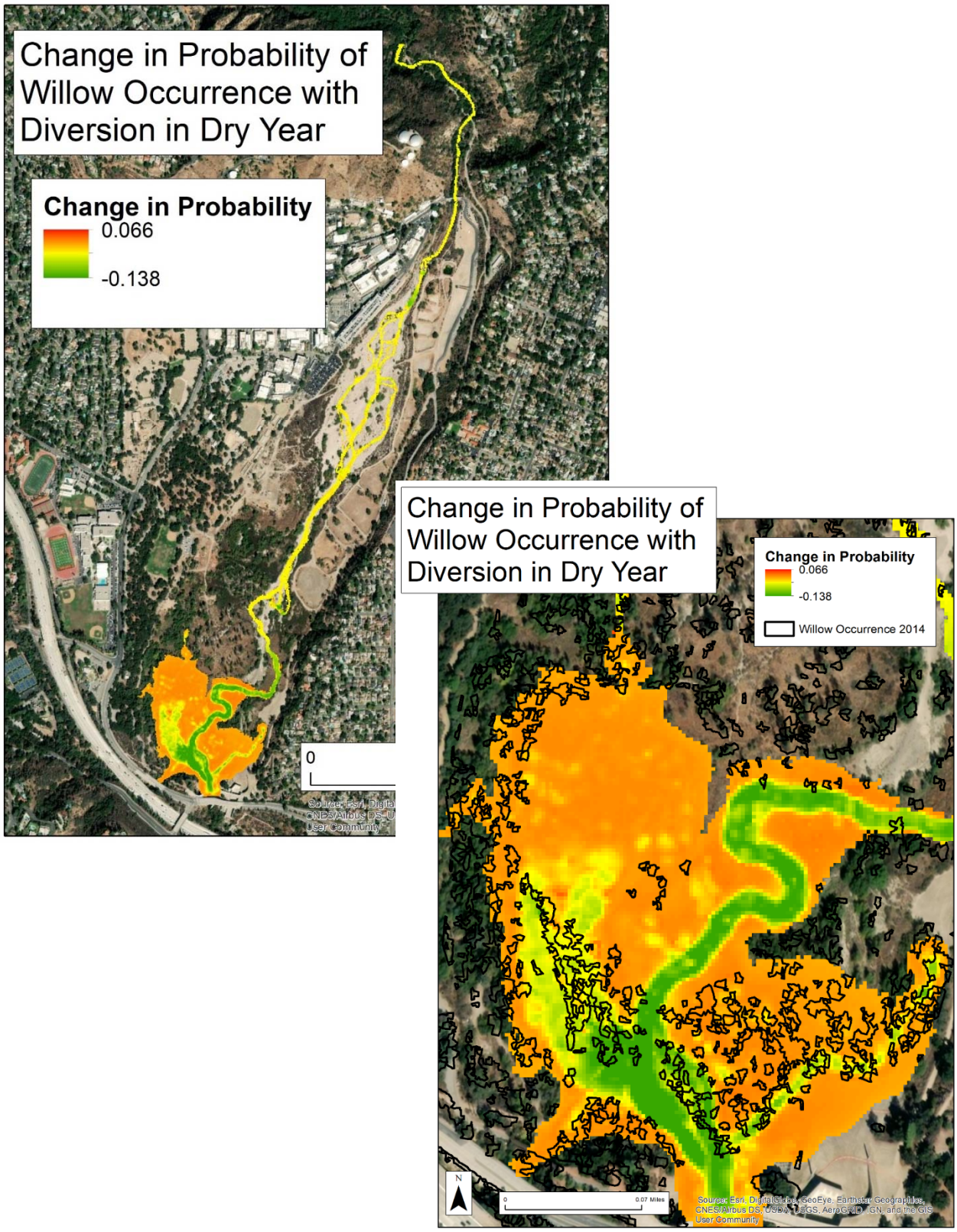


Figure 1: Change in probability of willow with the diversion in a dry year, compared to a dry year with no diversion. Green shows a decrease in probability, yellow is roughly no change, and red signifies an increase in probability. Note that green is a decrease of 13.8% and red is an increase of 6.6%. Lower graphic shows a zoomed in view of the lower basin.

Attachment A: Box plots showing differences in ranges of hydraulic variables in areas where willows were present (1) vs. absent (0)

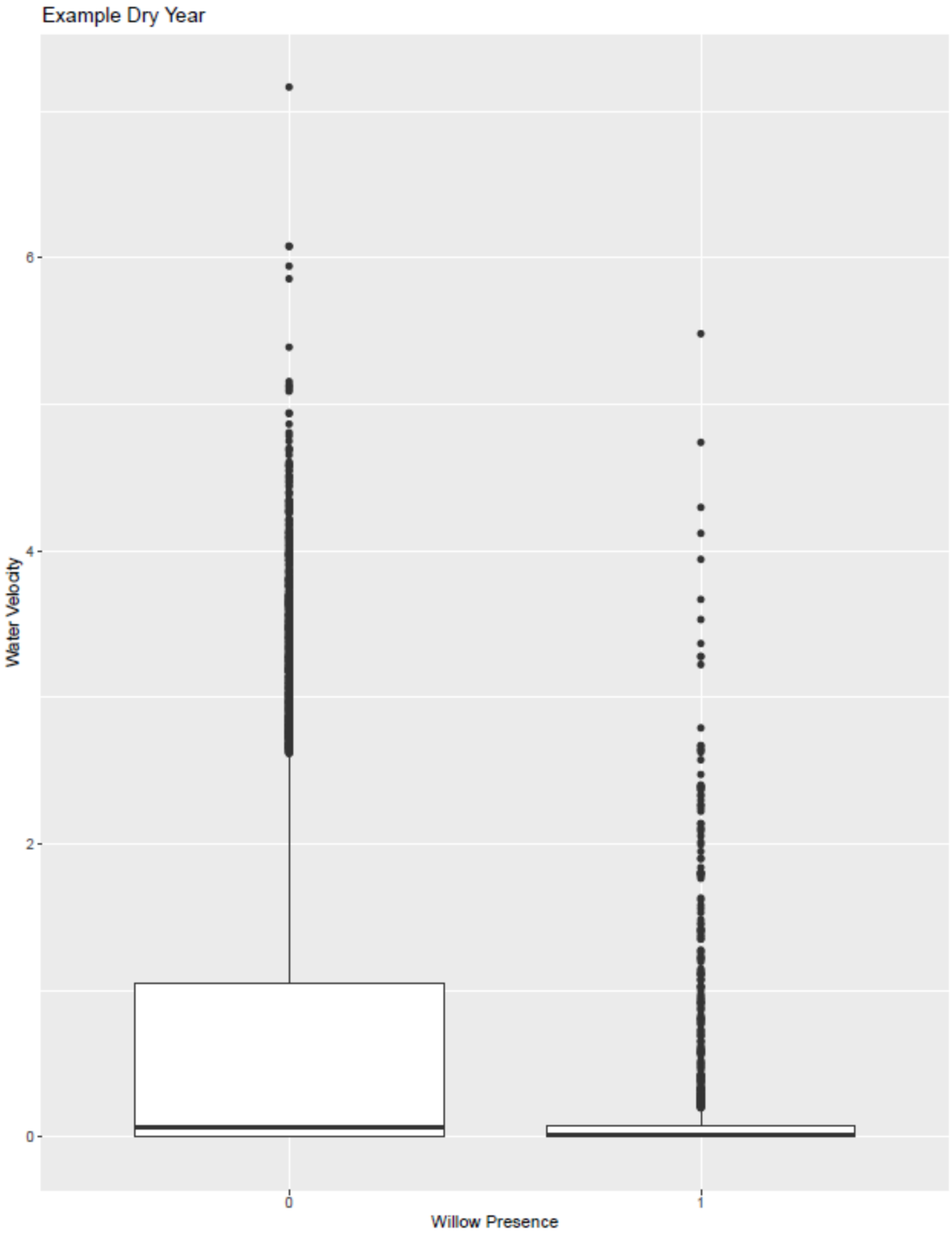


Figure A-1: Boxplot showing water velocity (ft/s) values for observations where willow shrub was and was not present.

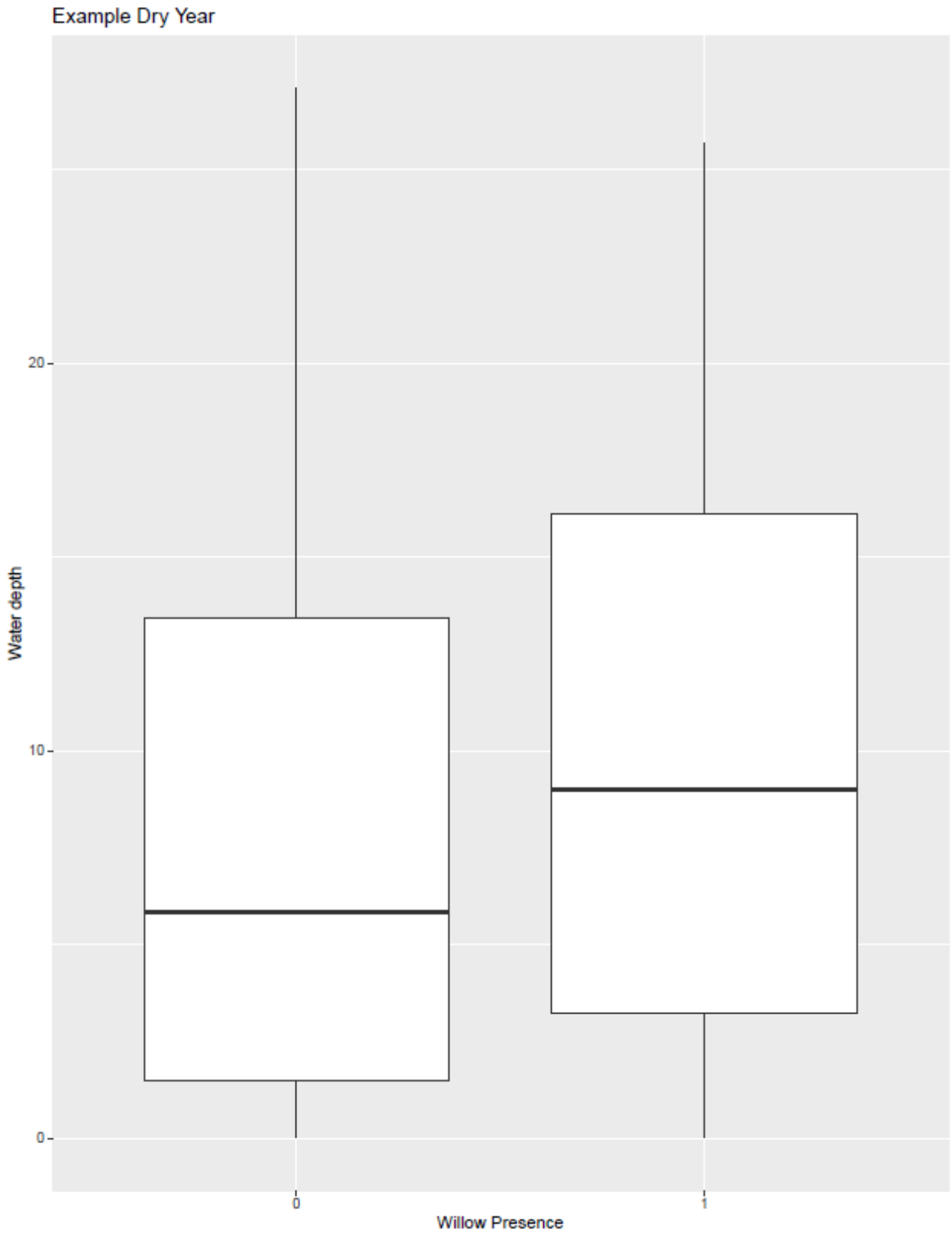


Figure A-2: Boxplot showing water depth (ft) values for observations where willow shrub was and was not present.

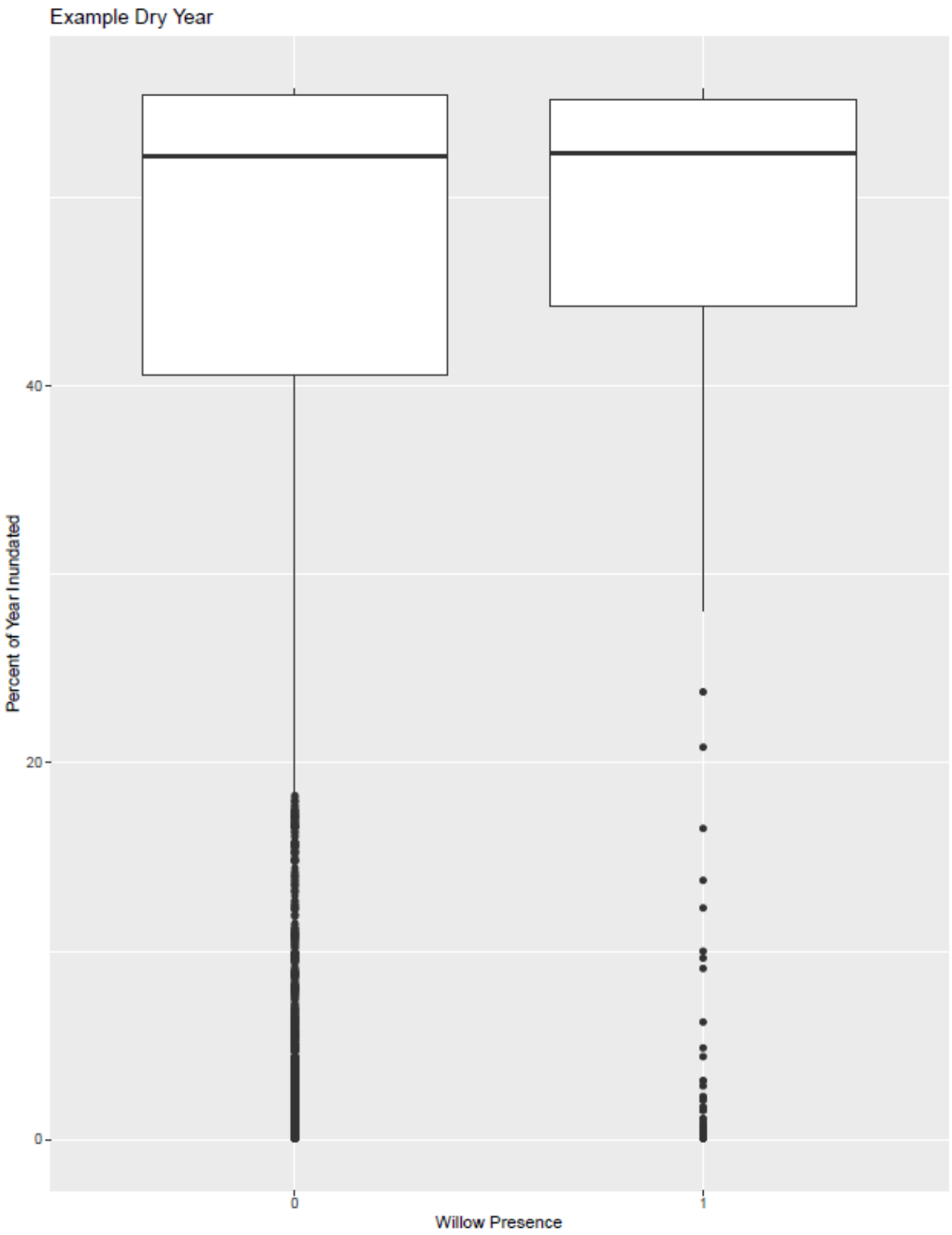


Figure A-3: Boxplot showing percentage of year with water inundation values for observations where willow shrub was and was not present.

Appendix G

Field Noise Measurement Data, December 2019;
Construction Noise Modeling Input/Output, February 2020;
and Traffic Noise Modeling Input/Output
(during Construction), February 2020

Field Noise Measurement Data, December 2019

DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT ARROYO SECO PROJECT # 11884.1
SITE ID
SITE ADDRESS OBSERVER(S) PETE VITAL
START DATE 12/3/14 END DATE 12/3/14
START TIME END TIME

METEOROLOGICAL CONDITIONS
TEMP 60 F HUMIDITY 47 % R.H. WIND (CALM) LIGHT MODERATE
WINDSPD 1 MPH DIR. N NE S SE S SW W NW VARIABLE STEADY GUSTY
SKY SUNNY CLEAR (OVRCAST) PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS
MEAS. INSTRUMENT PICCOLO SCM-3 TYPE 1 2 SERIAL # 1403 17004
CALIBRATOR BSWA CA 114 SERIAL # 48015
CALIBRATION CHECK PRE-TEST ____ dBA SPL POST-TEST ____ dBA SPL WINDSCRN YES

SETTINGS A-WTD (SLOW) FAST FRONTAL RANDOM ANSI OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
(ST-1) 17-18	9:42	9:57	62.2	80.7	50.7				

COMMENTS
READING TAKEN IN FRONT OF 898 W. ALTADENA DR (RESIDENTIAL); PRIMARY NOISE SOURCE IS TRAFFIC AND OTHER NOISES TO THE WEST OF THE MEASUREMENT LOCATION, ROADS TO THE WEST INCLUDE 210 FWY AND VARIOUS STREETS;

SOURCE INFO AND TRAFFIC COUNTS
PRIMARY NOISE SOURCE (TRAFFIC) AIRCRAFT RAIL INDUSTRIAL OTHER:
ROADWAY TYPE: ASPHALT DIST. TO RDWY (C/L) OR EOP: APX. 16' TO C/L ON W. ALTADENA DR.

TRAFFIC COUNT DURATION: 15 MIN SPEED ___ MIN SPEED

COUNT 1 (OR RDWY 1)	DIRECTION	NB/EB	SB/WB	NB/EB	SB/WB
	AUTOS	5			
	MED TRKS	0			
	HVY TRKS	0			
	BUSES	0			
	MOTRCLS	0			

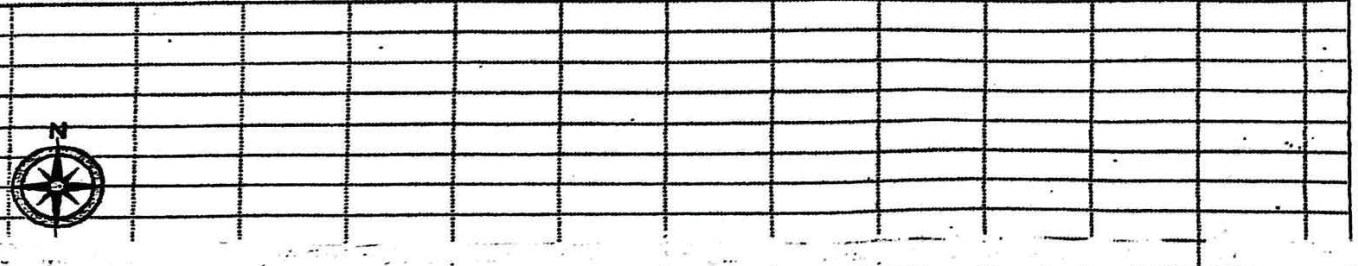
IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE ✓

COUNT 2 (OR RDWY 2)	NB/EB	SB/WB	NB/EB	SB/WB

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY:

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES DIST. BARKING DOGS (BIRDS) DIST. INDUSTRIAL
DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING (DIST. TRAFFIC (LIST RDWYS BELOW)) (DISTD GARDENERS/LANDSCAPING NOISE)
OTHER: 210 FWY; TRASH TRUCK PICK-UP IN DISTANCE;

DESCRIPTION / SKETCH
TERRAIN HARD SOFT (MIXED) FLAT OTHER:
PHOTOS 6671; 6672; 6673; 6674; 6675; 6676; 6677; 6678;
OTHER COMMENTS / SKETCH



DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT: ARROYO SECO — PROJECT #: 11884.1
SITE ID:
SITE ADDRESS:
OBSERVER(S): PETE VITAR
START DATE: 12/3/14 — END DATE: 12/3/14
START TIME: — END TIME:

METEOROLOGICAL CONDITIONS

TEMP: 63 F — HUMIDITY: 41 % R.H. — WIND: (CALM) LIGHT MODERATE
WINDSPD: 1 MPH — DIR. N NE S SE S SW W NW — VARIABLE STEADY GUSTY
SKY: SUNNY CLEAR (OVRCAST) PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS

MEAS. INSTRUMENT: PICCOLO SCM-3 — TYPE 1 2 — SERIAL # 1403 17004
CALIBRATOR: BSWA CA 114 — SERIAL # 480151
CALIBRATION CHECK — PRE-TEST _____ dBA SPL — POST-TEST _____ dBA SPL — WINDSCRN YES

SETTINGS: A-WTD (SLOW) FAST FRONTAL RANDOM ANSI OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
(ST-2) 19-20	10:11	10:26	62.8	82.7	53.0				

COMMENTS: READING TAKEN IN FRONT OF 892 W. MANPOSA ST (RESIDENTIAL); PRIMARY NOISE SOURCE IS TRAFFIC TO THE WEST OF THE MEAS LOCATION; ROADS TO THE WEST INCLUDE 210 FWY AND VARIOUS STREETS; NEARBY DOG BARKING CONSISTENT THROUGHOUT NOISE READING;

SOURCE INFO AND TRAFFIC COUNTS

PRIMARY NOISE SOURCE: TRAFFIC AIRCRAFT RAIL INDUSTRIAL OTHER:
ROADWAY TYPE: ASPHALT — DIST. TO RDWY C/L OR EOP: APX 16' FROM C/L ON W. MANPOSA ST
TRAFFIC COUNT DURATION: 15 MIN — SPEED: MIN — SPEED

COUNT 1 (OR RDWY 1) DIRECTION	NB/EB	SB/WB	NB/EB	SB/WB
AUTOS	0			
MED TRKS	0			
HVY TRKS	0			
BUSES	0			
MOTRCLS	0			

IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE ✓

COUNT 2 (OR RDWY 2)	NB/EB	SB/WB	NB/EB	SB/WB

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY:

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES (DIST. BARKING DOGS) (BIRDS) DIST. INDUSTRIAL
DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING (DIST. TRAFFIC (LIST RDWYS BELOW)) DISTD GARDENERS/LANDSCAPING NOISE
OTHER: 210 FWY; TRASH TRUCK PICK-UP IN DISTANCE; DOG BARKING NEARBY THROUGHOUT READING

DESCRIPTION / SKETCH

TERRAIN: HARD SOFT (MIXED) FLAT OTHER:
PHOTOS: 6680; 6681; 6682; 6683; 6684;
OTHER COMMENTS / SKETCH



DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT ARROYO SECO PROJECT # 11884.1
SITE ID
SITE ADDRESS OBSERVER(S) PETE VITAR
START DATE 12/3/14 END DATE 12/3/14
START TIME END TIME

METEOROLOGICAL CONDITIONS
TEMP 65 F HUMIDITY 40 % R.H. WIND (CALM) LIGHT MODERATE
WINDSPD 2 MPH DIR. N NE S SE S SW W NW VARIABLE STEADY GUSTY
SKY SUNNY CLEAR (OVRCAST) PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS
MEAS. INSTRUMENT PICCOLO SLM-3 TYPE 1 2 SERIAL # 1403 17004
CALIBRATOR BSWA CA 114 SERIAL # 480151
CALIBRATION CHECK PRE-TEST ____ dBA SPL POST-TEST ____ dBA SPL WINDSCRN YES

SETTINGS A-WTD (SLOW) FAST FRONTAL RANDOM ANSI OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
(ST-3) 21-22	10:41	10:56	62.6	75.2	54.5				

COMMENTS
READING TAKEN AT WESTERN EDGE OF SUNSET OVERLOOK PARK ALONG WINDSOR AVE; PRIMARY NOISE SOURCE IS TRAFFIC ALONG WINDSOR AVE AND DISTANT TRAFFIC NOISE ~~FROM~~ TO THE WEST OF THE MEYER, INCLUDING 210 FWY JUST NORTH OF INTERSECTION WITH VENTURA ST.

SOURCE INFO AND TRAFFIC COUNTS
PRIMARY NOISE SOURCE (TRAFFIC) AIRCRAFT RAIL INDUSTRIAL OTHER:
ROADWAY TYPE: ASPHALT DIST. TO RDWY C/L OR EOP: APX 25' TO C/L ON WINDSOR AVE
TRAFFIC COUNT DURATION: 15 MIN

COUNT 1 (OR RDWY 1)	DIRECTION	NB/EB	SB/WB	NB/EB SPEED	SB/WB SPEED
	AUTOS	28			
	MED TRKS	0			
	HVY TRKS	0			
	BUSES	0			
	MOTRCLS	1			

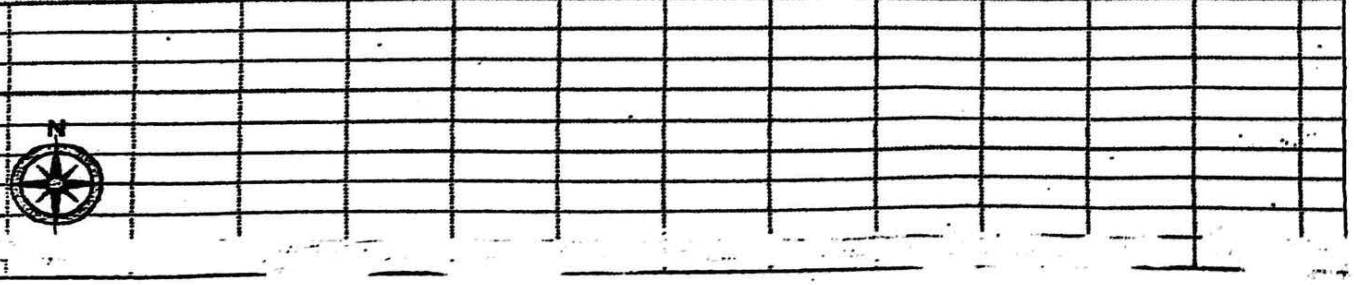
IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE ✓

COUNT 2 (OR RDWY 2)	NB/EB	SB/WB	NB/EB SPEED	SB/WB SPEED

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY:

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES DIST. BARKING DOGS (BIRDS) DIST. INDUSTRIAL
DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING (DIST. TRAFFIC (LIST RDWYS BELOW)) DISTD GARDENERS/LANDSCAPING NOISE
OTHER: 210 FWY;

DESCRIPTION / SKETCH
TERRAIN HARD SOFT (MIXED) FLAT OTHER:
PHOTOS 6686; 6687; 6688; 6689; 6690; 6691; 6692; 6693; 6694
OTHER COMMENTS / SKETCH



DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT ARROYO SECO PROJECT # 11884.1
SITE ID
SITE ADDRESS OBSERVER(S) PETE VIJAR
START DATE 12/3/14 END DATE 12/3/14
START TIME END TIME

METEOROLOGICAL CONDITIONS
TEMP 65 F HUMIDITY 40 % R.H. WIND (CALM) LIGHT MODERATE
WINDSPD 2 MPH DIR. N NE S SE S SW W NW VARIABLE STEADY GUSTY
SKY SUNNY CLEAR (OVRCAST) PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS
MEAS. INSTRUMENT PICCOLO SCM-3 TYPE 1 2 SERIAL # 1403 17004
CALIBRATOR BSWA CA 114 SERIAL # 480151
CALIBRATION CHECK PRE-TEST ____ dBA SPL POST-TEST ____ dBA SPL WINDSCRN YES

SETTINGS A-WTD (SLOW) FAST FRONTAL RANDOM ANSI OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
(ST-4) 23-24	11:04	11:20	57.2	74.0	50.9				

COMMENTS
READING TAKEN IN COUNTY OF 978 KENT ST (RESIDENTIAL); PRIMARY NOISE SOURCE IS TRAFFIC NOISE TO THE WEST OF THE METER LOCATION; ROADS TO THE WEST INCLUDE 210 FWY;

SOURCE INFO AND TRAFFIC COUNTS
PRIMARY NOISE SOURCE (TRAFFIC) AIRCRAFT RAIL INDUSTRIAL OTHER:
ROADWAY TYPE: ASPHALT DIST. TO RDWY (C/L) OR EOP: APX 20' FROM KENT ST C/L
TRAFFIC COUNT DURATION: 15 MIN

COUNT 1 (OR RDWY 1)	DIRECTION	NB/EB	SB/WB	SPEED NB/EB	SPEED SB/WB
	AUTOS	0			
	MED TRKS	0			
	HVY TRKS	0			
	BUSES	0			
	MOTRCLS	0			

IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE ✓

COUNT 2 (OR RDWY 2) ____ MIN

NB/EB	SB/WB	SPEED NB/EB	SPEED SB/WB

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY:

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES DIST. BARKING DOGS (BIRDS) DIST. INDUSTRIAL
DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING (DIST. TRAFFIC (LIST RDWYS BELOW)) DISTD GARDENERS/LANDSCAPING NOISE
OTHER: 210 FWY;

DESCRIPTION / SKETCH
TERRAIN HARD SOFT (MIXED) FLAT OTHER:
PHOTOS 6696; 6697; 6698; 6699; 6700; 6701
OTHER COMMENTS / SKETCH



DUDEK

FIELD NOISE MEASUREMENT DATA

PROJECT: ARROYO SECO — PROJECT #: 11884.1
SITE ID:
SITE ADDRESS: — OBSERVER(S): PETE VITAL
START DATE: 12/3/14 — END DATE: 12/3/14
START TIME: — END TIME:

METEOROLOGICAL CONDITIONS

TEMP: 65 F — HUMIDITY: 40 % R.H. — WIND: (CALM) LIGHT MODERATE
WINDSPD: 2 MPH — DIR: N NE S SE S SW W NW — VARIABLE STEADY GUSTY
SKY: SUNNY CLEAR (OVRCAST) PRTLY CLDY FOG RAIN

ACOUSTIC MEASUREMENTS

MEAS. INSTRUMENT: PICCOLO SLM-3 — TYPE 1 2 — SERIAL #: 1403 17004
CALIBRATOR: BSWA CA 114 — SERIAL #: 480151
CALIBRATION CHECK — PRE-TEST: ____ dBA SPL — POST-TEST: ____ dBA SPL — WINDSCRN: YES

SETTINGS: A-WTD (SLOW) FAST FRONTAL RANDOM ANSI — OTHER:

REC. #	BEGIN	END	Leq	Lmax	Lmin	L90	L50	L10	OTHER (SPECIFY METRIC
ST-5 25-26	11:29	11:44	66.4	80.4	52.5				

COMMENTS:
READING TAKEN IN FRONT OF 2245 WINDSOR AVE (RESIDENTIAL);
PRIMARY NOISE SOURCE IS TRAFFIC ON WINDSOR AVE;

SOURCE INFO AND TRAFFIC COUNTS

PRIMARY NOISE SOURCE: (TRAFFIC) AIRCRAFT RAIL INDUSTRIAL OTHER:
ROADWAY TYPE: ASPHALT — DIST. TO RDWY C/L OR EOP: APX 40' TO WINDSOR AVE C/L

TRAFFIC COUNT DURATION: 15 MIN — SPEED ____ MIN

COUNT 1 (OR RDWY 1)

DIRECTION	NB/EB	SB/WB	NB/EB SPEED	SB/WB SPEED
AUTOS	145			
MED TRKS	2			
HVY TRKS	0			
BUSES	0			
MOTRCLS	1			

IF COUNTING BOTH DIRECTIONS AS ONE, CHECK HERE ✓

COUNT 2 (OR RDWY 2)

NB/EB	SB/WB	NB/EB SPEED	SB/WB SPEED

SPEEDS ESTIMATED BY: RADAR / DRIVING THE PACE
POSTED SPEED LIMIT SIGNS SAY:

OTHER NOISE SOURCES (BACKGROUND): DIST. AIRCRAFT RUSTLING LEAVES DIST. BARKING DOGS (BIRDS) DIST. INDUSTRIAL
DIST. KIDS PLAYING DIST. CONVRSTNS / YELLING DIST. TRAFFIC (LIST RDWYS BELOW) DIST'D GARDENERS/LANDSCAPING NOISE
OTHER:

DESCRIPTION / SKETCH

TERRAIN HARD SOFT (MIXED) FLAT OTHER:
PHOTOS 6703; 6704; 6705; 6706; 6707; 6708;
OTHER COMMENTS / SKETCH



Construction Noise Modeling Input/Output, February, 2020

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/17/2020
Case Description: Arroyo Seco - Area 2 - Demolition

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - East	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	800	0
Dozer	No	40		81.7	810	0
Front End Loader	No	40		79.1	820	0
Backhoe	No	40		77.6	810	0
Tractor	No	40	84		820	0
Hydra Break Ram	Yes	10	90		810	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Saw	65.5	58.5	N/A	N/A	N/A	N/A
Dozer	57.5	53.5	N/A	N/A	N/A	N/A
Front End Loader	54.8	50.8	N/A	N/A	N/A	N/A
Backhoe	53.4	49.4	N/A	N/A	N/A	N/A
Tractor	59.7	55.7	N/A	N/A	N/A	N/A
Hydra Break Ram	65.8	55.8	N/A	N/A	N/A	N/A
Total	65.8	62.8	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - West	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	1700	0
Dozer	No	40		81.7	1710	0
Front End Loader	No	40		79.1	1720	0
Backhoe	No	40		77.6	1710	0
Tractor	No	40	84		1720	0
Hydra Break Ram	Yes	10	90		1710	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	

Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Saw		59	52	N/A	N/A	N/A	N/A
Dozer		51	47	N/A	N/A	N/A	N/A
Front End Loader		48.4	44.4	N/A	N/A	N/A	N/A
Backhoe		46.9	42.9	N/A	N/A	N/A	N/A
Tractor		53.3	49.3	N/A	N/A	N/A	N/A
Hydra Break Ram		59.3	49.3	N/A	N/A	N/A	N/A
	Total	59.3	56.3	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/14/2020
Case Description: Arroyo Seco - Area 2 - Site Preparation

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - East	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		800	0
Dozer	No	40		81.7	810	0
Backhoe	No	40		77.6	820	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader		60.9	56.9	N/A	N/A	N/A	N/A
Dozer		57.5	53.5	N/A	N/A	N/A	N/A
Backhoe		53.3	49.3	N/A	N/A	N/A	N/A
	Total	60.9	59	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - West	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		1700	0
Dozer	No	40		81.7	1710	0
Backhoe	No	40		77.6	1720	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader		54.4	50.4	N/A	N/A	N/A	N/A
Dozer		51	47	N/A	N/A	N/A	N/A
Backhoe		46.8	42.8	N/A	N/A	N/A	N/A
	Total	54.4	52.5	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/17/2020
Case Description: Arroyo Seco - Area 2 - Grading/Excavation

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - East	Residential	55	50	45

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Excavator	No	40		80.7	800	0
Dozer	No	40		81.7	810	0
Front End Loader	No	40		79.1	820	0
Backhoe	No	40		77.6	810	0
Vibrating Hopper	No	50		87	810	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator		56.6	52.6	N/A	N/A	N/A	N/A
Dozer		57.5	53.5	N/A	N/A	N/A	N/A
Front End Loader		54.8	50.8	N/A	N/A	N/A	N/A
Backhoe		53.4	49.4	N/A	N/A	N/A	N/A
Vibrating Hopper		62.8	59.8	N/A	N/A	N/A	N/A
	Total	62.8	62	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - West	Residential	55	50	45

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Excavator	No	40		80.7	1700	0
Dozer	No	40		81.7	1710	0
Front End Loader	No	40		79.1	1720	0

Backhoe	No	40	77.6	1710	0
Vibrating Hopper	No	50	87	1710	0

			Results			
	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Excavator	50.1	46.1	N/A	N/A	N/A	N/A
Dozer	51	47	N/A	N/A	N/A	N/A
Front End Loader	48.4	44.4	N/A	N/A	N/A	N/A
Backhoe	46.9	42.9	N/A	N/A	N/A	N/A
Vibrating Hopper	56.3	53.3	N/A	N/A	N/A	N/A
Total	56.3	55.5	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/14/2020
Case Description: Arroyo Seco - Area 2 - Building Construction

				---- Receptor #1 ----	
		Baselines (dBA)			
Description	Land Use	Daytime	Evening	Night	
Residential - East	Residential	55	50	45	

			Equipment			
			Spec	Actual	Receptor	Estimated
	Impact		Lmax	Lmax	Distance	Shielding
Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Concrete Mixer Truck	No	40		78.8	800	0
Crane	No	16		80.6	810	0
Excavator	No	40		80.7	820	0
Generator	No	50		80.6	810	0
Backhoe	No	40		77.6	830	0
Slurry Trenching Machine	No	50		80.4	830	0
Welder / Torch	No	40		74	820	0
Welder / Torch	No	40		74	850	0
Welder / Torch	No	40		74	810	0

			Results			
	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck	54.7	50.7	N/A	N/A	N/A	N/A
Crane	56.4	48.4	N/A	N/A	N/A	N/A
Excavator	56.4	52.4	N/A	N/A	N/A	N/A
Generator	56.4	53.4	N/A	N/A	N/A	N/A
Backhoe	53.2	49.2	N/A	N/A	N/A	N/A
Slurry Trenching Machine	56	52.9	N/A	N/A	N/A	N/A
Welder / Torch	49.7	45.7	N/A	N/A	N/A	N/A
Welder / Torch	49.4	45.4	N/A	N/A	N/A	N/A

Welder / Torch		49.8	45.8	N/A	N/A	N/A	N/A
	Total	56.4	59.9	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - West	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	1700	0
Crane	No	16		80.6	1710	0
Excavator	No	40		80.7	1720	0
Generator	No	50		80.6	1710	0
Backhoe	No	40		77.6	1750	0
Slurry Trenching Machine	No	50		80.4	1730	0
Welder / Torch	No	40		74	1710	0
Welder / Torch	No	40		74	1740	0
Welder / Torch	No	40		74	1720	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck		48.2	44.2	N/A	N/A	N/A	N/A
Crane		49.9	41.9	N/A	N/A	N/A	N/A
Excavator		50	46	N/A	N/A	N/A	N/A
Generator		49.9	46.9	N/A	N/A	N/A	N/A
Backhoe		46.7	42.7	N/A	N/A	N/A	N/A
Slurry Trenching Machine		49.6	46.6	N/A	N/A	N/A	N/A
Welder / Torch		43.3	39.3	N/A	N/A	N/A	N/A
Welder / Torch		43.2	39.2	N/A	N/A	N/A	N/A
Welder / Torch		43.3	39.3	N/A	N/A	N/A	N/A
	Total	50	53.4	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/14/2020
Case Description: Arroyo Seco - Area 2 - Paving

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - East	Residential	55	50	45

Impact	Equipment Spec Lmax	Actual Lmax	Receptor Distance	Estimated Shielding

Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)
Concrete Mixer Truck	No	40		78.8	800	0
Paver	No	50		77.2	810	0
Concrete Pump Truck	No	20		81.4	820	0
Compactor (ground)	No	20		83.2	810	0
All Other Equipment > 5 HP	No	50	85		830	0
Roller	No	20		80	830	0
Tractor	No	40	84		820	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck	54.7	50.7	N/A	N/A	N/A	N/A
Paver	53	50	N/A	N/A	N/A	N/A
Concrete Pump Truck	57.1	50.1	N/A	N/A	N/A	N/A
Compactor (ground)	59	52.1	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP	60.6	57.6	N/A	N/A	N/A	N/A
Roller	55.6	48.6	N/A	N/A	N/A	N/A
Tractor	59.7	55.7	N/A	N/A	N/A	N/A
Total	60.6	61.8	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - West	Residential	55	50	45

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	1700	0
Paver	No	50		77.2	1710	0
Concrete Pump Truck	No	20		81.4	1720	0
Compactor (ground)	No	20		83.2	1710	0
All Other Equipment > 5 HP	No	50	85		1750	0
Roller	No	20		80	1730	0
Tractor	No	40	84		1710	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck	48.2	44.2	N/A	N/A	N/A	N/A
Paver	46.5	43.5	N/A	N/A	N/A	N/A
Concrete Pump Truck	50.7	43.7	N/A	N/A	N/A	N/A
Compactor (ground)	52.5	45.6	N/A	N/A	N/A	N/A
All Other Equipment > 5 HP	54.1	51.1	N/A	N/A	N/A	N/A
Roller	49.2	42.2	N/A	N/A	N/A	N/A
Tractor	53.3	49.3	N/A	N/A	N/A	N/A
Total	54.1	55.3	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Report date: 2/14/2020
Case Description: Arroyo Seco - Area 2 - Dewatering

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - East	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pumps	No	50		80.9	800	0
Backhoe	No	40		77.6	810	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Pumps	56.9	53.8	N/A	N/A	N/A	N/A
Backhoe	53.4	49.4	N/A	N/A	N/A	N/A
Total	56.9	55.2	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - West	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Pumps	No	50		80.9	1700	0
Backhoe	No	40		77.6	1710	0

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Pumps	50.3	47.3	N/A	N/A	N/A	N/A
Backhoe	46.9	42.9	N/A	N/A	N/A	N/A
Total	50.3	48.6	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Report date: 2/23/2020
Case Description: Arroyo Seco - Area 3 - Demolition

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential - Nearest	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	250	5
Backhoe	No	40		77.6	260	5
Front End Loader	No	40		79.1	270	5
Tractor	No	40	84		260	5
Hydra Break Ram	Yes	10	90		260	5

Results

Equipment	Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq
Concrete Saw	70.6	63.6	N/A	N/A	N/A	N/A
Backhoe	58.2	54.3	N/A	N/A	N/A	N/A
Front End Loader	59.5	55.5	N/A	N/A	N/A	N/A
Tractor	64.7	60.7	N/A	N/A	N/A	N/A
Hydra Break Ram	70.7	60.7	N/A	N/A	N/A	N/A
Total	70.7	67.2	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential - Typical	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	400	5
Backhoe	No	40		77.6	400	5
Front End Loader	No	40		79.1	400	5
Tractor	No	40	84		400	5
Hydra Break Ram	Yes	10	90		400	5

Results

Equipment	Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq
Concrete Saw	66.5	59.5	N/A	N/A	N/A	N/A
Backhoe	54.5	50.5	N/A	N/A	N/A	N/A
Front End Loader	56	52.1	N/A	N/A	N/A	N/A
Tractor	60.9	57	N/A	N/A	N/A	N/A
Hydra Break Ram	66.9	56.9	N/A	N/A	N/A	N/A
Total	66.9	63.3	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
100 foot radius	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	100	5
Backhoe	No	40		77.6	100	5
Front End Loader	No	40		79.1	100	5
Tractor	No	40	84		100	5
Hydra Break Ram	Yes	10	90		100	5

Equipment	Results Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq
Concrete Saw	78.6	71.6	N/A	N/A	N/A	N/A
Backhoe	66.5	62.6	N/A	N/A	N/A	N/A
Front End Loader	68.1	64.1	N/A	N/A	N/A	N/A
Tractor	73	69	N/A	N/A	N/A	N/A
Hydra Break Ram	79	69	N/A	N/A	N/A	N/A
Total	79	75.4	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/23/2020
Case Description: Arroyo Seco - Area 3 - Site Preparation

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential - Nearest Work	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	250	5
Backhoe	No	40		77.6	260	5

Equipment	Results Calculated (dBA) *Lmax	Leq	Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq	Night Lmax
Dozer	62.7	58.7	N/A	N/A	N/A	N/A	N/A
Backhoe	58.2	54.3	N/A	N/A	N/A	N/A	N/A

	Total	62.7	60	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Residential - Typical Work	Residential	55	50	45

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	400	5
Backhoe	No	40		77.6	400	5

Results

	Calculated (dBA)		Noise Limits (dBA)				
			Day		Evening		Night
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax
Dozer	58.6	54.6	N/A	N/A	N/A	N/A	N/A
Backhoe	54.5	50.5	N/A	N/A	N/A	N/A	N/A
Total	58.6	56.1	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
100 Ft Radius	Residential	55	50	45

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	100	5
Backhoe	No	40		77.6	100	5

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Dozer	70.6	66.7	N/A	N/A	N/A	N/A
Backhoe	66.5	62.6	N/A	N/A	N/A	N/A
Total	70.6	68.1	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Report date: 2/23/2020
Case Description: Arroyo Seco - Area 3 - Grading/Excavation

---- Receptor #1 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Residential - Nearest	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
All Other Equipment > 5 HP	No	50	85		250	5
Dozer	No	40		81.7	260	5
Dozer	No	40		81.7	270	5
Backhoe	No	40		77.6	260	5
Vibrating Hopper	No	50		87	260	5

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
All Other Equipment > 5 HP	66	63	N/A	N/A	N/A	N/A
Dozer	62.3	58.4	N/A	N/A	N/A	N/A
Dozer	62	58	N/A	N/A	N/A	N/A
Backhoe	58.2	54.3	N/A	N/A	N/A	N/A
Vibrating Hopper	67.7	64.7	N/A	N/A	N/A	N/A
Total	67.7	68.1	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Residential - Typical	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
All Other Equipment > 5 HP	No	50	85		400	5
Dozer	No	40		81.7	400	5
Dozer	No	40		81.7	400	5
Backhoe	No	40		77.6	400	5
Vibrating Hopper	No	50		87	400	5

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
All Other Equipment > 5 HP	61.9	58.9	N/A	N/A	N/A	N/A
Dozer	58.6	54.6	N/A	N/A	N/A	N/A
Dozer	58.6	54.6	N/A	N/A	N/A	N/A
Backhoe	54.5	50.5	N/A	N/A	N/A	N/A
Vibrating Hopper	63.9	60.9	N/A	N/A	N/A	N/A
Total	63.9	64.3	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night

100 foot radius	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
All Other Equipment > 5 HP	No	50	85		100	5
Dozer	No	40		81.7	100	5
Dozer	No	40		81.7	100	5
Backhoe	No	40		77.6	100	5
Vibrating Hopper	No	50		87	100	5

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
All Other Equipment > 5 HP		74	71	N/A	N/A	N/A	N/A
Dozer		70.6	66.7	N/A	N/A	N/A	N/A
Dozer		70.6	66.7	N/A	N/A	N/A	N/A
Backhoe		66.5	62.6	N/A	N/A	N/A	N/A
Vibrating Hopper		76	73	N/A	N/A	N/A	N/A
	Total	76	76.4	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/23/2020
Case Description: Arroyo Seco - Area 3 - Building Construction

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Residential - Nearest	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	250	5
Man Lift	No	20		74.7	260	5
Generator	No	50		80.6	270	5
Front End Loader	No	40		79.1	260	5

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane		61.6	53.6	N/A	N/A	N/A	N/A
Man Lift		55.4	48.4	N/A	N/A	N/A	N/A
Generator		61	58	N/A	N/A	N/A	N/A

Front End Loader		59.8	55.8	N/A	N/A	N/A	N/A
	Total	61.6	61.2	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential - Typical	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	400	5
Man Lift	No	20		74.7	400	5
Generator	No	50		80.6	400	5
Front End Loader	No	40		79.1	400	5

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane		57.5	49.5	N/A	N/A	N/A	N/A
Man Lift		51.6	44.6	N/A	N/A	N/A	N/A
Generator		57.6	54.6	N/A	N/A	N/A	N/A
Front End Loader		56	52.1	N/A	N/A	N/A	N/A
	Total	57.6	57.5	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
100 ft Radius	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	100	5
Man Lift	No	20		74.7	100	5
Generator	No	50		80.6	100	5
Front End Loader	No	40		79.1	100	5

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane		69.5	61.6	N/A	N/A	N/A	N/A
Man Lift		63.7	56.7	N/A	N/A	N/A	N/A
Generator		69.6	66.6	N/A	N/A	N/A	N/A
Front End Loader		68.1	64.1	N/A	N/A	N/A	N/A
	Total	69.6	69.6	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 2/23/2020
Case Description: Arroyo Seco - Area 3 - Paving

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential - Nearest	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	250	5
Grader	No	40	85		260	5
Paver	No	50		77.2	270	5
Concrete Pump Truck	No	20		81.4	260	5
Roller	No	20		80	280	5
Tractor	No	40	84		270	5

Equipment	Calculated (dBA) *Lmax	Leq	Results Noise Limits (dBA) Day Lmax	Day Leq	Evening Lmax	Evening Leq
Concrete Mixer Truck	59.8	55.8	N/A	N/A	N/A	N/A
Grader	65.7	61.7	N/A	N/A	N/A	N/A
Paver	57.6	54.6	N/A	N/A	N/A	N/A
Concrete Pump Truck	62.1	55.1	N/A	N/A	N/A	N/A
Roller	60	53	N/A	N/A	N/A	N/A
Tractor	64.4	60.4	N/A	N/A	N/A	N/A
Total	65.7	65.8	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Residential - Typical	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	400	5
Grader	No	40	85		400	5
Paver	No	50		77.2	400	5
Concrete Pump Truck	No	20		81.4	400	5
Roller	No	20		80	400	5
Tractor	No	40	84		400	5

Calculated (dBA)	Results Noise Limits (dBA) Day	Evening

Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck		55.7	51.8	N/A	N/A	N/A	N/A
Grader		61.9	58	N/A	N/A	N/A	N/A
Paver		54.2	51.1	N/A	N/A	N/A	N/A
Concrete Pump Truck		58.3	51.3	N/A	N/A	N/A	N/A
Roller		56.9	49.9	N/A	N/A	N/A	N/A
Tractor		60.9	57	N/A	N/A	N/A	N/A
	Total	61.9	62.1	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
100 ft Radius	Residential	55	50	45

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	100	5
Grader	No	40	85		100	5
Paver	No	50		77.2	100	5
Concrete Pump Truck	No	20		81.4	100	5
Roller	No	20		80	100	5
Tractor	No	40	84		100	5

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck	67.8	63.8	N/A	N/A	N/A	N/A
Grader	74	70	N/A	N/A	N/A	N/A
Paver	66.2	63.2	N/A	N/A	N/A	N/A
Concrete Pump Truck	70.4	63.4	N/A	N/A	N/A	N/A
Roller	69	62	N/A	N/A	N/A	N/A
Tractor	73	69	N/A	N/A	N/A	N/A
Total	74	74.2	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Report date: 2/23/2020
Case Description: Arroyo Seco - Area 3 - Architectural Coating

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - Nearest	Residential	55	50	45

		Equipment Spec	Actual	Receptor	Estimated
Description	Impact Device	Usage(%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)

Description	Impact Device	Usage(%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)
Compressor (air)	No	40		77.7	250	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)		58.7	54.7	N/A	N/A	N/A	N/A
	Total	58.7	54.7	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Residential - Typical	Residential	55	50	45

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	400	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)		54.6	50.6	N/A	N/A	N/A	N/A
	Total	54.6	50.6	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
100 Ft Radius	Residential	55	50	45

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	100	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq
Compressor (air)		66.6	62.7	N/A	N/A	N/A	N/A
	Total	66.6	62.7	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Traffic Noise Modeling Input/Output (during Construction), February 2020

Dudek 23 February 2020
MG TNM 2.5

INPUT: ROADWAYS
PROJECT/CONTRACT: 11884
RUN: Arroyo Seco Const Traffic Avg Conds

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with the approval of FHWA

Roadway Name	Width	Points Name	No.	Coordinates (pavement) X	Y	Z	Flow Control Control Device	Speed Constraint	Percent Vehicles Affected	Segment Pvmt Type	On Struct?
	ft			ft	ft	ft		mph	%		
Windsor Avenue - Oak Grove Dr - Fig	75.0	point1	1	100.0	100.0	100.00				Average	
		point2	2	100.0	1,000.0	100.00					
Windsor Avenue - Fig - Ventura	75.0	point3	3	100.0	1,100.0	100.00				Average	
		point4	4	100.0	2,000.0	100.00					
Windsr Ave w Area 2- Oak Grv Dr - Fig	75.0	point5	5	1,000.0	100.0	100.00				Average	
		point6	6	1,000.0	1,000.0	100.00					
Windsr Ave w Area 2 - Fig to Ventura	75.0	point7	7	1,000.0	1,100.0	100.00				Average	
		point8	8	1,000.0	2,000.0	100.00					
Explorer Road - north of Windsor Ave	25.0	point9	9	100.0	2,100.0	150.00				Average	
		point10	10	100.0	3,000.0	150.00					
Explorer Rd w Area 3- n of Wndsr Ave	25.0	point11	11	2,000.0	2,100.0	150.00				Average	
		point12	12	2,000.0	3,000.0	150.00					
Windsr Ave w Area 3- Oak Grv Dr - Fig	75.0	point13	13	2,000.0	100.0	100.00				Average	
		point14	14	2,000.0	1,000.0	100.00					
Windsr Ave w Area 3 - Fig to Ventura	75.0	point15	15	2,000.0	1,100.0	100.00				Average	
		point16	16	2,000.0	2,000.0	100.00					

Dudek **23 February 2020**
MG **TNM 2.5**

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: **11884**
RUN: **Arroyo Seco Const Traffic Avg Conds**

Roadway	**Points**											
Name	**Name**	**No.**	**Segment**									
			Autos		**MTrucks**		**HTrucks**		**Buses**		**Motorcycles**	
			V	**S**	**V**	**S**	**V**	**S**	**V**	**S**	**V**	**S**
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
Windsor Avenue - Oak Grove Dr - Fig	point1	1	1176	35	24	35	15	35	0	0	0	0
	point2	2										
Windsor Avenue - Fig - Ventura	point3	3	788	35	16	35	10	35	0	0	0	0
	point4	4										
Windsr Ave w Area 2- Oak Grv Dr - Fig	point5	5	1183	35	25	35	16	35	0	0	0	0
	point6	6										
Windsr Ave w Area 2 - Fig to Ventura	point7	7	795	35	17	35	11	35	0	0	0	0
	point8	8										
Explorer Road - north of Windsor Ave	point9	9	339	25	7	25	4	25	0	0	0	0
	point10	10										
Explorer Rd w Area 3- n of Wndsr Ave	point11	11	345	25	8	25	15	25	0	0	0	0
	point12	12										
Windsr Ave w Area 3- Oak Grv Dr - Fig	point13	13	1182	35	25	35	26	35	0	0	0	0
	point14	14										
Windsr Ave w Area 3 - Fig to Ventura	point15	15	794	35	17	35	21	35	0	0	0	0
	point16	16										

Dudek **23 February 2020**
MG **TNM 2.5**

INPUT: RECEIVERS
PROJECT/CONTRACT: **11884**
RUN: **Arroyo Seco Const Traffic Avg Conds**

Receiver Name	**No.**	**#DUs**	**Coordinates (ground)**			**Height above Ground**	**Input Sound Levels and Criteria**				**Active in Calc.**
			X	**Y**	**Z**		**Existing LAeq1h**	**Impact Criteria LAeq1h**	**Sub'l**	**NR Goal**	
			ft	ft	ft	ft	dBA	dBA	dB	dB	
Rcvr 1 wo Proj - Oak Grove to Fig	1	1	150.0	500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 2 wo Proj- Fig to Ventura	3	1	150.0	1,500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 3 wo Proj - Explr Rd - Area 3	5	1	250.0	2,500.0	180.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 1 w Proj - Area 2	6	1	1,050.0	500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 2 w Proj - Area 2	8	1	1,050.0	1,500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 1 w Proj - Area 3	9	1	2,050.0	500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 2 w Proj - Area 3	11	1	2,050.0	1,500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 3 w Proj - Explr Rd - Area 3	12	1	2,150.0	2,500.0	180.00	5.00	0.00	66	10.0	8.0	Y

Dudek			**23 February 2020**	
MG			**TNM 2.5**	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	**11884**			
RUN:	**Arroyo Seco Const Traffic Avg Conds**			
Terrain Line	**Points**			
Name	**No.**	**Coordinates (ground)**		
		X	**Y**	**Z**
		ft	ft	ft
Terrain Line2	1	220.0	2,000.0	170.00
	2	220.0	3,000.0	170.00
Terrain Line3	3	2,120.0	2,016.2	170.00
	4	2,120.0	3,016.2	170.00

Dudek
MG

23 February 2020
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 11884
RUN: Arroyo Seco Const Traffic Avg Conds
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Rcvr 1 wo Proj - Oak Grove to Fig	1	1	0.0	65.4	66	65.4	10	----	65.4	0.0	8	-8.0
Rcvr 2 wo Proj- Fig to Ventura	3	1	0.0	63.8	66	63.8	10	----	63.8	0.0	8	-8.0
Rcvr 3 wo Proj - Explr Rd - Area 3	5	1	0.0	50.9	66	50.9	10	----	50.9	0.0	8	-8.0
Rcvr 1 w Proj - Area 2	6	1	0.0	65.5	66	65.5	10	----	65.5	0.0	8	-8.0
Rcvr 2 w Proj - Area 2	8	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
Rcvr 1 w Proj - Area 3	9	1	0.0	65.9	66	65.9	10	----	65.9	0.0	8	-8.0
Rcvr 2 w Proj - Area 3	11	1	0.0	64.4	66	64.4	10	----	64.4	0.0	8	-8.0
Rcvr 3 w Proj - Explr Rd - Area 3	12	1	0.0	53.0	66	53.0	10	----	53.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	8	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Dudek	**23 February 2020**
MG	**TNM 2.5**

INPUT: ROADWAYS	**Average pavement type shall be used unless**
PROJECT/CONTRACT:	**11884**	**a State highway agency substantiates the use**
RUN:	**Arroyo Seco Const Traffic - Peak Conds**	**of a different type with the approval of FHWA**

Roadway		**Points**									
Name	**Width**	**Name**	**No.**	**Coordinates (pavement)**			**Flow Control**			**Segment**	
				X	**Y**	**Z**	**Control Device**	**Speed Constraint**	**Percent Vehicles Affected**	**Pvmt Type**	**On Struct?**
	ft			ft	ft	ft		mph	%		
Windsor Avenue - Oak Grove Dr - Fig	75.0	point1	1	100.0	100.0	100.00				Average	
		point2	2	100.0	1,000.0	100.00					
Windsor Avenue - Fig - Ventura	75.0	point3	3	100.0	1,100.0	100.00				Average	
		point4	4	100.0	2,000.0	100.00					
Windsr Ave w Area 2- Oak Grv Dr - Fig	75.0	point5	5	1,000.0	100.0	100.00				Average	
		point6	6	1,000.0	1,000.0	100.00					
Windsr Ave w Area 2 - Fig to Ventura	75.0	point7	7	1,000.0	1,100.0	100.00				Average	
		point8	8	1,000.0	2,000.0	100.00					
Explorer Road - north of Windsor Ave	25.0	point9	9	100.0	2,100.0	150.00				Average	
		point10	10	100.0	3,000.0	150.00					
Explorer Rd w Area 3- n of Wndsr Ave	25.0	point11	11	2,000.0	2,100.0	150.00				Average	
		point12	12	2,000.0	3,000.0	150.00					
Windsr Ave w Area 3- Oak Grv Dr - Fig	75.0	point13	13	2,000.0	100.0	100.00				Average	
		point14	14	2,000.0	1,000.0	100.00					
Windsr Ave w Area 3 - Fig to Ventura	75.0	point15	15	2,000.0	1,100.0	100.00				Average	
		point16	16	2,000.0	2,000.0	100.00					

Dudek **23 February 2020**
MG **TNM 2.5**

INPUT: TRAFFIC FOR LAeq1h Volumes
PROJECT/CONTRACT: **11884**
RUN: **Arroyo Seco Const Traffic - Peak Conds**

Roadway	Points		Segment									
Name	Name	No.	Autos		MTrucks		HTrucks		Buses		Motorcycles	
			V	S	V	S	V	S	V	S	V	S
			veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph	veh/hr	mph
Windsor Avenue - Oak Grove Dr - Fig	point1	1	1176	35	24	35	15	35	0	0	0	0
	point2	2										
Windsor Avenue - Fig - Ventura	point3	3	788	35	16	35	10	35	0	0	0	0
	point4	4										
Windsr Ave w Area 2- Oak Grv Dr - Fig	point5	5	1188	35	25	35	25	35	0	0	0	0
	point6	6										
Windsr Ave w Area 2 - Fig to Ventura	point7	7	800	35	17	35	20	35	0	0	0	0
	point8	8										
Explorer Road - north of Windsor Ave	point9	9	339	25	7	25	4	25	0	0	0	0
	point10	10										
Explorer Rd w Area 3- n of Wndsr Ave	point11	11	344	25	8	25	63	25	0	0	0	0
	point12	12										
Windsr Ave w Area 3- Oak Grv Dr - Fig	point13	13	1181	35	25	35	75	35	0	0	0	0
	point14	14										
Windsr Ave w Area 3 - Fig to Ventura	point15	15	793	35	17	35	70	35	0	0	0	0
	point16	16										

Dudek **23 February 2020**
MG **TNM 2.5**

INPUT: RECEIVERS
PROJECT/CONTRACT: **11884**
RUN: **Arroyo Seco Const Traffic - Peak Conds**

Receiver Name	No.	#DUs	Coordinates (ground) X	Y	Z	Height above Ground	Input Sound Levels and Criteria: Existing LAeq1h	Impact Criteria LAeq1h	Impact Criteria Sub'l	NR Goal	Active in Calc.
			ft	ft	ft	ft	dBA	dBA	dB	dB	
Rcvr 1 wo Proj - Oak Grove to Fig	1	1	150.0	500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 2 wo Proj- Fig to Ventura	3	1	150.0	1,500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 3 wo Proj - Explr Rd - Area 3	5	1	250.0	2,500.0	180.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 1 w Proj - Area 2	6	1	1,050.0	500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 2 w Proj - Area 2	8	1	1,050.0	1,500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 1 w Proj - Area 3	9	1	2,050.0	500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 2 w Proj - Area 3	11	1	2,050.0	1,500.0	100.00	5.00	0.00	66	10.0	8.0	Y
Rcvr 3 w Proj - Explr Rd - Area 3	12	1	2,150.0	2,500.0	180.00	5.00	0.00	66	10.0	8.0	Y

Dudek			**23 February 2020**	
MG			**TNM 2.5**	
INPUT: TERRAIN LINES				
PROJECT/CONTRACT:	**11884**			
RUN:	**Arroyo Seco Const Traffic - Peak Conds**			
Terrain Line	**Points**			
Name	**No.**	**Coordinates (ground)**		
		X	**Y**	**Z**
		ft	ft	ft
Terrain Line1	1	220.0	2,000.0	170.00
	2	220.0	3,000.0	170.00
Terrain Line2	3	2,120.0	2,016.2	170.00
	4	2,120.0	3,016.2	170.00

Dudek
MG
23 February 2020
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: 11884
RUN: Arroyo Seco Const Traffic - Peak Conds
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Rcvr 1 wo Proj - Oak Grove to Fig	1	1	0.0	65.4	66	65.4	10	----	65.4	0.0	8	-8.0
Rcvr 2 wo Proj- Fig to Ventura	3	1	0.0	63.8	66	63.8	10	----	63.8	0.0	8	-8.0
Rcvr 3 wo Proj - Explr Rd - Area 3	5	1	0.0	51.0	66	51.0	10	----	51.0	0.0	8	-8.0
Rcvr 1 w Proj - Area 2	6	1	0.0	65.9	66	65.9	10	----	65.9	0.0	8	-8.0
Rcvr 2 w Proj - Area 2	8	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0
Rcvr 1 w Proj - Area 3	9	1	0.0	67.5	66	67.5	10	Snd Lvl	67.5	0.0	8	-8.0
Rcvr 2 w Proj - Area 3	11	1	0.0	66.5	66	66.5	10	Snd Lvl	66.5	0.0	8	-8.0
Rcvr 3 w Proj - Explr Rd - Area 3	12	1	0.0	57.2	66	57.2	10	----	57.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	8	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Appendix H

Transportation Technical Data and Analysis Worksheets, May 2020

TRANSPORTATION TECHNICAL DATA AND ANALYSIS WORKSHEETS

Dudek, May 2020

- Construction Schedule and Trips for Area 2 and Area 3
- Traffic Counts
- Excerpts from Devil's Gate Reservoir Sediment Removal and Management Project Traffic Impact Analysis
- Caltrans Data and Traffic Growth Factor Analysis
- Estimated PCE AM and PM Peak Hour Volumes
- Signal Timing Data
- Queuing Analysis - SimTraffic Worksheets

Construction Schedule and Trips for all Construction Phases of Area 2 and Area 3

Phase	Construction Phase	No. of Workers	Average Daily Worker Trips	No. of Daily Vendor Trucks	Average Daily Vendor (Delivery) Trips	Total Haul Trips	No. of Daily Haul Trucks	Average Daily Haul Trips	Total Average Daily Trips	Start Date	End Date	Duration
1	Area 2: Site Preparation	4	8	1	2	14	1	2	12	8/2/21	8/9/21	6
2	**Area 2: Dewatering**	**7**	**13**	**1**	**2**	**64**	**1**	**2**	**17**	**08/02/21**	**09/24/21**	**40**
3	**Area 2: Demolition**	**5**	**10**	**1**	**2**	**420**	**42**	**84**	**96**	**08/10/21**	**08/16/21**	**5**
4	Area 2: Grading/Excavation	13	26	1	2	0	0	0	28	08/17/21	10/11/21	40
5	Area 2: Building Construction	9	18	1	2	0	0	0	20	08/23/21	10/11/21	36
6	Area 2: Paving	3	5	1	2	0	0	0	7	10/11/21	10/15/21	5
7	Area 3: Site Preparation	5	10	1	2	142	14	28	40	03/21/22	03/25/22	5
8	**Area 3: Demolition**	**5**	**10**	**1**	**2**	**4746**	**237**	**475**	**487**	**03/28/22**	**04/08/22**	**10**
9	Area 3: Grading/Excavation	2	4	0	0	0	0	0	4	04/11/22	08/26/22	100
10	Area 3: Building Construction	13	26	1	2	0	0	0	28	08/27/22	10/28/22	45
11	Area 3: Paving	7.5	15	1	2	0	0	0	17	08/29/22	10/28/22	45
12	Area 3: Architectural Coating	2.5	5	0	0	0	0	0	5	10/29/22	11/04/22	5

Bold denotes Peak Phase of Construction



- ***Traffic Counts***

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(951) 268-6268

City of Irwindale
N/S: I-605 Northbound Ramps
E/W: Los Angeles Street
Weather: Clear

File Name : IRW605NLAAM
Site Code : 05114482
Start Date : 11/18/2014
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

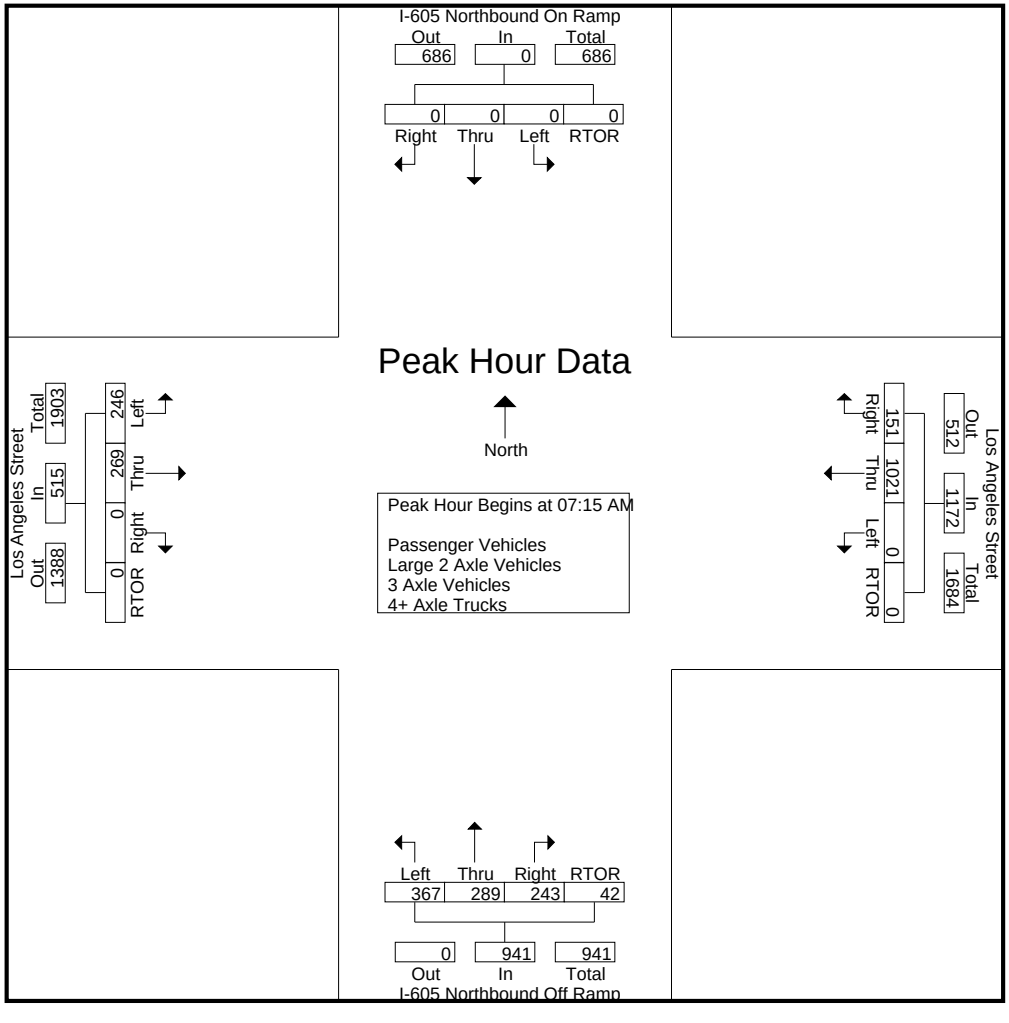
	I-605 Northbound On Ramp Southbound					Los Angeles Street Westbound					I-605 Northbound Off Ramp Northbound					Los Angeles Street Eastbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	265	56	0	321	92	79	58	9	238	42	46	0	0	88	647
07:15 AM	0	0	0	0	0	0	276	42	0	318	95	58	72	8	233	51	58	0	0	109	660
07:30 AM	0	0	0	0	0	0	260	38	0	298	93	77	56	13	239	68	68	0	0	136	673
07:45 AM	0	0	0	0	0	0	239	33	0	272	91	78	49	6	224	64	66	0	0	130	626
Total	0	0	0	0	0	0	1040	169	0	1209	371	292	235	36	934	225	238	0	0	463	2606
08:00 AM	0	0	0	0	0	0	246	38	0	284	88	76	66	15	245	63	77	0	0	140	669
08:15 AM	0	0	0	0	0	0	232	46	0	278	108	83	47	4	242	64	64	0	0	128	648
08:30 AM	0	0	0	0	0	0	209	21	0	230	89	73	48	2	212	49	65	0	0	114	556
08:45 AM	0	0	0	0	0	0	170	41	0	211	94	83	38	9	224	72	67	0	0	139	574
Total	0	0	0	0	0	0	857	146	0	1003	379	315	199	30	923	248	273	0	0	521	2447
Grand Total	0	0	0	0	0	0	1897	315	0	2212	750	607	434	66	1857	473	511	0	0	984	5053
Apprch %	0	0	0	0		0	85.8	14.2	0		40.4	32.7	23.4	3.6		48.1	51.9	0	0		
Total %	0	0	0	0	0	0	37.5	6.2	0	43.8	14.8	12	8.6	1.3	36.8	9.4	10.1	0	0	19.5	
Passenger Vehicles																					
% Passenger Vehicles	0	0	0	0	0	0	96.6	93	0	96.1	86.9	89.6	91.9	98.5	89.4	92.4	94.1	0	0	93.3	93.1
Large 2 Axle Vehicles	0	0	0	0	0	0	30	2	0	32	22	16	6	0	44	16	19	0	0	35	111
% Large 2 Axle Vehicles	0	0	0	0	0	0	1.6	0.6	0	1.4	2.9	2.6	1.4	0	2.4	3.4	3.7	0	0	3.6	2.2
3 Axle Vehicles	0	0	0	0	0	0	6	2	0	8	54	7	2	0	63	12	4	0	0	16	87
% 3 Axle Vehicles	0	0	0	0	0	0	0.3	0.6	0	0.4	7.2	1.2	0.5	0	3.4	2.5	0.8	0	0	1.6	1.7
4+ Axle Trucks	0	0	0	0	0	0	28	18	0	46	22	40	27	1	90	8	7	0	0	15	151
% 4+ Axle Trucks	0	0	0	0	0	0	1.5	5.7	0	2.1	2.9	6.6	6.2	1.5	4.8	1.7	1.4	0	0	1.5	3

	I-605 Northbound On Ramp Southbound					Los Angeles Street Westbound					I-605 Northbound Off Ramp Northbound					Los Angeles Street Eastbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	0	0	0	0	0	276	42	0	318	95	58	72	8	233	51	58	0	0	109	660
07:30 AM	0	0	0	0	0	0	260	38	0	298	93	77	56	13	239	68	68	0	0	136	673
07:45 AM	0	0	0	0	0	0	239	33	0	272	91	78	49	6	224	64	66	0	0	130	626
08:00 AM	0	0	0	0	0	0	246	38	0	284	88	76	66	15	245	63	77	0	0	140	669
Total Volume	0	0	0	0	0	0	1021	151	0	1172	367	289	243	42	941	246	269	0	0	515	2628
% App. Total	0	0	0	0		0	87.1	12.9	0		39	30.7	25.8	4.5		47.8	52.2	0	0		
PHF	.000	.000	.000	.000	.000	.000	.925	.899	.000	.921	.966	.926	.844	.700	.960	.904	.873	.000	.000	.920	.976

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City of Irwindale
N/S: I-605 Northbound Ramps
E/W: Los Angeles Street
Weather: Clear

File Name : IRW605NLAAM
Site Code : 05114482
Start Date : 11/18/2014
Page No : 2



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Corona, CA 92878
(951) 268-6268

City of Irwindale
N/S: I-605 SB Ramps / Rivergrade Rd
E/W: Lower Azusa Road
Weather: Clear

File Name : IRW605SLAAM
Site Code : 05114482
Start Date : 11/18/2014
Page No : 1

Groups Printed- Passenger Vehicles - Large 2 Axle Vehicles - 3 Axle Vehicles - 4+ Axle Trucks

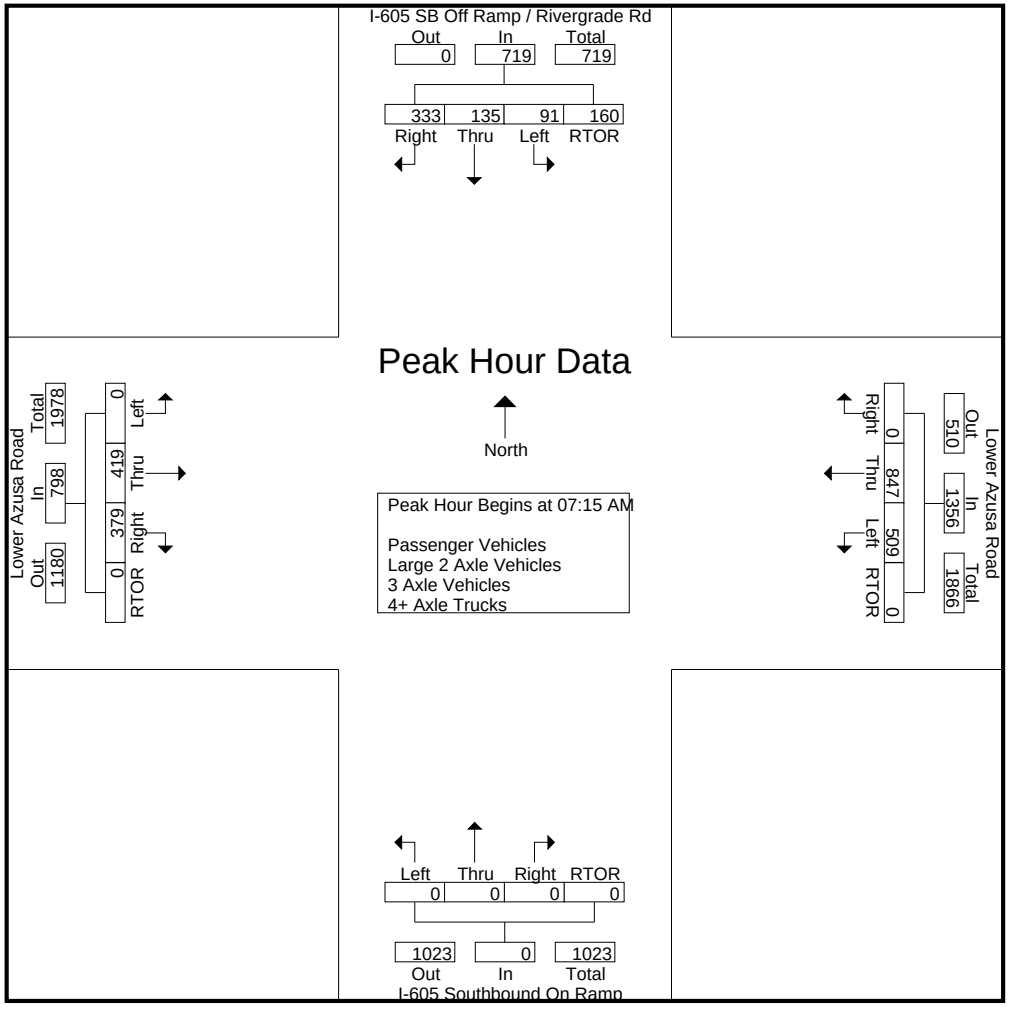
	I-605 SB Off Ramp / Rivergrade Rd Southbound					Lower Azusa Road Westbound					I-605 Southbound On Ramp Northbound					Lower Azusa Road Eastbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
07:00 AM	17	32	66	43	158	147	214	0	0	361	0	0	0	0	0	0	77	99	0	176	695
07:15 AM	17	30	80	51	178	140	223	0	0	363	0	0	0	0	0	0	88	88	0	176	717
07:30 AM	31	32	89	28	180	125	214	0	0	339	0	0	0	0	0	0	98	95	0	193	712
07:45 AM	17	38	81	42	178	119	212	0	0	331	0	0	0	0	0	0	124	94	0	218	727
Total	82	132	316	164	694	531	863	0	0	1394	0	0	0	0	0	0	387	376	0	763	2851
08:00 AM	26	35	83	39	183	125	198	0	0	323	0	0	0	0	0	0	109	102	0	211	717
08:15 AM	23	20	89	43	175	137	228	0	0	365	0	0	0	0	0	0	98	77	0	175	715
08:30 AM	29	33	83	49	194	109	189	0	0	298	0	0	0	0	0	0	88	94	0	182	674
08:45 AM	36	27	91	53	207	98	165	0	0	263	0	0	0	0	0	0	104	92	0	196	666
Total	114	115	346	184	759	469	780	0	0	1249	0	0	0	0	0	0	399	365	0	764	2772
Grand Total	196	247	662	348	1453	1000	1643	0	0	2643	0	0	0	0	0	0	786	741	0	1527	5623
Apprch %	13.5	17	45.6	24		37.8	62.2	0	0		0	0	0	0		0	51.5	48.5	0		
Total %	3.5	4.4	11.8	6.2	25.8	17.8	29.2	0	0	47	0	0	0	0	0	0	14	13.2	0	27.2	
Passenger Vehicles																					
% Passenger Vehicles	91.3	77.3	93.8	96.6	91.3	95.5	92.7	0	0	93.8	0	0	0	0	0	0	93.3	89.1	0	91.2	92.4
Large 2 Axle Vehicles	6	12	22	8	48	19	34	0	0	53	0	0	0	0	0	0	33	24	0	57	158
% Large 2 Axle Vehicles	3.1	4.9	3.3	2.3	3.3	1.9	2.1	0	0	2	0	0	0	0	0	0	4.2	3.2	0	3.7	2.8
3 Axle Vehicles	5	8	11	3	27	7	54	0	0	61	0	0	0	0	0	0	13	26	0	39	127
% 3 Axle Vehicles	2.6	3.2	1.7	0.9	1.9	0.7	3.3	0	0	2.3	0	0	0	0	0	0	1.7	3.5	0	2.6	2.3
4+ Axle Trucks	6	36	8	1	51	19	32	0	0	51	0	0	0	0	0	0	7	31	0	38	140
% 4+ Axle Trucks	3.1	14.6	1.2	0.3	3.5	1.9	1.9	0	0	1.9	0	0	0	0	0	0	0.9	4.2	0	2.5	2.5

	I-605 SB Off Ramp / Rivergrade Rd Southbound					Lower Azusa Road Westbound					I-605 Southbound On Ramp Northbound					Lower Azusa Road Eastbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	17	30	80	51	178	140	223	0	0	363	0	0	0	0	0	0	88	88	0	176	717
07:30 AM	31	32	89	28	180	125	214	0	0	339	0	0	0	0	0	0	98	95	0	193	712
07:45 AM	17	38	81	42	178	119	212	0	0	331	0	0	0	0	0	0	124	94	0	218	727
08:00 AM	26	35	83	39	183	125	198	0	0	323	0	0	0	0	0	0	109	102	0	211	717
Total Volume	91	135	333	160	719	509	847	0	0	1356	0	0	0	0	0	0	419	379	0	798	2873
% App. Total	12.7	18.8	46.3	22.3		37.5	62.5	0	0		0	0	0	0		0	52.5	47.5	0		
PHF	.734	.888	.935	.784	.982	.909	.950	.000	.000	.934	.000	.000	.000	.000	.000	.000	.845	.929	.000	.915	.988

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City of Irwindale
N/S: I-605 SB Ramps / Rivergrade Rd
E/W: Lower Azusa Road
Weather: Clear

File Name : IRW605SLAAM
Site Code : 05114482
Start Date : 11/18/2014
Page No : 2



- ***Excerpts from Devil's Gate Reservoir Sediment Removal and Management Project Traffic Impact Analysis***

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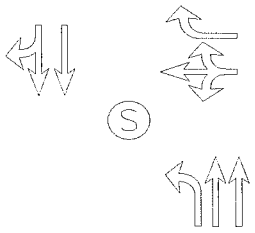
SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	1 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS



EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	5	5%		5	5	10
WB THRU	5	5%		5	5	10
WB RIGHT	570	5%	**55**	625	55	680
WINDSOR AVE						
NB LEFT	40	5%		40	5	45
NB THRU	555	5%		555	50	605
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	585	5%	**55**	640	60	700
SB RIGHT	530	5%		530	50	580
TOTALS	**2290**		**110**	**2400**	**230**	**2630**

Tustin Office: 714.665.4500 Tel/ 714.665.4501 Fax
Santa Clarita Office: 661.284.7400 Tel/ 661.284.7401 Fax
Victorville Office: 760.524.9100 Tel/ 760.524.9101 Fax
Temecula Office: 951.294.9300 Tel/ 951.294.9301 Fax

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	2 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	5	5%		5	5	10
WB THRU	5	5%		5	5	10
WB RIGHT	570	5%		570	50	620
WINDSOR AVE						
NB LEFT	40	5%		40	5	45
NB THRU	555	5%		555	50	605
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	585	5%	**55**	640	60	700
SB RIGHT	530	5%		530	50	580
TOTALS	**2290**		**55**	**2345**	**225**	**2570**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	3 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	5	5%		5	5	10
WB THRU	5	5%		5	5	10
WB RIGHT	570	5%	**55**	625	55	680
WINDSOR AVE						
NB LEFT	40	5%		40	5	45
NB THRU	555	5%		555	50	605
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	585	5%		585	55	640
SB RIGHT	530	5%		530	50	580
TOTALS	**2290**		**55**	**2345**	**225**	**2570**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	4 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	5	5%		5	5	10
WB THRU	5	5%		5	5	10
WB RIGHT	570	5%		570	50	620
WINDSOR AVE						
NB LEFT	40	5%		40	5	45
NB THRU	555	5%	**55**	610	55	665
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	585	5%		585	55	640
SB RIGHT	530	5%	**55**	585	55	640
TOTALS	**2290**		**110**	**2400**	**230**	**2630**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	5 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	5	5%		5	5	10
WB THRU	5	5%		5	5	10
WB RIGHT	570	5%		570	50	620
WINDSOR AVE						
NB LEFT	40	5%		40	5	45
NB THRU	555	5%		555	50	605
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	585	5%		585	55	640
SB RIGHT	530	5%	**55**	585	55	640
TOTALS	**2290**		**55**	**2345**	**225**	**2570**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	6 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	5	5%		5	5	10
WB THRU	5	5%		5	5	10
WB RIGHT	570	5%		570	50	620
WINDSOR AVE						
NB LEFT	40	5%		40	5	45
NB THRU	555	5%	**55**	610	55	665
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	585	5%		585	55	640
SB RIGHT	530	5%		530	50	580
TOTALS	**2290**		**55**	**2345**	**225**	**2570**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	7 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	275	5%	**55**	330	30	360
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	420	5%		420	40	460
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	370	5%	**55**	425	40	465
SB RIGHT	280	5%		280	25	305
TOTALS	**1415**		**110**	**1525**	**150**	**1675**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	8 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	275	5%		275	25	300
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	420	5%		420	40	460
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	370	5%	**55**	425	40	465
SB RIGHT	280	5%		280	25	305
TOTALS	**1415**		**55**	**1470**	**145**	**1615**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	9 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	275	5%	**55**	330	30	360
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	420	5%		420	40	460
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	370	5%		370	35	405
SB RIGHT	280	5%		280	25	305
TOTALS	**1415**		**55**	**1470**	**145**	**1615**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	10 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	275	5%		275	25	300
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	420	5%	**55**	475	45	520
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	370	5%		370	35	405
SB RIGHT	280	5%	**55**	335	30	365
TOTALS	**1415**		**110**	**1525**	**150**	**1675**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	11 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	275	5%		275	25	300
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	420	5%		420	40	460
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	370	5%		370	35	405
SB RIGHT	280	5%	**55**	335	30	365
TOTALS	**1415**		**55**	**1470**	**145**	**1615**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	12 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	275	5%		275	25	300
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	420	5%	**55**	475	45	520
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	370	5%		370	35	405
SB RIGHT	280	5%		280	25	305
TOTALS	**1415**		**55**	**1470**	**145**	**1615**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	13 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	335	5%	**55**	390	35	425
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	500	5%		500	45	545
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	435	5%	**55**	490	45	535
SB RIGHT	275	5%		275	25	300
TOTALS	**1615**		**110**	**1725**	**165**	**1890**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	14 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	335	5%		335	30	365
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	500	5%		500	45	545
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	435	5%	**55**	490	45	535
SB RIGHT	275	5%		275	25	300
TOTALS	**1615**		**55**	**1670**	**160**	**1830**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	15 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	335	5%	**55**	390	35	425
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	500	5%		500	45	545
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	435	5%		435	40	475
SB RIGHT	275	5%		275	25	300
TOTALS	**1615**		**55**	**1670**	**160**	**1830**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	16 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	335	5%		335	30	365
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	500	5%	**55**	555	50	605
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	435	5%		435	40	475
SB RIGHT	275	5%	**55**	330	30	360
TOTALS	**1615**		**110**	**1725**	**165**	**1890**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	17 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	335	5%		335	30	365
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	500	5%		500	45	545
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	435	5%		435	40	475
SB RIGHT	275	5%	55	330	30	360
TOTALS	**1615**		**55**	**1670**	**160**	**1830**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	18 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	20	5%		20	5	25
WB THRU	5	5%		5	5	10
WB RIGHT	335	5%		335	30	365
WINDSOR AVE						
NB LEFT	45	5%		45	5	50
NB THRU	500	5%	**55**	555	50	605
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	435	5%		435	40	475
SB RIGHT	275	5%		275	25	300
TOTALS	**1615**		**55**	**1670**	**160**	**1830**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	19 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	25	5%		25	5	30
WB THRU	5	5%		5	5	10
WB RIGHT	405	5%	**55**	460	40	500
WINDSOR AVE						
NB LEFT	100	5%		100	10	110
NB THRU	690	5%		690	60	750
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	550	5%	**55**	605	55	660
SB RIGHT	445	5%		445	40	485
TOTALS	**2220**		**110**	**2330**	**215**	**2545**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	20 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	25	5%		25	5	30
WB THRU	5	5%		5	5	10
WB RIGHT	405	5%		405	35	440
WINDSOR AVE						
NB LEFT	100	5%		100	10	110
NB THRU	690	5%		690	60	750
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	550	5%	**55**	605	55	660
SB RIGHT	445	5%		445	40	485
TOTALS	**2220**		**55**	**2275**	**210**	**2485**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	21 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	25	5%		25	5	30
WB THRU	5	5%		5	5	10
WB RIGHT	405	5%	**55**	460	40	500
WINDSOR AVE						
NB LEFT	100	5%		100	10	110
NB THRU	690	5%		690	60	750
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	550	5%		550	50	600
SB RIGHT	445	5%		445	40	485
TOTALS	**2220**		**55**	**2275**	**210**	**2485**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	22 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	25	5%		25	5	30
WB THRU	5	5%		5	5	10
WB RIGHT	405	5%		405	35	440
WINDSOR AVE						
NB LEFT	100	5%		100	10	110
NB THRU	690	5%	**55**	745	65	810
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	550	5%		550	50	600
SB RIGHT	445	5%	**55**	500	45	545
TOTALS	**2220**		**110**	**2330**	**215**	**2545**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	23 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	25	5%		25	5	30
WB THRU	5	5%		5	5	10
WB RIGHT	405	5%		405	35	440
WINDSOR AVE						
NB LEFT	100	5%		100	10	110
NB THRU	690	5%		690	60	750
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	550	5%		550	50	600
SB RIGHT	445	5%	55	500	45	545
TOTALS	**2220**		**55**	**2275**	**210**	**2485**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	10-Sep-13	VV.110264.0000	24 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY WB RAMPS						
EB LEFT	0	0%		0	0	0
EB THRU	0	0%		0	0	0
EB RIGHT	0	0%		0	0	0
WB LEFT	25	5%		25	5	30
WB THRU	5	5%		5	5	10
WB RIGHT	405	5%		405	35	440
WINDSOR AVE						
NB LEFT	100	5%		100	10	110
NB THRU	690	5%	**55**	745	65	810
NB RIGHT	0	0%		0	0	0
SB LEFT	0	0%		0	0	0
SB THRU	550	5%		550	50	600
SB RIGHT	445	5%		445	40	485
TOTALS	**2220**		**55**	**2275**	**210**	**2485**

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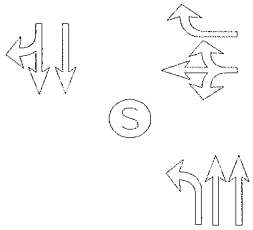
SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	1 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS



EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	7	0	0	5	**0**	5	5	10
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	569	3	9	580	**140**	720	65	785
WINDSOR AVE								
NB LEFT	41	0	0	40	**0**	40	5	45
NB THRU	541	13	39	580	**0**	580	50	630
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	579	5	15	595	**165**	760	70	830
SB RIGHT	528	2	6	535	**0**	535	50	585
TOTALS	**2265**				**305**	**2645**	**250**	**2895**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	2 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	7	0	0	5	**0**	5	5	10
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	569	3	9	580	**0**	580	50	630
WINDSOR AVE								
NB LEFT	41	0	0	40	**0**	40	5	45
NB THRU	541	13	39	580	**0**	580	50	630
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	579	5	15	595	**165**	760	70	830
SB RIGHT	528	2	6	535	**0**	535	50	585
TOTALS	**2265**				**165**	**2505**	**235**	**2740**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	3 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	7	0	0	5	**0**	5	5	10
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	569	3	9	580	**140**	720	65	785
WINDSOR AVE								
NB LEFT	41	0	0	40	**0**	40	5	45
NB THRU	541	13	39	580	**0**	580	50	630
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	579	5	15	595	**0**	595	55	650
SB RIGHT	528	2	6	535	**0**	535	50	585
TOTALS	**2265**				**140**	**2480**	**235**	**2715**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	4 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	7	0	0	5	**0**	5	5	10
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	569	3	9	580	**0**	580	50	630
WINDSOR AVE								
NB LEFT	41	0	0	40	**0**	40	5	45
NB THRU	541	13	39	580	**140**	720	65	785
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	579	5	15	595	**0**	595	55	650
SB RIGHT	528	2	6	535	**165**	700	65	765
TOTALS	**2265**				**305**	**2645**	**250**	**2895**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	5 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	7	0	0	5	**0**	5	5	10
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	569	3	9	580	**0**	580	50	630
WINDSOR AVE								
NB LEFT	41	0	0	40	**0**	40	5	45
NB THRU	541	13	39	580	**0**	580	50	630
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	579	5	15	595	**0**	595	55	650
SB RIGHT	528	2	6	535	**165**	700	65	765
TOTALS	**2265**				**165**	**2505**	**235**	**2740**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	6 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	7	0	0	5	**0**	5	5	10
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	569	3	9	580	**0**	580	50	630
WINDSOR AVE								
NB LEFT	41	0	0	40	**0**	40	5	45
NB THRU	541	13	39	580	**140**	720	65	785
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	579	5	15	595	**0**	595	55	650
SB RIGHT	528	2	6	535	**0**	535	50	585
TOTALS	**2265**				**140**	**2480**	**235**	**2715**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	7 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	271	3	9	280	**140**	420	40	460
WINDSOR AVE								
NB LEFT	43	1	3	45	**0**	45	5	50
NB THRU	417	2	6	425	**0**	425	40	465
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	366	4	12	380	**165**	545	50	595
SB RIGHT	268	11	33	300	**0**	300	25	325
TOTALS	**1385**				**305**	**1760**	**170**	**1930**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	8 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	271	3	9	280	**0**	280	25	305
WINDSOR AVE								
NB LEFT	43	1	3	45	**0**	45	5	50
NB THRU	417	2	6	425	**0**	425	40	465
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	366	4	12	380	**165**	545	50	595
SB RIGHT	268	11	33	300	**0**	300	25	325
TOTALS	**1385**				**165**	**1620**	**155**	**1775**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	9 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	271	3	9	280	**140**	420	40	460
WINDSOR AVE								
NB LEFT	43	1	3	45	**0**	45	5	50
NB THRU	417	2	6	425	**0**	425	40	465
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	366	4	12	380	**0**	380	35	415
SB RIGHT	268	11	33	300	**0**	300	25	325
TOTALS	**1385**				**140**	**1595**	**155**	**1750**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	10 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	271	3	9	280	**0**	280	25	305
WINDSOR AVE								
NB LEFT	43	1	3	45	**0**	45	5	50
NB THRU	417	2	6	425	**140**	565	50	615
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	366	4	12	380	**0**	380	35	415
SB RIGHT	268	11	33	300	**165**	465	40	505
TOTALS	**1385**				**305**	**1760**	**165**	**1925**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	11 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	271	3	9	280	**0**	280	25	305
WINDSOR AVE								
NB LEFT	43	1	3	45	**0**	45	5	50
NB THRU	417	2	6	425	**0**	425	40	465
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	366	4	12	380	**0**	380	35	415
SB RIGHT	268	11	33	300	**165**	465	40	505
TOTALS	**1385**				**165**	**1620**	**155**	**1775**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	12 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	0	0	0	5	**0**	5	5	10
WB RIGHT	271	3	9	280	**0**	280	25	305
WINDSOR AVE								
NB LEFT	43	1	3	45	**0**	45	5	50
NB THRU	417	2	6	425	**140**	565	50	615
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	366	4	12	380	**0**	380	35	415
SB RIGHT	268	11	33	300	**0**	300	25	325
TOTALS	**1385**				**140**	**1595**	**150**	**1745**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	13 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	5	0	0	5	**0**	5	5	10
WB RIGHT	335	17	50	385	**140**	525	45	570
WINDSOR AVE								
NB LEFT	45	2	7	50	**0**	50	5	55
NB THRU	500	25	75	575	**0**	575	50	625
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	435	22	65	500	**165**	665	60	725
SB RIGHT	275	14	41	315	**0**	315	30	345
TOTALS	**1615**				**305**	**2155**	**200**	**2355**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	14 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	5	0	0	5	**0**	5	5	10
WB RIGHT	335	17	50	385	**0**	385	35	420
WINDSOR AVE								
NB LEFT	45	2	7	50	**0**	50	5	55
NB THRU	500	25	75	575	**0**	575	50	625
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	435	22	65	500	**165**	665	60	725
SB RIGHT	275	14	41	315	**0**	315	30	345
TOTALS	**1615**				**165**	**2015**	**190**	**2205**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	15 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	5	0	0	5	**0**	5	5	10
WB RIGHT	335	17	50	385	**140**	525	45	570
WINDSOR AVE								
NB LEFT	45	2	7	50	**0**	50	5	55
NB THRU	500	25	75	575	**0**	575	50	625
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	435	22	65	500	**0**	500	45	545
SB RIGHT	275	14	41	315	**0**	315	30	345
TOTALS	**1615**				**140**	**1990**	**185**	**2175**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	16 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	5	0	0	5	**0**	5	5	10
WB RIGHT	335	17	50	385	**0**	385	35	420
WINDSOR AVE								
NB LEFT	45	2	7	50	**0**	50	5	55
NB THRU	500	25	75	575	**140**	715	65	780
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	435	22	65	500	**0**	500	45	545
SB RIGHT	275	14	41	315	**165**	480	45	525
TOTALS	**1615**				**305**	**2155**	**205**	**2360**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	17 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	5	0	0	5	**0**	5	5	10
WB RIGHT	335	17	50	385	**0**	385	35	420
WINDSOR AVE								
NB LEFT	45	2	7	50	**0**	50	5	55
NB THRU	500	25	75	575	**0**	575	50	625
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	435	22	65	500	**0**	500	45	545
SB RIGHT	275	14	41	315	**165**	480	45	525
TOTALS	**1615**				**165**	**2015**	**190**	**2205**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	18 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	20	0	0	20	**0**	20	5	25
WB THRU	5	0	0	5	**0**	5	5	10
WB RIGHT	335	17	50	385	**0**	385	35	420
WINDSOR AVE								
NB LEFT	45	2	7	50	**0**	50	5	55
NB THRU	500	25	75	575	**140**	715	65	780
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	435	22	65	500	**0**	500	45	545
SB RIGHT	275	14	41	315	**0**	315	30	345
TOTALS	**1615**				**140**	**1990**	**190**	**2180**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	19 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1B

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	26	0	0	25	**0**	25	5	30
WB THRU	3	0	0	5	**0**	5	5	10
WB RIGHT	405	2	6	410	**140**	550	50	600
WINDSOR AVE								
NB LEFT	98	0	0	100	**0**	100	10	110
NB THRU	689	1	3	690	**0**	690	60	750
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	550	0	0	550	**165**	715	65	780
SB RIGHT	442	4	12	455	**0**	455	40	495
TOTALS	**2213**				**305**	**2540**	**235**	**2775**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	20 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	26	0	0	25	**0**	25	5	30
WB THRU	3	0	0	5	**0**	5	5	10
WB RIGHT	405	2	6	410	**0**	410	35	445
WINDSOR AVE								
NB LEFT	98	0	0	100	**0**	100	10	110
NB THRU	689	1	3	690	**0**	690	60	750
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	550	0	0	550	**165**	715	65	780
SB RIGHT	442	4	12	455	**0**	455	40	495
TOTALS	**2213**				**165**	**2400**	**220**	**2620**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	21 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1D

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	26	0	0	25	**0**	25	5	30
WB THRU	3	0	0	5	**0**	5	5	10
WB RIGHT	405	2	6	410	**140**	550	50	600
WINDSOR AVE								
NB LEFT	98	0	0	100	**0**	100	10	110
NB THRU	689	1	3	690	**0**	690	60	750
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	550	0	0	550	**0**	550	50	600
SB RIGHT	442	4	12	455	**0**	455	40	495
TOTALS	**2213**				**140**	**2375**	**220**	**2595**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	22 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1F

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	26	0	0	25	**0**	25	5	30
WB THRU	3	0	0	5	**0**	5	5	10
WB RIGHT	405	2	6	410	**0**	410	35	445
WINDSOR AVE								
NB LEFT	98	0	0	100	**0**	100	10	110
NB THRU	689	1	3	690	**140**	830	75	905
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	550	0	0	550	**0**	550	50	600
SB RIGHT	442	4	12	455	**165**	620	55	675
TOTALS	**2213**				**305**	**2540**	**235**	**2775**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	23 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1G

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	26	0	0	25	**0**	25	5	30
WB THRU	3	0	0	5	**0**	5	5	10
WB RIGHT	405	2	6	410	**0**	410	35	445
WINDSOR AVE								
NB LEFT	98	0	0	100	**0**	100	10	110
NB THRU	689	1	3	690	**0**	690	60	750
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	550	0	0	550	**0**	550	50	600
SB RIGHT	442	4	12	455	**165**	620	55	675
TOTALS	**2213**				**165**	**2400**	**220**	**2620**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	24 OF 24

E/W STREET : I-210 FWY WB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 6
ROUTE 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY WB RAMPS								
EB LEFT	0	0	0	0	**0**	0	0	0
EB THRU	0	0	0	0	**0**	0	0	0
EB RIGHT	0	0	0	0	**0**	0	0	0
WB LEFT	26	0	0	25	**0**	25	5	30
WB THRU	3	0	0	5	**0**	5	5	10
WB RIGHT	405	2	6	410	**0**	410	35	445
WINDSOR AVE								
NB LEFT	98	0	0	100	**0**	100	10	110
NB THRU	689	1	3	690	**140**	830	75	905
NB RIGHT	0	0	0	0	**0**	0	0	0
SB LEFT	0	0	0	0	**0**	0	0	0
SB THRU	550	0	0	550	**0**	550	50	600
SB RIGHT	442	4	12	455	**0**	455	40	495
TOTALS	**2213**				**140**	**2375**	**220**	**2595**

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INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR
EAST-WEST STREET: I-210 WB RAMPS
JURISDICTION: PASADENA

DATE: 06-01-11

PEAK HOUR: 07:30AM

Windsor Ave (WB)

NORTH LEG

TOTAL: 1,114

Rt	Thru	Lt	
530	584 (585)		Total
135	159		1st
130	155		2nd
128	130		3rd
137	140		4th

TT = 7
TT% = 7/1114 = 0.63% ≈ 1%

TT = 3
TT% = 3/579 = 0.52% ≈ 1%

WB 210 Fwy

EAST LEG TOTAL: 579

	1st	2nd	3rd	4th	Total
Rt	136	140	141	155	572 (570)
Thru	0	0	0	0	5
Lt	0	1	2	4	5 7

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

WEST LEG TOTAL: 0

PEAK HOUR FACTORS

NORTH LEG = 0.95
SOUTH LEG = 0.76
EAST LEG = 0.91
WEST LEG =

ALL LEGS = 0.95

	Lt	Thru	Rt
1st	9	109	
2nd	11	102	
3rd	13	182	
4th	8	161	
Total	40 41	555 554	

TT = 13
TT% = 13/595 = 2.18% ≈ 2%

TOTAL: 595

SOUTH LEG
Windsor Ave (EB)

HOUR TOTAL: 2,288

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 WB RAMPS

TIME: 07:00AM-08:00AM DATE: 06-01-11

NORTH LEG

Rt	Thru	Lt	
479	599		Total
96	138		1st
118	147		2nd
135	159		3rd
130	155		4th

	1st	2nd	3rd	4th	Total
Rt	91	102	136	140	469
Thru	0	0	0	0	0
Lt	2	1	0	1	4

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	9	72	
2nd	14	85	
3rd	9	109	
4th	11	102	
Total	43	368	

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 WB RAMPS

TIME: 08:00AM-09:00AM DATE: 06-01-11

NORTH LEG

Rt	Thru	Lt	
475	538		Total
128	130		1st
137	140		2nd
86	129		3rd
124	139		4th

	1st	2nd	3rd	4th	Total
Rt	141	155	143	105	544
Thru	0	0	2	0	2
Lt	2	4	3	3	12

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	13	182	
2nd	8	161	
3rd	10	133	
4th	19	159	
Total	50	635	

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : WINDSOR — PASADENA

EAST-WEST STREET : I-210 WB RAMPS — 06-01-11

BEGINNING TIME : 07:00AM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
						WB NORTH LEG						
96	137	0	0	0	0	0	1	0	0	0	0	234
118	147	0	0	0	0	0	0	0	0	0	0	265
135	158	0	0	1	0	0	0	0	0	0	0	294
129	152	0	0	1	0	0	2	0	1	0	0	285
127	129	0	0	1	0	0	0	0	1	0	0	258
137	140	0	0	0	0	0	0	0	0	0	0	277
85	129	0	0	0 3	0	0	0 2	0	1	0 2	0	215
122	139	0	0	0	0	0	0	0	2	0	0	263
						TT=3+2+2=7						
949	1131	0	0	3	0	0	3	0	5	0	0	2091
						EB SOUTH LEG						
0	70	9	0	2	0	0	0	0	0	0	0	81
0	82	14	0	3	0	0	0	0	0	0	0	99
0	107	9	0	2	0	0	0	0	0	0	0	118
0	97	11	0	4	0	0	1	0	0	0	0	113
0	178	13	0	4	0	0	0	0	0	0	0	195
0	159	8	0	2	0	0	0	0	0	0	0	169
0	130	10	0	2 12	0	0	1 1	0	0	0 0	0	143
0	159	19	0	0	0	0	0	0	0	0	0	178
						TT=12+1+0=13						
0	982	93	0	19	0	0	2	0	0	0	0	1096
						NB EAST LEG						
91	0	2	0	0	0	0	0	0	0	0	0	93
101	0	1	1	0	0	0	0	0	0	0	0	103
136	0	0	0	0	0	0	0	0	0	0	0	136
139	0	1	1	0	0	0	0	0	0	0	0	141
140	0	2	1	0	0	0	0	0	0	0	0	143
154	0	4	1	0	0	0	0	0	0	0	0	159
143	2	3	0	0 3	0	0	0 0	0	0	0 0	0	148
105	0	3	0	0	0	0	0	0	0	0	0	108
						TT=3+0+0=3						
1009	2	16	4	0	0	0	0	0	0	0	0	1031
						WEST LEG						
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0

Prepared by Newport Traffic Studies

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR
EAST-WEST STREET: I-210 WB RAMPS
JURISDICTION: PASADENA

DATE: 06-01-11

PEAK HOUR: 12:30PM

Windsor Ave (WB)

NORTH LEG

TOTAL: 649

Rt	Thru	Lt	
279 (280)	370		Total
64	94		1st
70	88		2nd
70	89		3rd
75	99		4th

TT = 15

$TT\% = \frac{15}{649} = 2.31\% \approx 2\%$

TT = 3

$TT\% = \frac{3}{294} = 1.02\% \approx 1\%$

WB 210 FWY

EAST LEG TOTAL: 294

	1st	2nd	3rd	4th	Total
Rt	68	79	72	55	274 (295)
Thru	0	0	0	0	5
Lt	8	3	3	6	20

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

WEST LEG TOTAL: 0

PEAK HOUR FACTORS

NORTH LEG = 0.93
SOUTH LEG = 0.89
EAST LEG = 0.90
WEST LEG =

ALL LEGS = 0.97

	Lt	Thru	Rt
1st	14	116	
2nd	9	104	
3rd	9	105	
4th	12	94	
Total	44 (45)	419 (420)	

TT = 3

$TT\% = \frac{3}{463} = 0.65\% \approx 1\%$

TOTAL: 463

SOUTH LEG
Windsor Ave (EB)

HOUR TOTAL: 1,406

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 WB RAMPS

TIME: 12:00PM-01:00PM DATE: 06-01-11

NORTH LEG

Rt	Thru	Lt	
249	336		Total
50	77		1st
65	77		2nd
64	94		3rd
70	88		4th

	1st	2nd	3rd	4th	Total
Rt	51	64	68	79	262
Thru	0	0	0	0	0
Lt	15	5	8	3	31

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	8	91	
2nd	11	80	
3rd	14	116	
4th	9	104	
Total	42	391	

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 WB RAMPS

TIME: 01:00PM-02:00PM DATE: 06-01-11

NORTH LEG

Rt	Thru	Lt	
271	357		Total
70	89		1st
75	99		2nd
49	77		3rd
77	92		4th

	1st	2nd	3rd	4th	Total
Rt	72	55	58	65	250
Thru	0	0	0	0	0
Lt	3	6	3	4	16

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	9	105	
2nd	12	94	
3rd	8	105	
4th	7	90	
Total	36	394	

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : WINDSOR — PASADENA

EAST-WEST STREET : I-210 WB RAMPS — 06-01-11

BEGINNING TIME : 12:00PM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
						WB NORTH LEG						
50	75	0	0	1	0	0	1	0	0	0	0	127
65	77	0	0	0	0	0	0	0	0	0	0	142
64	94	0	0	0	0	0	0	0	0	0	0	158
67	86	0	1	1	0	1	1	0	1	0	0	158
62	89	0	4	0	0	4	0	0	0	0	0	159
75	97	0	0	1	0	0	1	0	0	0	0	174
47	75	0	1	1	0	1	1	0	0	0	0	126
77	89	0	0	1	0	0	1	0	0	1	0	169
						TT=9+7+1=15						
507	682	0	6	5	0	6	5	0	1	1	0	1213
						EB SOUTH LEG						
0	91	8	0	0	0	0	0	0	0	0	0	99
0	80	11	0	0	0	0	0	0	0	0	0	91
0	115	13	0	0	0	0	1	1	0	0	0	130
0	103	9	0	1	0	0	0	0	0	0	0	113
0	105	9	0	0	0	0	0	0	0	0	0	114
0	94	12	0	0	0	0	0	0	0	0	0	106
0	104	8	0	0	0	0	1	2	0	0	0	113
0	87	7	0	1	0	0	2	0	0	0	0	97
						TT=1+2+0=3						
0	779	77	0	2	0	0	4	1	0	0	0	863
						NB EAST LEG						
50	0	15	1	0	0	0	0	0	0	0	0	66
64	0	5	0	0	0	0	0	0	0	0	0	69
67	0	8	0	0	0	1	0	0	0	0	0	76
79	0	3	0	0	0	0	0	0	0	0	0	82
71	0	3	1	0	0	0	0	0	0	0	0	75
54	0	6	0	0	0	0	0	0	1	0	0	61
58	0	3	0	0	0	0	0	1	0	0	1	61
64	0	4	1	0	0	0	0	0	0	0	0	69
						TT=1+1+1=3						
507	0	47	3	0	0	1	0	0	1	0	0	559
						WEST LEG						
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0

Prepared by Newport Traffic Studies

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR/ ARROYO
EAST-WEST STREET: I-210 WB RAMPS
JURISDICTION: LA CANADA

DATE: 04-12-12

PEAK HOUR: 03:00PM

NORTH LEG (SB)

TOTAL: 709

Rt	Thru	Lt	
274	435		Total
72	107		1st
65	101		2nd
76	115		3rd
61	112		4th

(WB)

EAST LEG TOTAL: 355

	1st	2nd	3rd	4th	Total
Rt	72	85	92	86	335
Thru					
Lt	8	3	7	2	20

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

WEST LEG TOTAL: 0

PEAK HOUR FACTORS

NORTH LEG = 0.93
SOUTH LEG = 0.96
EAST LEG = 0.90
WEST LEG =

ALL LEGS = 0.93

	Lt	Thru	Rt
1st	15	127	
2nd	11	115	
3rd	10	132	
4th	10	124	
Total	46	498	

TOTAL: 544

SOUTH LEG (NB)

HOUR TOTAL: 1,608

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR/ ARROYO

EAST-WEST STREET: I-210 WB RAMPS

TIME: 02:00PM-03:00PM DATE: 04-12-12

NORTH LEG

Rt	Thru	Lt	
259	468		Total
48	119		1st
62	108		2nd
86	119		3rd
63	122		4th

	1st	2nd	3rd	4th	Total
Rt	69	72	73	81	295
Thru					
Lt	1	4	3	4	12

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	5	96	
2nd	18	90	
3rd	13	126	
4th	5	87	
Total	41	399	

Prepared by NEWPORT TRAFFIC STUDIES

(6)

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR/ ARROYO

EAST-WEST STREET: I-210 WB RAMPS

TIME: 03:00PM-04:00PM DATE: 04-12-12

NORTH LEG

274	435		Total
72	107		1st
65	101		2nd
76	115		3rd
61	112		4th
Rt	Thru	Lt	

Rt	72	85	92	86	335
Thru					
Lt	8	3	7	2	20
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	15	127	
2nd	11	115	
3rd	10	132	
4th	10	124	
Total	46	498	

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR
EAST-WEST STREET: I-210 WB RAMPS
JURISDICTION: PASADENA

DATE: 06-01-11

PEAK HOUR: 05:00PM

Windsor Ave (WB)

NORTH LEG

TOTAL: 996

Rt	Thru	Lt	
446 (445)	550		Total
116	131		1st
114	120		2nd
119	140		3rd
97	159		4th

TT = 4

TT% = 4/996 = 0.40% ≈ 1%

TT = 2

TT% = 2/436 = 0.46% ≈ 1%

WB 210 Fwy

EAST LEG TOTAL: 436

	1st	2nd	3rd	4th	Total
Rt	103	102	100	102	407 (405)
Thru	0	0	3	0	3 (5)
Lt	5	4	9	8	25 26

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

WEST LEG TOTAL: 0

PEAK HOUR FACTORS

NORTH LEG = 0.96
SOUTH LEG = 0.87
EAST LEG = 0.97
WEST LEG =

ALL LEGS = 0.96

	Lt	Thru	Rt
1st	22	204	
2nd	21	152	
3rd	28	170	
4th	27	164	
Total	100 98	690	

TT = 1

TT% = 1/788 = 0.13% ≈ 1%

TOTAL: 788

SOUTH LEG

Windsor Ave (EB)

HOUR TOTAL: 2,220

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 WB RAMPS

TIME: 04:00PM-05:00PM DATE: 06-01-11

NORTH LEG

Rt	Thru	Lt	
361	467		Total
85	123		1st
75	100		2nd
93	120		3rd
108	124		4th

	1st	2nd	3rd	4th	Total
Rt	76	77	96	81	330
Thru	0	0	0	1	1
Lt	3	7	3	9	22

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	15	126	
2nd	12	129	
3rd	17	137	
4th	19	161	
Total	63	553	

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 WB RAMPS

TIME: 05:00PM-06:00PM DATE: 06-01-11

NORTH LEG

Rt	Thru	Lt	
446	550		Total
116	131		1st
114	120		2nd
119	140		3rd
97	159		4th

	1st	2nd	3rd	4th	Total
Rt	103	102	100	102	407
Thru	0	0	3	0	3
Lt	5	4	9	8	26

Total	1st	2nd	3rd	4th	
					Lt
					Thru
					Rt

	Lt	Thru	Rt
1st	22	204	
2nd	21	152	
3rd	28	170	
4th	27	164	
Total	98	690	

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : WINDSOR PASADENA

EAST-WEST STREET : I-210 WB RAMPS 06-01-11

BEGINNING TIME : 04:00PM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
					WB NORTH LEG							
85	123	0	0	0	0	0	0	0	0	0	0	208
74	100	0	0	0	0	0	0	0	1	0	0	175
92	120	0	0	0	0	1	0	0	0	0	0	213
106	123	0	1	1	0	1	0	0	0	0	0	232
115	131	0	0	0	0	1	0	0	0	0	0	247
113	120	0	0	0	0	1	0	0	0	0	0	234
118	140	0	0	0	0	0	0	0	1	0	0	259
96	159	0	0	0	0	0	0	0	1	0	0	256
						TT=0+2+2=4						
799	1016	0	1	1	0	4	0	0	3	0	0	1824
					EB SOUTH LEG							
0	126	15	0	0	0	0	0	0	0	0	0	141
0	128	12	0	1	0	0	0	0	0	0	0	141
0	137	17	0	0	0	0	0	0	0	0	0	154
0	161	19	0	0	0	0	0	0	0	0	0	180
0	204	22	0	0	0	0	0	0	0	0	0	226
0	151	21	0	0	0	0	1	0	0	0	0	173
0	170	28	0	0	0	0	0	0	0	0	0	198
0	164	27	0	0	0	0	0	0	0	0	0	191
						TT=0+1+0=1						
0	1241	161	0	1	0	0	1	0	0	0	0	1404
					NB EAST LEG							
71	0	3	5	0	0	0	0	0	0	0	0	79
76	0	7	1	0	0	0	0	0	0	0	0	84
92	0	3	4	0	0	0	0	0	0	0	0	99
81	1	9	0	0	0	0	0	0	0	0	0	91
101	0	5	1	0	0	1	0	0	0	0	0	108
102	0	4	0	0	0	0	0	0	0	0	0	106
100	3	9	0	0	0	0	0	0	0	0	0	112
102	0	8	0	0	0	0	0	0	0	0	0	110
						TT=1+1+0=2						
725	4	48	11	0	0	1	0	0	0	0	0	789
					WEST LEG							
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0

Prepared by Newport Traffic Studies

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	570	40	555	0	0	585	530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1471	1461	1805	3438			3193	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1471	1461	452	3438			3193	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	600	42	584	0	0	616	558
RTOR Reduction (vph)	0	0	0	0	113	113	0	0	0	0	290	0
Lane Group Flow (vph)	0	0	0	0	191	193	42	584	0	0	884	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					10.2	10.2	16.8	16.8			16.8	
Effective Green, g (s)					10.2	10.2	16.8	16.8			16.8	
Actuated g/C Ratio					0.29	0.29	0.48	0.48			0.48	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					429	426	217	1650			1533	
v/s Ratio Prot								0.17			c0.28	
v/s Ratio Perm					0.13	c0.13	0.09					
v/c Ratio					0.44	0.45	0.19	0.35			0.58	
Uniform Delay, d1					10.1	10.1	5.2	5.7			6.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.7	0.8	2.0	0.6			1.6	
Delay (s)					10.8	10.9	7.2	6.3			8.1	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			10.9			6.4			8.1	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	35.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/10/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	275	45	420	0	0	370	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1506	1461	1719	3438			3216	
Flt Permitted					0.99	1.00	0.40	1.00			1.00	
Satd. Flow (perm)					1506	1461	718	3438			3216	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	284	46	433	0	0	381	289
RTOR Reduction (vph)	0	0	0	0	108	126	0	0	0	0	121	0
Lane Group Flow (vph)	0	0	0	0	49	27	46	433	0	0	549	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					5.9	5.9	19.4	19.4			19.4	
Effective Green, g (s)					5.9	5.9	19.4	19.4			19.4	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					267	259	418	2003			1874	
v/s Ratio Prot								0.13			c0.17	
v/s Ratio Perm					0.03	0.02	0.06					
v/c Ratio					0.18	0.10	0.11	0.22			0.29	
Uniform Delay, d1					11.7	11.5	3.1	3.3			3.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.5	0.2			0.4	
Delay (s)					12.0	11.7	3.6	3.6			3.9	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			3.6			3.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	335	45	500	0	0	435	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1498	1461	1719	3438			3238	
Flt Permitted					0.99	1.00	0.36	1.00			1.00	
Satd. Flow (perm)					1498	1461	650	3438			3238	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	360	48	538	0	0	468	296
RTOR Reduction (vph)	0	0	0	0	137	151	0	0	0	0	128	0
Lane Group Flow (vph)	0	0	0	0	59	40	48	538	0	0	636	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.4	6.4	18.9	18.9			18.9	
Effective Green, g (s)					6.4	6.4	18.9	18.9			18.9	
Actuated g/C Ratio					0.19	0.19	0.57	0.57			0.57	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					288	281	369	1951			1838	
v/s Ratio Prot								0.16			c0.20	
v/s Ratio Perm					0.04	0.03	0.07					
v/c Ratio					0.21	0.14	0.13	0.28			0.35	
Uniform Delay, d1					11.3	11.2	3.4	3.7			3.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.2	0.7	0.4			0.5	
Delay (s)					11.7	11.4	4.1	4.0			4.4	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.5			4.0			4.4	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

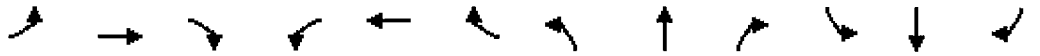
HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/10/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	405	100	690	0	0	550	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1497	1461	1805	3438			3294	
Flt Permitted					0.99	1.00	0.25	1.00			1.00	
Satd. Flow (perm)					1497	1461	476	3438			3294	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	422	104	719	0	0	573	464
RTOR Reduction (vph)	0	0	0	0	165	171	0	0	0	0	154	0
Lane Group Flow (vph)	0	0	0	0	64	53	104	719	0	0	883	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.2	8.2	32.5	32.5			32.5	
Effective Green, g (s)					8.2	8.2	32.5	32.5			32.5	
Actuated g/C Ratio					0.17	0.17	0.67	0.67			0.67	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					252	246	318	2294			2198	
v/s Ratio Prot								0.21			c0.27	
v/s Ratio Perm					0.04	0.04	0.22					
v/c Ratio					0.26	0.21	0.33	0.31			0.40	
Uniform Delay, d1					17.6	17.5	3.4	3.4			3.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.5	0.4	2.7	0.4			0.5	
Delay (s)					18.1	17.9	6.2	3.8			4.2	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.0			4.1			4.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	625	40	555	0	0	640	530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1369	1358	1805	3438			3092	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1369	1358	463	3438			3092	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	658	42	584	0	0	674	558
RTOR Reduction (vph)	0	0	0	0	109	109	0	0	0	0	302	0
Lane Group Flow (vph)	0	0	0	0	223	227	42	584	0	0	930	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	13%	0%	5%	0%	0%	12%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.3	11.3	16.4	16.4			16.4	
Effective Green, g (s)					11.3	11.3	16.4	16.4			16.4	
Actuated g/C Ratio					0.32	0.32	0.46	0.46			0.46	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					433	430	213	1579			1420	
v/s Ratio Prot								0.17			c0.30	
v/s Ratio Perm					0.16	c0.17	0.09					
v/c Ratio					0.51	0.53	0.20	0.37			0.66	
Uniform Delay, d1					10.0	10.0	5.7	6.3			7.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.0	1.2	2.1	0.7			2.4	
Delay (s)					11.0	11.2	7.8	7.0			9.8	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.1			7.0			9.8	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	35.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/11/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	330	45	420	0	0	425	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1499	1344	1719	3438			3041	
Flt Permitted					0.99	1.00	0.38	1.00			1.00	
Satd. Flow (perm)					1499	1344	679	3438			3041	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	340	46	433	0	0	438	289
RTOR Reduction (vph)	0	0	0	0	129	146	0	0	0	0	125	0
Lane Group Flow (vph)	0	0	0	0	57	34	46	433	0	0	602	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	16%	5%
Bus Blockages (#/hr)	0	0	0	0	0	20	0	0	0	0	0	0
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.4	6.4	19.0	19.0			19.0	
Effective Green, g (s)					6.4	6.4	19.0	19.0			19.0	
Actuated g/C Ratio					0.19	0.19	0.57	0.57			0.57	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					287	258	386	1956			1730	
v/s Ratio Prot								0.13			c0.20	
v/s Ratio Perm					0.04	0.03	0.07					
v/c Ratio					0.20	0.13	0.12	0.22			0.35	
Uniform Delay, d1					11.3	11.2	3.3	3.6			3.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.6	0.3			0.6	
Delay (s)					11.7	11.4	4.0	3.8			4.4	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.6			3.8			4.4	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	33.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	390	45	500	0	0	490	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.95	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1356	1311	1719	3438			3066	
Flt Permitted					1.00	1.00	0.32	1.00			1.00	
Satd. Flow (perm)					1356	1311	580	3438			3066	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	419	48	538	0	0	527	296
RTOR Reduction (vph)	0	0	0	0	143	143	0	0	0	0	137	0
Lane Group Flow (vph)	0	0	0	0	81	79	48	538	0	0	686	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	17%	5%	5%	0%	0%	15%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.3	8.3	18.8	18.8			18.8	
Effective Green, g (s)					8.3	8.3	18.8	18.8			18.8	
Actuated g/C Ratio					0.24	0.24	0.54	0.54			0.54	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					321	310	311	1841			1642	
v/s Ratio Prot								0.16			c0.22	
v/s Ratio Perm					0.06	c0.06	0.08					
v/c Ratio					0.25	0.26	0.15	0.29			0.42	
Uniform Delay, d1					10.9	10.9	4.1	4.5			4.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.4	1.1	0.4			0.8	
Delay (s)					11.3	11.3	5.2	4.9			5.7	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.3			4.9			5.7	
Approach LOS		A			B			A			A	

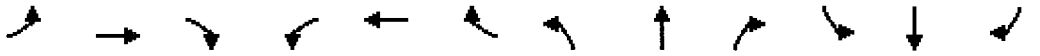
Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	35.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	460	100	690	0	0	605	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1493	1461	1805	3438			3310	
Flt Permitted					0.99	1.00	0.23	1.00			1.00	
Satd. Flow (perm)					1493	1461	433	3438			3310	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	479	104	719	0	0	630	464
RTOR Reduction (vph)	0	0	0	0	168	168	0	0	0	0	162	0
Lane Group Flow (vph)	0	0	0	0	88	86	104	719	0	0	932	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					9.1	9.1	31.9	31.9			31.9	
Effective Green, g (s)					9.1	9.1	31.9	31.9			31.9	
Actuated g/C Ratio					0.19	0.19	0.65	0.65			0.65	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					277	271	282	2238			2155	
v/s Ratio Prot								0.21			c0.28	
v/s Ratio Perm					0.06	0.06	0.24					
v/c Ratio					0.32	0.32	0.37	0.32			0.43	
Uniform Delay, d1					17.3	17.3	3.9	3.8			4.2	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.7	0.7	3.7	0.4			0.6	
Delay (s)					17.9	17.9	7.6	4.2			4.8	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			17.9			4.6			4.8	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	49.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	680	45	605	0	0	700	580
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1368	1358	1805	3438			3092	
Flt Permitted					1.00	1.00	0.25	1.00			1.00	
Satd. Flow (perm)					1368	1358	469	3438			3092	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	716	47	637	0	0	737	611
RTOR Reduction (vph)	0	0	0	0	89	89	0	0	0	0	337	0
Lane Group Flow (vph)	0	0	0	0	272	276	47	637	0	0	1011	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	13%	0%	5%	0%	0%	12%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.9	11.9	16.2	16.2			16.2	
Effective Green, g (s)					11.9	11.9	16.2	16.2			16.2	
Actuated g/C Ratio					0.33	0.33	0.45	0.45			0.45	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					451	448	210	1543			1388	
v/s Ratio Prot								0.19			c0.33	
v/s Ratio Perm					0.20	c0.20	0.10					
v/c Ratio					0.60	0.62	0.22	0.41			0.73	
Uniform Delay, d1					10.1	10.2	6.1	6.7			8.1	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					2.3	2.5	2.5	0.8			3.4	
Delay (s)					12.4	12.7	8.6	7.5			11.5	
Level of Service					B	B	A	A			B	
Approach Delay (s)		0.0			12.5			7.6			11.5	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	36.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	390	45	500	0	0	490	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.95	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1356	1311	1719	3438			3066	
Flt Permitted					1.00	1.00	0.32	1.00			1.00	
Satd. Flow (perm)					1356	1311	580	3438			3066	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	419	48	538	0	0	527	296
RTOR Reduction (vph)	0	0	0	0	143	143	0	0	0	0	137	0
Lane Group Flow (vph)	0	0	0	0	81	79	48	538	0	0	686	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	17%	5%	5%	0%	0%	15%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.3	8.3	18.8	18.8			18.8	
Effective Green, g (s)					8.3	8.3	18.8	18.8			18.8	
Actuated g/C Ratio					0.24	0.24	0.54	0.54			0.54	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					321	310	311	1841			1642	
v/s Ratio Prot								0.16			c0.22	
v/s Ratio Perm					0.06	c0.06	0.08					
v/c Ratio					0.25	0.26	0.15	0.29			0.42	
Uniform Delay, d1					10.9	10.9	4.1	4.5			4.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.4	1.1	0.4			0.8	
Delay (s)					11.3	11.3	5.2	4.9			5.7	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.3			4.9			5.7	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	35.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

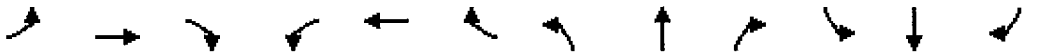
HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	405	100	690	0	0	550	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1497	1461	1805	3438			3294	
Flt Permitted					0.99	1.00	0.25	1.00			1.00	
Satd. Flow (perm)					1497	1461	476	3438			3294	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	422	104	719	0	0	573	464
RTOR Reduction (vph)	0	0	0	0	165	171	0	0	0	0	154	0
Lane Group Flow (vph)	0	0	0	0	64	53	104	719	0	0	883	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.2	8.2	32.5	32.5			32.5	
Effective Green, g (s)					8.2	8.2	32.5	32.5			32.5	
Actuated g/C Ratio					0.17	0.17	0.67	0.67			0.67	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					252	246	318	2294			2198	
v/s Ratio Prot								0.21			c0.27	
v/s Ratio Perm					0.04	0.04	0.22					
v/c Ratio					0.26	0.21	0.33	0.31			0.40	
Uniform Delay, d1					17.6	17.5	3.4	3.4			3.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.5	0.4	2.7	0.4			0.5	
Delay (s)					18.1	17.9	6.2	3.8			4.2	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.0			4.1			4.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	500	110	750	0	0	660	485
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1491	1461	1805	3438			3311	
Flt Permitted					1.00	1.00	0.19	1.00			1.00	
Satd. Flow (perm)					1491	1461	368	3438			3311	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	521	115	781	0	0	688	505
RTOR Reduction (vph)	0	0	0	0	141	141	0	0	0	0	184	0
Lane Group Flow (vph)	0	0	0	0	135	135	115	781	0	0	1009	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					10.1	10.1	31.5	31.5			31.5	
Effective Green, g (s)					10.1	10.1	31.5	31.5			31.5	
Actuated g/C Ratio					0.20	0.20	0.64	0.64			0.64	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					304	298	234	2183			2103	
v/s Ratio Prot								0.23			0.30	
v/s Ratio Perm					0.09	c0.09	c0.31					
v/c Ratio					0.44	0.45	0.49	0.36			0.48	
Uniform Delay, d1					17.3	17.3	4.8	4.3			4.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.0	1.1	7.2	0.5			0.8	
Delay (s)					18.3	18.4	12.0	4.7			5.5	
Level of Service					B	B	B	A			A	
Approach Delay (s)		0.0			18.4			5.7			5.5	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	49.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	570	40	555	0	0	640	530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1471	1461	1805	3438			3092	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1471	1461	452	3438			3092	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	600	42	584	0	0	674	558
RTOR Reduction (vph)	0	0	0	0	113	113	0	0	0	0	290	0
Lane Group Flow (vph)	0	0	0	0	191	193	42	584	0	0	942	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	12%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					10.2	10.2	16.8	16.8			16.8	
Effective Green, g (s)					10.2	10.2	16.8	16.8			16.8	
Actuated g/C Ratio					0.29	0.29	0.48	0.48			0.48	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					429	426	217	1650			1484	
v/s Ratio Prot								0.17			c0.30	
v/s Ratio Perm					0.13	c0.13	0.09					
v/c Ratio					0.44	0.45	0.19	0.35			0.63	
Uniform Delay, d1					10.1	10.1	5.2	5.7			6.8	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.7	0.8	2.0	0.6			2.1	
Delay (s)					10.8	10.9	7.2	6.3			8.9	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			10.9			6.4			8.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	35.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/11/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	275	45	420	0	0	425	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1506	1461	1719	3438			3041	
Flt Permitted					0.99	1.00	0.38	1.00			1.00	
Satd. Flow (perm)					1506	1461	679	3438			3041	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	284	46	433	0	0	438	289
RTOR Reduction (vph)	0	0	0	0	108	126	0	0	0	0	121	0
Lane Group Flow (vph)	0	0	0	0	49	27	46	433	0	0	606	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	16%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					5.9	5.9	19.4	19.4			19.4	
Effective Green, g (s)					5.9	5.9	19.4	19.4			19.4	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					267	259	396	2003			1772	
v/s Ratio Prot								0.13			c0.20	
v/s Ratio Perm					0.03	0.02	0.07					
v/c Ratio					0.18	0.10	0.12	0.22			0.34	
Uniform Delay, d1					11.7	11.5	3.1	3.3			3.6	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.6	0.2			0.5	
Delay (s)					12.0	11.7	3.7	3.6			4.2	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			3.6			4.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	335	45	500	0	0	490	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.95	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1498	1461	1719	3438			3066	
Flt Permitted					0.99	1.00	0.33	1.00			1.00	
Satd. Flow (perm)					1498	1461	600	3438			3066	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	360	48	538	0	0	527	296
RTOR Reduction (vph)	0	0	0	0	137	151	0	0	0	0	128	0
Lane Group Flow (vph)	0	0	0	0	59	40	48	538	0	0	695	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	15%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.4	6.4	18.9	18.9			18.9	
Effective Green, g (s)					6.4	6.4	18.9	18.9			18.9	
Actuated g/C Ratio					0.19	0.19	0.57	0.57			0.57	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					288	281	341	1951			1740	
v/s Ratio Prot								0.16			c0.23	
v/s Ratio Perm					0.04	0.03	0.08					
v/c Ratio					0.21	0.14	0.14	0.28			0.40	
Uniform Delay, d1					11.3	11.2	3.4	3.7			4.0	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.2	0.9	0.4			0.7	
Delay (s)					11.7	11.4	4.2	4.0			4.7	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.5			4.1			4.7	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	405	100	690	0	0	605	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1497	1461	1805	3438			3167	
Flt Permitted					0.99	1.00	0.23	1.00			1.00	
Satd. Flow (perm)					1497	1461	441	3438			3167	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	422	104	719	0	0	630	464
RTOR Reduction (vph)	0	0	0	0	165	171	0	0	0	0	154	0
Lane Group Flow (vph)	0	0	0	0	64	53	104	719	0	0	940	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	8%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.2	8.2	32.5	32.5			32.5	
Effective Green, g (s)					8.2	8.2	32.5	32.5			32.5	
Actuated g/C Ratio					0.17	0.17	0.67	0.67			0.67	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					252	246	294	2294			2114	
v/s Ratio Prot								0.21			c0.30	
v/s Ratio Perm					0.04	0.04	0.24					
v/c Ratio					0.26	0.21	0.35	0.31			0.44	
Uniform Delay, d1					17.6	17.5	3.5	3.4			3.8	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.5	0.4	3.3	0.4			0.7	
Delay (s)					18.1	17.9	6.8	3.8			4.5	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.0			4.2			4.5	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	620	45	605	0	0	700	580
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1369	1358	1805	3438			3092	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1369	1358	463	3438			3092	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	653	47	637	0	0	737	611
RTOR Reduction (vph)	0	0	0	0	90	90	0	0	0	0	332	0
Lane Group Flow (vph)	0	0	0	0	240	243	47	637	0	0	1016	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	13%	0%	5%	0%	0%	12%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.5	11.5	16.4	16.4			16.4	
Effective Green, g (s)					11.5	11.5	16.4	16.4			16.4	
Actuated g/C Ratio					0.32	0.32	0.46	0.46			0.46	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					439	435	212	1571			1413	
v/s Ratio Prot								0.19			c0.33	
v/s Ratio Perm					0.18	c0.18	0.10					
v/c Ratio					0.55	0.56	0.22	0.41			0.72	
Uniform Delay, d1					10.0	10.1	5.9	6.5			7.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.4	1.6	2.4	0.8			3.2	
Delay (s)					11.4	11.6	8.3	7.3			11.1	
Level of Service					B	B	A	A			B	
Approach Delay (s)		0.0			11.5			7.3			11.1	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	35.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	300	50	460	0	0	465	305
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1503	1344	1719	3438			3041	
Flt Permitted					0.99	1.00	0.35	1.00			1.00	
Satd. Flow (perm)					1503	1344	628	3438			3041	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	309	52	474	0	0	479	314
RTOR Reduction (vph)	0	0	0	0	116	136	0	0	0	0	133	0
Lane Group Flow (vph)	0	0	0	0	52	31	52	474	0	0	660	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	16%	5%
Bus Blockages (#/hr)	0	0	0	0	0	20	0	0	0	0	0	0
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.1	6.1	19.2	19.2			19.2	
Effective Green, g (s)					6.1	6.1	19.2	19.2			19.2	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					275	246	362	1982			1753	
v/s Ratio Prot								0.14			c0.22	
v/s Ratio Perm					0.03	0.02	0.08					
v/c Ratio					0.19	0.12	0.14	0.24			0.38	
Uniform Delay, d1					11.5	11.4	3.3	3.5			3.8	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.8	0.3			0.6	
Delay (s)					11.8	11.6	4.1	3.7			4.4	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.7			3.8			4.4	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	365	50	545	0	0	535	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.95	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1359	1311	1719	3438			3066	
Flt Permitted					0.99	1.00	0.29	1.00			1.00	
Satd. Flow (perm)					1359	1311	533	3438			3066	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	392	54	586	0	0	575	323
RTOR Reduction (vph)	0	0	0	0	126	126	0	0	0	0	143	0
Lane Group Flow (vph)	0	0	0	0	85	82	54	586	0	0	756	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	17%	5%	5%	0%	0%	15%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					7.0	7.0	19.0	19.0			19.0	
Effective Green, g (s)					7.0	7.0	19.0	19.0			19.0	
Actuated g/C Ratio					0.21	0.21	0.56	0.56			0.56	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					280	270	298	1921			1713	
v/s Ratio Prot								0.17			c0.25	
v/s Ratio Perm					0.06	0.06	0.10					
v/c Ratio					0.30	0.30	0.18	0.31			0.44	
Uniform Delay, d1					11.4	11.4	3.7	4.0			4.4	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.6	0.6	1.3	0.4			0.8	
Delay (s)					12.0	12.1	5.0	4.4			5.2	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			12.1			4.5			5.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	34.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	440	110	750	0	0	660	485
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1495	1461	1805	3438			3311	
Flt Permitted					0.99	1.00	0.20	1.00			1.00	
Satd. Flow (perm)					1495	1461	376	3438			3311	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	458	115	781	0	0	688	505
RTOR Reduction (vph)	0	0	0	0	144	144	0	0	0	0	176	0
Lane Group Flow (vph)	0	0	0	0	102	99	115	781	0	0	1017	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					9.2	9.2	32.1	32.1			32.1	
Effective Green, g (s)					9.2	9.2	32.1	32.1			32.1	
Actuated g/C Ratio					0.19	0.19	0.65	0.65			0.65	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					279	273	245	2239			2156	
v/s Ratio Prot								0.23			c0.31	
v/s Ratio Perm					0.07	0.07	0.31					
v/c Ratio					0.37	0.36	0.47	0.35			0.47	
Uniform Delay, d1					17.5	17.5	4.3	3.9			4.3	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.8	0.8	6.3	0.4			0.7	
Delay (s)					18.3	18.3	10.7	4.3			5.1	
Level of Service					B	B	B	A			A	
Approach Delay (s)		0.0			18.3			5.1			5.1	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	625	40	555	0	0	585	530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1369	1358	1805	3438			3193	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1369	1358	463	3438			3193	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	658	42	584	0	0	616	558
RTOR Reduction (vph)	0	0	0	0	109	109	0	0	0	0	302	0
Lane Group Flow (vph)	0	0	0	0	223	227	42	584	0	0	872	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	13%	0%	5%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.3	11.3	16.4	16.4			16.4	
Effective Green, g (s)					11.3	11.3	16.4	16.4			16.4	
Actuated g/C Ratio					0.32	0.32	0.46	0.46			0.46	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					433	430	213	1579			1467	
v/s Ratio Prot								0.17			c0.27	
v/s Ratio Perm					0.16	c0.17	0.09					
v/c Ratio					0.51	0.53	0.20	0.37			0.59	
Uniform Delay, d1					10.0	10.0	5.7	6.3			7.2	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.0	1.2	2.1	0.7			1.8	
Delay (s)					11.0	11.2	7.8	7.0			9.0	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.1			7.0			9.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	35.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/11/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	330	45	420	0	0	370	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1334	1279	1719	3438			3216	
Flt Permitted					0.99	1.00	0.40	1.00			1.00	
Satd. Flow (perm)					1334	1279	718	3438			3216	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	340	46	433	0	0	381	289
RTOR Reduction (vph)	0	0	0	0	129	145	0	0	0	0	126	0
Lane Group Flow (vph)	0	0	0	0	57	35	46	433	0	0	544	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	20%	5%	5%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.6	6.6	19.0	19.0			19.0	
Effective Green, g (s)					6.6	6.6	19.0	19.0			19.0	
Actuated g/C Ratio					0.20	0.20	0.57	0.57			0.57	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					262	251	406	1944			1819	
v/s Ratio Prot								0.13			c0.17	
v/s Ratio Perm					0.04	0.03	0.06					
v/c Ratio					0.22	0.14	0.11	0.22			0.30	
Uniform Delay, d1					11.3	11.2	3.4	3.6			3.8	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.3	0.6	0.3			0.4	
Delay (s)					11.8	11.4	4.0	3.9			4.2	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.6			3.9			4.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	33.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	390	45	500	0	0	435	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1356	1311	1719	3438			3238	
Flt Permitted					1.00	1.00	0.35	1.00			1.00	
Satd. Flow (perm)					1356	1311	631	3438			3238	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	419	48	538	0	0	468	296
RTOR Reduction (vph)	0	0	0	0	143	143	0	0	0	0	137	0
Lane Group Flow (vph)	0	0	0	0	81	79	48	538	0	0	627	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	17%	5%	5%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.3	8.3	18.8	18.8			18.8	
Effective Green, g (s)					8.3	8.3	18.8	18.8			18.8	
Actuated g/C Ratio					0.24	0.24	0.54	0.54			0.54	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					321	310	338	1841			1734	
v/s Ratio Prot								0.16			c0.19	
v/s Ratio Perm					0.06	c0.06	0.08					
v/c Ratio					0.25	0.26	0.14	0.29			0.36	
Uniform Delay, d1					10.9	10.9	4.1	4.5			4.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.4	0.9	0.4			0.6	
Delay (s)					11.3	11.3	5.0	4.9			5.3	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.3			4.9			5.3	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	35.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

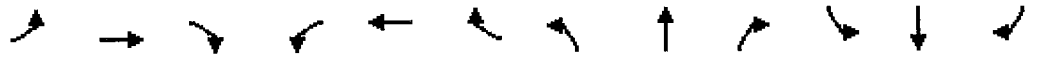
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	460	100	690	0	0	550	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1378	1334	1805	3438			3294	
Flt Permitted					0.99	1.00	0.25	1.00			1.00	
Satd. Flow (perm)					1378	1334	467	3438			3294	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	479	104	719	0	0	573	464
RTOR Reduction (vph)	0	0	0	0	167	167	0	0	0	0	163	0
Lane Group Flow (vph)	0	0	0	0	89	87	104	719	0	0	874	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	15%	0%	5%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					9.3	9.3	31.9	31.9			31.9	
Effective Green, g (s)					9.3	9.3	31.9	31.9			31.9	
Actuated g/C Ratio					0.19	0.19	0.65	0.65			0.65	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					260	252	303	2229			2136	
v/s Ratio Prot								0.21			c0.27	
v/s Ratio Perm					0.06	c0.07	0.22					
v/c Ratio					0.34	0.34	0.34	0.32			0.41	
Uniform Delay, d1					17.3	17.3	3.9	3.8			4.1	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.8	0.8	3.1	0.4			0.6	
Delay (s)					18.1	18.1	7.0	4.2			4.7	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.1			4.6			4.7	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	49.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	680	45	605	0	0	640	580
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1368	1358	1805	3438			3085	
Flt Permitted					1.00	1.00	0.25	1.00			1.00	
Satd. Flow (perm)					1368	1358	469	3438			3085	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	716	47	637	0	0	674	611
RTOR Reduction (vph)	0	0	0	0	89	89	0	0	0	0	337	0
Lane Group Flow (vph)	0	0	0	0	272	276	47	637	0	0	948	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	13%	0%	5%	0%	0%	12%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.9	11.9	16.2	16.2			16.2	
Effective Green, g (s)					11.9	11.9	16.2	16.2			16.2	
Actuated g/C Ratio					0.33	0.33	0.45	0.45			0.45	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					451	448	210	1543			1384	
v/s Ratio Prot								0.19			c0.31	
v/s Ratio Perm					0.20	c0.20	0.10					
v/c Ratio					0.60	0.62	0.22	0.41			0.69	
Uniform Delay, d1					10.1	10.2	6.1	6.7			7.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					2.3	2.5	2.5	0.8			2.8	
Delay (s)					12.4	12.7	8.6	7.5			10.7	
Level of Service					B	B	A	A			B	
Approach Delay (s)		0.0			12.5			7.6			10.7	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	36.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	360	50	460	0	0	405	305
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1496	1344	1719	3438			3035	
Flt Permitted					0.99	1.00	0.37	1.00			1.00	
Satd. Flow (perm)					1496	1344	676	3438			3035	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	371	52	474	0	0	418	314
RTOR Reduction (vph)	0	0	0	0	141	159	0	0	0	0	136	0
Lane Group Flow (vph)	0	0	0	0	59	38	52	474	0	0	596	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	16%	5%
Bus Blockages (#/hr)	0	0	0	0	0	20	0	0	0	0	0	0
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.4	6.4	18.9	18.9			18.9	
Effective Green, g (s)					6.4	6.4	18.9	18.9			18.9	
Actuated g/C Ratio					0.19	0.19	0.57	0.57			0.57	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					288	258	384	1951			1723	
v/s Ratio Prot								0.14			c0.20	
v/s Ratio Perm					0.04	0.03	0.08					
v/c Ratio					0.21	0.15	0.14	0.24			0.35	
Uniform Delay, d1					11.3	11.2	3.4	3.6			3.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.3	0.7	0.3			0.6	
Delay (s)					11.7	11.4	4.1	3.9			4.4	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.6			3.9			4.4	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	425	50	545	0	0	475	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1353	1311	1719	3438			3060	
Flt Permitted					1.00	1.00	0.31	1.00			1.00	
Satd. Flow (perm)					1353	1311	558	3438			3060	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	457	54	586	0	0	511	323
RTOR Reduction (vph)	0	0	0	0	117	117	0	0	0	0	157	0
Lane Group Flow (vph)	0	0	0	0	125	125	54	586	0	0	677	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	17%	5%	5%	0%	0%	15%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					9.4	9.4	18.5	18.5			18.5	
Effective Green, g (s)					9.4	9.4	18.5	18.5			18.5	
Actuated g/C Ratio					0.26	0.26	0.52	0.52			0.52	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					354	343	288	1772			1577	
v/s Ratio Prot								0.17			c0.22	
v/s Ratio Perm					0.09	c0.10	0.10					
v/c Ratio					0.35	0.36	0.19	0.33			0.43	
Uniform Delay, d1					10.8	10.8	4.7	5.1			5.4	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.6	0.7	1.4	0.5			0.9	
Delay (s)					11.4	11.5	6.1	5.6			6.3	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.4			5.6			6.3	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	35.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	500	110	750	0	0	600	485
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1491	1461	1805	3438			3294	
Flt Permitted					1.00	1.00	0.21	1.00			1.00	
Satd. Flow (perm)					1491	1461	403	3438			3294	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	521	115	781	0	0	625	505
RTOR Reduction (vph)	0	0	0	0	141	141	0	0	0	0	184	0
Lane Group Flow (vph)	0	0	0	0	135	135	115	781	0	0	946	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					10.1	10.1	31.5	31.5			31.5	
Effective Green, g (s)					10.1	10.1	31.5	31.5			31.5	
Actuated g/C Ratio					0.20	0.20	0.64	0.64			0.64	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					304	298	256	2183			2092	
v/s Ratio Prot								0.23			c0.29	
v/s Ratio Perm					0.09	c0.09	0.29					
v/c Ratio					0.44	0.45	0.45	0.36			0.45	
Uniform Delay, d1					17.3	17.3	4.6	4.3			4.6	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.0	1.1	5.6	0.5			0.7	
Delay (s)					18.3	18.4	10.2	4.7			5.3	
Level of Service					B	B	B	A			A	
Approach Delay (s)		0.0			18.4			5.4			5.3	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	49.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	570	40	610	0	0	585	585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1471	1461	1805	3195			3180	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1471	1461	452	3195			3180	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	600	42	642	0	0	616	616
RTOR Reduction (vph)	0	0	0	0	92	92	0	0	0	0	324	0
Lane Group Flow (vph)	0	0	0	0	212	214	42	642	0	0	908	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	13%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					10.6	10.6	16.8	16.8			16.8	
Effective Green, g (s)					10.6	10.6	16.8	16.8			16.8	
Actuated g/C Ratio					0.30	0.30	0.47	0.47			0.47	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					440	437	215	1516			1509	
v/s Ratio Prot								0.20			c0.29	
v/s Ratio Perm					0.14	c0.15	0.09					
v/c Ratio					0.48	0.49	0.20	0.42			0.60	
Uniform Delay, d1					10.2	10.2	5.4	6.1			6.8	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.8	0.9	2.0	0.9			1.8	
Delay (s)					11.0	11.0	7.4	7.0			8.6	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.0			7.0			8.6	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	35.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	275	45	475	0	0	370	335
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1506	1461	1719	3139			3193	
Flt Permitted					0.99	1.00	0.38	1.00			1.00	
Satd. Flow (perm)					1506	1461	680	3139			3193	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	284	46	490	0	0	381	345
RTOR Reduction (vph)	0	0	0	0	108	126	0	0	0	0	144	0
Lane Group Flow (vph)	0	0	0	0	49	27	46	490	0	0	582	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	15%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					5.9	5.9	19.4	19.4			19.4	
Effective Green, g (s)					5.9	5.9	19.4	19.4			19.4	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					267	259	396	1829			1860	
v/s Ratio Prot								0.16			c0.18	
v/s Ratio Perm					0.03	0.02	0.07					
v/c Ratio					0.18	0.10	0.12	0.27			0.31	
Uniform Delay, d1					11.7	11.5	3.1	3.4			3.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.6	0.4			0.4	
Delay (s)					12.0	11.7	3.7	3.8			4.0	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			3.8			4.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	335	45	555	0	0	435	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1498	1461	1719	3167			3216	
Flt Permitted					0.99	1.00	0.33	1.00			1.00	
Satd. Flow (perm)					1498	1461	598	3167			3216	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	360	48	597	0	0	468	355
RTOR Reduction (vph)	0	0	0	0	123	123	0	0	0	0	155	0
Lane Group Flow (vph)	0	0	0	0	73	68	48	597	0	0	668	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	14%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.6	6.6	18.9	18.9			18.9	
Effective Green, g (s)					6.6	6.6	18.9	18.9			18.9	
Actuated g/C Ratio					0.20	0.20	0.56	0.56			0.56	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					295	288	337	1787			1814	
v/s Ratio Prot								0.19			c0.21	
v/s Ratio Perm					0.05	0.05	0.08					
v/c Ratio					0.25	0.24	0.14	0.33			0.37	
Uniform Delay, d1					11.4	11.3	3.5	3.9			4.0	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.4	0.9	0.5			0.6	
Delay (s)					11.8	11.8	4.3	4.4			4.6	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			4.4			4.6	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	33.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	405	100	745	0	0	550	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1497	1461	1805	3252			3274	
Flt Permitted					0.99	1.00	0.23	1.00			1.00	
Satd. Flow (perm)					1497	1461	438	3252			3274	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	422	104	776	0	0	573	521
RTOR Reduction (vph)	0	0	0	0	148	148	0	0	0	0	176	0
Lane Group Flow (vph)	0	0	0	0	81	76	104	776	0	0	918	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	11%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.6	8.6	32.5	32.5			32.5	
Effective Green, g (s)					8.6	8.6	32.5	32.5			32.5	
Actuated g/C Ratio					0.18	0.18	0.66	0.66			0.66	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					262	256	290	2153			2167	
v/s Ratio Prot								0.24			c0.28	
v/s Ratio Perm					0.05	0.05	0.24					
v/c Ratio					0.31	0.30	0.36	0.36			0.42	
Uniform Delay, d1					17.7	17.6	3.7	3.7			3.9	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.7	0.7	3.4	0.5			0.6	
Delay (s)					18.3	18.3	7.1	4.2			4.5	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.3			4.5			4.5	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	49.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	620	45	665	0	0	640	635
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1470	1461	1805	3195			3181	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1470	1461	463	3195			3181	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	653	47	700	0	0	674	668
RTOR Reduction (vph)	0	0	0	0	73	73	0	0	0	0	364	0
Lane Group Flow (vph)	0	0	0	0	257	260	47	700	0	0	978	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	13%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.6	11.6	16.4	16.4			16.4	
Effective Green, g (s)					11.6	11.6	16.4	16.4			16.4	
Actuated g/C Ratio					0.32	0.32	0.46	0.46			0.46	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					474	471	211	1456			1449	
v/s Ratio Prot								0.22			c0.31	
v/s Ratio Perm					0.17	c0.18	0.10					
v/c Ratio					0.54	0.55	0.22	0.48			0.68	
Uniform Delay, d1					10.0	10.1	5.9	6.8			7.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.3	1.4	2.4	1.1			2.5	
Delay (s)					11.3	11.5	8.4	8.0			10.2	
Level of Service					B	B	A	A			B	
Approach Delay (s)		0.0			11.4			8.0			10.2	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	9.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	36.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	300	50	520	0	0	405	365
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1503	1461	1719	3139			3194	
Flt Permitted					0.99	1.00	0.35	1.00			1.00	
Satd. Flow (perm)					1503	1461	627	3139			3194	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	309	52	536	0	0	418	376
RTOR Reduction (vph)	0	0	0	0	116	136	0	0	0	0	159	0
Lane Group Flow (vph)	0	0	0	0	52	31	52	536	0	0	635	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	15%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.1	6.1	19.2	19.2			19.2	
Effective Green, g (s)					6.1	6.1	19.2	19.2			19.2	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					275	268	362	1810			1842	
v/s Ratio Prot								0.17			c0.20	
v/s Ratio Perm					0.03	0.02	0.08					
v/c Ratio					0.19	0.11	0.14	0.30			0.34	
Uniform Delay, d1					11.5	11.3	3.3	3.6			3.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.8	0.4			0.5	
Delay (s)					11.8	11.5	4.1	4.0			4.2	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.7			4.0			4.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	275	45	475	0	0	370	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1506	1461	1719	3139			3216	
Flt Permitted					0.99	1.00	0.40	1.00			1.00	
Satd. Flow (perm)					1506	1461	718	3139			3216	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	284	46	490	0	0	381	289
RTOR Reduction (vph)	0	0	0	0	108	126	0	0	0	0	121	0
Lane Group Flow (vph)	0	0	0	0	49	27	46	490	0	0	549	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	15%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					5.9	5.9	19.4	19.4			19.4	
Effective Green, g (s)					5.9	5.9	19.4	19.4			19.4	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					267	259	418	1829			1874	
v/s Ratio Prot								0.16			c0.17	
v/s Ratio Perm					0.03	0.02	0.06					
v/c Ratio					0.18	0.10	0.11	0.27			0.29	
Uniform Delay, d1					11.7	11.5	3.1	3.4			3.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.5	0.4			0.4	
Delay (s)					12.0	11.7	3.6	3.8			3.9	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			3.8			3.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	440	110	810	0	0	600	545
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1495	1461	1805	3252			3274	
Flt Permitted					0.99	1.00	0.20	1.00			1.00	
Satd. Flow (perm)					1495	1461	372	3252			3274	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	458	115	844	0	0	625	568
RTOR Reduction (vph)	0	0	0	0	122	122	0	0	0	0	202	0
Lane Group Flow (vph)	0	0	0	0	124	121	115	844	0	0	991	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	11%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					9.7	9.7	32.1	32.1			32.1	
Effective Green, g (s)					9.7	9.7	32.1	32.1			32.1	
Actuated g/C Ratio					0.19	0.19	0.64	0.64			0.64	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					291	285	240	2096			2110	
v/s Ratio Prot								0.26			0.30	
v/s Ratio Perm					0.08	0.08	c0.31					
v/c Ratio					0.42	0.42	0.48	0.40			0.47	
Uniform Delay, d1					17.6	17.6	4.6	4.2			4.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.0	1.0	6.7	0.6			0.8	
Delay (s)					18.6	18.6	11.3	4.8			5.3	
Level of Service					B	B	B	A			A	
Approach Delay (s)		0.0			18.6			5.6			5.3	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	570	40	555	0	0	585	585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1471	1461	1805	3438			3064	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1471	1461	452	3438			3064	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	600	42	584	0	0	616	616
RTOR Reduction (vph)	0	0	0	0	113	113	0	0	0	0	320	0
Lane Group Flow (vph)	0	0	0	0	191	193	42	584	0	0	912	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	5%	13%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					10.2	10.2	16.8	16.8			16.8	
Effective Green, g (s)					10.2	10.2	16.8	16.8			16.8	
Actuated g/C Ratio					0.29	0.29	0.48	0.48			0.48	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					429	426	217	1650			1471	
v/s Ratio Prot								0.17			c0.30	
v/s Ratio Perm					0.13	c0.13	0.09					
v/c Ratio					0.44	0.45	0.19	0.35			0.62	
Uniform Delay, d1					10.1	10.1	5.2	5.7			6.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.7	0.8	2.0	0.6			2.0	
Delay (s)					10.8	10.9	7.2	6.3			8.7	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			10.9			6.4			8.7	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	35.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/11/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	275	45	420	0	0	370	335
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1506	1461	1719	3438			3003	
Flt Permitted					0.99	1.00	0.38	1.00			1.00	
Satd. Flow (perm)					1506	1461	680	3438			3003	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	284	46	433	0	0	381	345
RTOR Reduction (vph)	0	0	0	0	108	126	0	0	0	0	144	0
Lane Group Flow (vph)	0	0	0	0	49	27	46	433	0	0	582	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	5%	19%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					5.9	5.9	19.4	19.4			19.4	
Effective Green, g (s)					5.9	5.9	19.4	19.4			19.4	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					267	259	396	2003			1749	
v/s Ratio Prot								0.13			c0.19	
v/s Ratio Perm					0.03	0.02	0.07					
v/c Ratio					0.18	0.10	0.12	0.22			0.33	
Uniform Delay, d1					11.7	11.5	3.1	3.3			3.6	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.6	0.2			0.5	
Delay (s)					12.0	11.7	3.7	3.6			4.1	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			3.6			4.1	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	41.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/11/2012

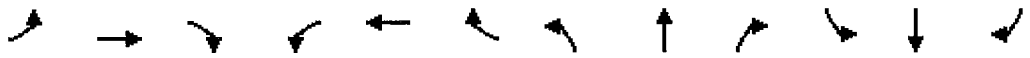
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	335	45	500	0	0	435	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1498	1461	1719	3438			3029	
Flt Permitted					0.99	1.00	0.33	1.00			1.00	
Satd. Flow (perm)					1498	1461	600	3438			3029	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	360	48	538	0	0	468	355
RTOR Reduction (vph)	0	0	0	0	137	151	0	0	0	0	154	0
Lane Group Flow (vph)	0	0	0	0	59	40	48	538	0	0	669	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	5%	0%	0%	5%	20%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.4	6.4	18.9	18.9			18.9	
Effective Green, g (s)					6.4	6.4	18.9	18.9			18.9	
Actuated g/C Ratio					0.19	0.19	0.57	0.57			0.57	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					288	281	341	1951			1719	
v/s Ratio Prot								0.16			c0.22	
v/s Ratio Perm					0.04	0.03	0.08					
v/c Ratio					0.21	0.14	0.14	0.28			0.39	
Uniform Delay, d1					11.3	11.2	3.4	3.7			4.0	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.2	0.9	0.4			0.7	
Delay (s)					11.7	11.4	4.2	4.0			4.7	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.5			4.1			4.7	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/11/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	405	100	690	0	0	550	500
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1497	1461	1805	3438			3129	
Flt Permitted					0.99	1.00	0.23	1.00			1.00	
Satd. Flow (perm)					1497	1461	441	3438			3129	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	422	104	719	0	0	573	521
RTOR Reduction (vph)	0	0	0	0	165	171	0	0	0	0	173	0
Lane Group Flow (vph)	0	0	0	0	64	53	104	719	0	0	921	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	5%	0%	0%	0%	15%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.2	8.2	32.5	32.5			32.5	
Effective Green, g (s)					8.2	8.2	32.5	32.5			32.5	
Actuated g/C Ratio					0.17	0.17	0.67	0.67			0.67	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					252	246	294	2294			2088	
v/s Ratio Prot								0.21			c0.29	
v/s Ratio Perm					0.04	0.04	0.24					
v/c Ratio					0.26	0.21	0.35	0.31			0.44	
Uniform Delay, d1					17.6	17.5	3.5	3.4			3.8	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.5	0.4	3.3	0.4			0.7	
Delay (s)					18.1	17.9	6.8	3.8			4.5	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.0			4.2			4.5	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

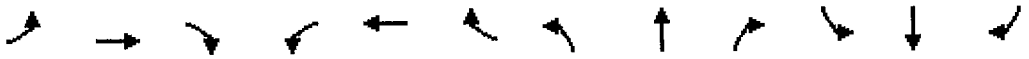
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	620	45	605	0	0	640	635
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1470	1461	1805	3195			3181	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1470	1461	463	3195			3181	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	653	47	637	0	0	674	668
RTOR Reduction (vph)	0	0	0	0	91	91	0	0	0	0	361	0
Lane Group Flow (vph)	0	0	0	0	239	242	47	637	0	0	981	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	13%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.3	11.3	16.4	16.4			16.4	
Effective Green, g (s)					11.3	11.3	16.4	16.4			16.4	
Actuated g/C Ratio					0.32	0.32	0.46	0.46			0.46	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					465	462	213	1468			1461	
v/s Ratio Prot								0.20			c0.31	
v/s Ratio Perm					0.16	c0.17	0.10					
v/c Ratio					0.51	0.52	0.22	0.43			0.67	
Uniform Delay, d1					10.0	10.0	5.8	6.5			7.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.0	1.1	2.4	0.9			2.5	
Delay (s)					10.9	11.1	8.2	7.5			10.0	
Level of Service					B	B	A	A			B	
Approach Delay (s)		0.0			11.0			7.5			10.0	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	35.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



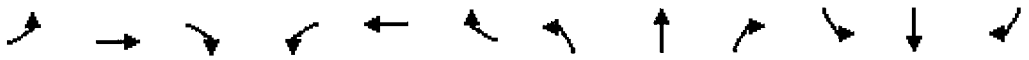
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	300	50	460	0	0	405	365
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1503	1461	1719	3139			3194	
Flt Permitted					0.99	1.00	0.35	1.00			1.00	
Satd. Flow (perm)					1503	1461	627	3139			3194	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	309	52	474	0	0	418	376
RTOR Reduction (vph)	0	0	0	0	116	136	0	0	0	0	159	0
Lane Group Flow (vph)	0	0	0	0	52	31	52	474	0	0	635	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	15%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.1	6.1	19.2	19.2			19.2	
Effective Green, g (s)					6.1	6.1	19.2	19.2			19.2	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					275	268	362	1810			1842	
v/s Ratio Prot								0.15			c0.20	
v/s Ratio Perm					0.03	0.02	0.08					
v/c Ratio					0.19	0.11	0.14	0.26			0.34	
Uniform Delay, d1					11.5	11.3	3.3	3.5			3.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.8	0.4			0.5	
Delay (s)					11.8	11.5	4.1	3.9			4.2	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.7			3.9			4.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	365	50	545	0	0	475	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1496	1461	1719	3167			3216	
Flt Permitted					0.99	1.00	0.30	1.00			1.00	
Satd. Flow (perm)					1496	1461	535	3167			3216	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	392	54	586	0	0	511	387
RTOR Reduction (vph)	0	0	0	0	127	127	0	0	0	0	170	0
Lane Group Flow (vph)	0	0	0	0	84	81	54	586	0	0	728	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	14%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.8	6.8	18.9	18.9			18.9	
Effective Green, g (s)					6.8	6.8	18.9	18.9			18.9	
Actuated g/C Ratio					0.20	0.20	0.56	0.56			0.56	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					302	295	300	1776			1804	
v/s Ratio Prot								0.19			c0.23	
v/s Ratio Perm					0.06	0.06	0.10					
v/c Ratio					0.28	0.27	0.18	0.33			0.40	
Uniform Delay, d1					11.4	11.4	3.6	4.0			4.2	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.5	0.5	1.3	0.5			0.7	
Delay (s)					11.9	11.9	4.9	4.5			4.9	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.9			4.5			4.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	33.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	440	110	750	0	0	600	545
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1495	1461	1805	3252			3274	
Flt Permitted					0.99	1.00	0.20	1.00			1.00	
Satd. Flow (perm)					1495	1461	376	3252			3274	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	458	115	781	0	0	625	568
RTOR Reduction (vph)	0	0	0	0	144	144	0	0	0	0	198	0
Lane Group Flow (vph)	0	0	0	0	102	99	115	781	0	0	995	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	11%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					9.2	9.2	32.1	32.1			32.1	
Effective Green, g (s)					9.2	9.2	32.1	32.1			32.1	
Actuated g/C Ratio					0.19	0.19	0.65	0.65			0.65	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					279	273	245	2117			2132	
v/s Ratio Prot								0.24			0.30	
v/s Ratio Perm					0.07	0.07	c0.31					
v/c Ratio					0.37	0.36	0.47	0.37			0.47	
Uniform Delay, d1					17.5	17.5	4.3	3.9			4.3	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.8	0.8	6.3	0.5			0.7	
Delay (s)					18.3	18.3	10.7	4.4			5.0	
Level of Service					B	B	B	A			A	
Approach Delay (s)		0.0			18.3			5.2			5.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/11/2012



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	570	40	610	0	0	585	530
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1471	1461	1805	3195			3193	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1471	1461	452	3195			3193	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	600	42	642	0	0	616	558
RTOR Reduction (vph)	0	0	0	0	92	92	0	0	0	0	293	0
Lane Group Flow (vph)	0	0	0	0	212	214	42	642	0	0	881	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	13%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					10.6	10.6	16.8	16.8			16.8	
Effective Green, g (s)					10.6	10.6	16.8	16.8			16.8	
Actuated g/C Ratio					0.30	0.30	0.47	0.47			0.47	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					440	437	215	1516			1515	
v/s Ratio Prot								0.20			c0.28	
v/s Ratio Perm					0.14	c0.15	0.09					
v/c Ratio					0.48	0.49	0.20	0.42			0.58	
Uniform Delay, d1					10.2	10.2	5.4	6.1			6.7	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.8	0.9	2.0	0.9			1.6	
Delay (s)					11.0	11.0	7.4	7.0			8.4	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.0			7.0			8.4	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	8.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	35.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	275	45	475	0	0	370	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1506	1461	1719	3139			3216	
Flt Permitted					0.99	1.00	0.40	1.00			1.00	
Satd. Flow (perm)					1506	1461	718	3139			3216	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	284	46	490	0	0	381	289
RTOR Reduction (vph)	0	0	0	0	108	126	0	0	0	0	121	0
Lane Group Flow (vph)	0	0	0	0	49	27	46	490	0	0	549	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	15%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					5.9	5.9	19.4	19.4			19.4	
Effective Green, g (s)					5.9	5.9	19.4	19.4			19.4	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					267	259	418	1829			1874	
v/s Ratio Prot								0.16			c0.17	
v/s Ratio Perm					0.03	0.02	0.06					
v/c Ratio					0.18	0.10	0.11	0.27			0.29	
Uniform Delay, d1					11.7	11.5	3.1	3.4			3.5	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	0.5	0.4			0.4	
Delay (s)					12.0	11.7	3.6	3.8			3.9	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			3.8			3.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	335	45	555	0	0	435	275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1498	1461	1719	3167			3238	
Flt Permitted					0.99	1.00	0.36	1.00			1.00	
Satd. Flow (perm)					1498	1461	648	3167			3238	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	360	48	597	0	0	468	296
RTOR Reduction (vph)	0	0	0	0	123	123	0	0	0	0	129	0
Lane Group Flow (vph)	0	0	0	0	73	68	48	597	0	0	635	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	14%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.6	6.6	18.9	18.9			18.9	
Effective Green, g (s)					6.6	6.6	18.9	18.9			18.9	
Actuated g/C Ratio					0.20	0.20	0.56	0.56			0.56	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					295	288	366	1787			1827	
v/s Ratio Prot								0.19			c0.20	
v/s Ratio Perm					0.05	0.05	0.07					
v/c Ratio					0.25	0.24	0.13	0.33			0.35	
Uniform Delay, d1					11.4	11.3	3.4	3.9			4.0	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.4	0.4	0.7	0.5			0.5	
Delay (s)					11.8	11.8	4.2	4.4			4.5	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.8			4.4			4.5	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	33.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	405	100	745	0	0	550	445
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1497	1461	1805	3252			3294	
Flt Permitted					0.99	1.00	0.25	1.00			1.00	
Satd. Flow (perm)					1497	1461	473	3252			3294	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	422	104	776	0	0	573	464
RTOR Reduction (vph)	0	0	0	0	148	148	0	0	0	0	157	0
Lane Group Flow (vph)	0	0	0	0	81	76	104	776	0	0	880	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	11%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					8.6	8.6	32.5	32.5			32.5	
Effective Green, g (s)					8.6	8.6	32.5	32.5			32.5	
Actuated g/C Ratio					0.18	0.18	0.66	0.66			0.66	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					262	256	313	2153			2180	
v/s Ratio Prot								0.24			c0.27	
v/s Ratio Perm					0.05	0.05	0.22					
v/c Ratio					0.31	0.30	0.33	0.36			0.40	
Uniform Delay, d1					17.7	17.6	3.6	3.7			3.8	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.7	0.7	2.8	0.5			0.6	
Delay (s)					18.3	18.3	6.4	4.2			4.4	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.3			4.4			4.4	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	49.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	5	5	620	45	665	0	0	640	580
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.85	0.85	1.00	1.00			0.93	
Flt Protected					1.00	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1470	1461	1805	3195			3193	
Flt Permitted					1.00	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1470	1461	463	3195			3193	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	5	5	653	47	700	0	0	674	611
RTOR Reduction (vph)	0	0	0	0	73	73	0	0	0	0	333	0
Lane Group Flow (vph)	0	0	0	0	257	260	47	700	0	0	952	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	13%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					11.6	11.6	16.4	16.4			16.4	
Effective Green, g (s)					11.6	11.6	16.4	16.4			16.4	
Actuated g/C Ratio					0.32	0.32	0.46	0.46			0.46	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					474	471	211	1456			1455	
v/s Ratio Prot								0.22			c0.30	
v/s Ratio Perm					0.17	c0.18	0.10					
v/c Ratio					0.54	0.55	0.22	0.48			0.65	
Uniform Delay, d1					10.0	10.1	5.9	6.8			7.6	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.3	1.4	2.4	1.1			2.3	
Delay (s)					11.3	11.5	8.4	8.0			9.9	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.4			8.0			9.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	36.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	300	50	520	0	0	405	605
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.91	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1503	1461	1719	3139			3129	
Flt Permitted					0.99	1.00	0.24	1.00			1.00	
Satd. Flow (perm)					1503	1461	441	3139			3129	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	0	0	0	21	5	309	52	536	0	0	418	624
RTOR Reduction (vph)	0	0	0	0	116	136	0	0	0	0	264	0
Lane Group Flow (vph)	0	0	0	0	52	31	52	536	0	0	778	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	15%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					6.1	6.1	19.2	19.2			19.2	
Effective Green, g (s)					6.1	6.1	19.2	19.2			19.2	
Actuated g/C Ratio					0.18	0.18	0.58	0.58			0.58	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					275	268	254	1810			1804	
v/s Ratio Prot								0.17			c0.25	
v/s Ratio Perm					0.03	0.02	0.12					
v/c Ratio					0.19	0.11	0.20	0.30			0.43	
Uniform Delay, d1					11.5	11.3	3.4	3.6			4.0	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.3	0.2	1.8	0.4			0.8	
Delay (s)					11.8	11.5	5.2	4.0			4.7	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			11.7			4.1			4.7	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	5.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	33.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	20	5	365	50	605	0	0	475	300
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.94	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1496	1461	1719	3167			3238	
Flt Permitted					0.99	1.00	0.32	1.00			1.00	
Satd. Flow (perm)					1496	1461	582	3167			3238	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	22	5	392	54	651	0	0	511	323
RTOR Reduction (vph)	0	0	0	0	100	100	0	0	0	0	144	0
Lane Group Flow (vph)	0	0	0	0	111	108	54	651	0	0	690	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	5%	14%	0%	0%	5%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					7.2	7.2	19.0	19.0			19.0	
Effective Green, g (s)					7.2	7.2	19.0	19.0			19.0	
Actuated g/C Ratio					0.21	0.21	0.56	0.56			0.56	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					315	308	323	1759			1799	
v/s Ratio Prot								0.21			c0.21	
v/s Ratio Perm					0.07	0.07	0.09					
v/c Ratio					0.35	0.35	0.17	0.37			0.38	
Uniform Delay, d1					11.5	11.5	3.7	4.3			4.3	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					0.7	0.7	1.1	0.6			0.6	
Delay (s)					12.2	12.2	4.8	4.9			4.9	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			12.2			4.9			4.9	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	6.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	34.2	Sum of lost time (s)	8.0
Intersection Capacity Utilization	45.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
6: Windsor Ave & WB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	25	5	440	110	810	0	0	600	485
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					4.0	4.0	4.0	4.0			4.0	
Lane Util. Factor					0.95	0.95	1.00	0.95			0.95	
Frt					0.87	0.85	1.00	1.00			0.93	
Flt Protected					0.99	1.00	0.95	1.00			1.00	
Satd. Flow (prot)					1495	1461	1805	3252			3294	
Flt Permitted					0.99	1.00	0.21	1.00			1.00	
Satd. Flow (perm)					1495	1461	408	3252			3294	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	0	0	0	26	5	458	115	844	0	0	625	505
RTOR Reduction (vph)	0	0	0	0	122	122	0	0	0	0	179	0
Lane Group Flow (vph)	0	0	0	0	124	121	115	844	0	0	951	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	5%	0%	11%	0%	0%	0%	5%
Turn Type				Perm	NA	Perm	Perm	NA			NA	
Protected Phases					8			2			6	
Permitted Phases				8		8	2					
Actuated Green, G (s)					9.7	9.7	32.1	32.1			32.1	
Effective Green, g (s)					9.7	9.7	32.1	32.1			32.1	
Actuated g/C Ratio					0.19	0.19	0.64	0.64			0.64	
Clearance Time (s)					4.0	4.0	4.0	4.0			4.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0			3.0	
Lane Grp Cap (vph)					291	285	263	2096			2123	
v/s Ratio Prot								0.26			c0.29	
v/s Ratio Perm					0.08	0.08	0.28					
v/c Ratio					0.42	0.42	0.44	0.40			0.45	
Uniform Delay, d1					17.6	17.6	4.4	4.2			4.4	
Progression Factor					1.00	1.00	1.00	1.00			1.00	
Incremental Delay, d2					1.0	1.0	5.2	0.6			0.7	
Delay (s)					18.6	18.6	9.6	4.8			5.1	
Level of Service					B	B	A	A			A	
Approach Delay (s)		0.0			18.6			5.4			5.1	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

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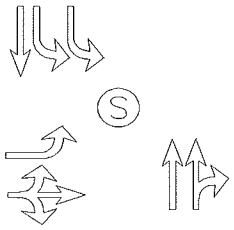
SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	1 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS



EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	550	5%		550	50	600
EB THRU	5	5%		5	5	10
EB RIGHT	105	5%		105	10	115
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	130	5%		130	10	140
NB RIGHT	20	5%		20	5	25
SB LEFT	415	5%	**55**	470	40	510
SB THRU	190	5%		190	15	205
SB RIGHT	0	0%		0	0	0
TOTALS	**1415**		**55**	**1470**	**135**	**1605**

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Santa Clarita Office: 661.284.7400 Tel/ 661.284.7401 Fax
Victorville Office: 760.524.9100 Tel/ 760.524.9101 Fax
Temecula Office: 951.294.9300 Tel/ 951.294.9301 Fax

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	12-Jul-11	VV.110264.0000	2 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	550	5%	**55**	605	55	660
EB THRU	5	5%		5	5	10
EB RIGHT	105	5%		105	10	115
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	130	5%		130	10	140
NB RIGHT	20	5%		20	5	25
SB LEFT	415	5%		415	35	450
SB THRU	190	5%		190	15	205
SB RIGHT	0	0%		0	0	0
TOTALS	**1415**		**55**	**1470**	**135**	**1605**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	28-Jun-12	VV.110264.0000	3 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	320	5%		320	30	350
EB THRU	5	5%		5	5	10
EB RIGHT	55	5%		55	5	60
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	145	5%		145	15	160
NB RIGHT	15	5%		15	5	20
SB LEFT	295	5%	**55**	350	30	380
SB THRU	100	5%		100	10	110
SB RIGHT	0	0%		0	0	0
TOTALS	**935**		**55**	**990**	**100**	**1090**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	12-Jul-11	VV.110264.0000	4 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	320	5%	**55**	375	35	410
EB THRU	5	5%		5	5	10
EB RIGHT	55	5%		55	5	60
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	145	5%		145	15	160
NB RIGHT	15	5%		15	5	20
SB LEFT	295	5%		295	25	320
SB THRU	100	5%		100	10	110
SB RIGHT	0	0%		0	0	0
TOTALS	**935**		**55**	**990**	**100**	**1090**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	12-Jul-11	VV.110264.0000	5 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	370	5%		370	35	405
EB THRU	5	5%		5	5	10
EB RIGHT	50	5%		50	5	55
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	160	5%		160	15	175
NB RIGHT	15	5%		15	5	20
SB LEFT	280	5%	**55**	335	30	365
SB THRU	160	5%		160	15	175
SB RIGHT	0	0%		0	0	0
TOTALS	**1040**		**55**	**1095**	**110**	**1205**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	12-Jul-11	VV.110264.0000	6 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	370	12%	**55**	425	40	465
EB THRU	5	5%		5	5	10
EB RIGHT	50	5%		50	5	55
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	160	5%		160	15	175
NB RIGHT	15	5%		15	5	20
SB LEFT	280	5%		280	25	305
SB THRU	160	5%		160	15	175
SB RIGHT	0	0%		0	0	0
TOTALS	**1040**		**55**	**1095**	**110**	**1205**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	28-Jun-12	VV.110264.0000	7 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	595	5%		595	55	650
EB THRU	5	5%		5	5	10
EB RIGHT	105	5%		105	10	115
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	195	5%		195	20	215
NB RIGHT	15	5%		15	5	20
SB LEFT	415	5%	**55**	470	40	510
SB THRU	165	5%		165	15	180
SB RIGHT	0	0%		0	0	0
TOTALS	**1495**		**55**	**1550**	**150**	**1700**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	DJ	12-Jul-11	VV.110264.0000	8 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING TRAFFIC	TRUCK PERCENTAGE	PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #						
I-210 FWY EB RAMPS						
EB LEFT	595	5%	**55**	650	60	710
EB THRU	5	5%		5	5	10
EB RIGHT	105	5%		105	10	115
WB LEFT	0	0%		0	0	0
WB THRU	0	0%		0	0	0
WB RIGHT	0	0%		0	0	0
WINDSOR AVE						
NB LEFT	0	0%		0	0	0
NB THRU	195	5%		195	20	215
NB RIGHT	15	5%		15	5	20
SB LEFT	415	5%		415	35	450
SB THRU	165	5%		165	15	180
SB RIGHT	0	0%		0	0	0
TOTALS	**1495**		**55**	**1550**	**150**	**1700**

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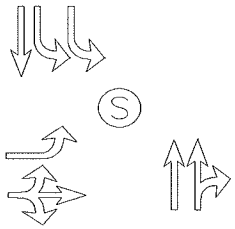
SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	1 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS



EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	550	0	0	550	**0**	550	50	600
EB THRU	0	0	0	5	**0**	5	5	10
EB RIGHT	104	0	0	105	**0**	105	10	115
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	129	0	0	130	**0**	130	10	140
NB RIGHT	22	0	0	20	**0**	20	5	25
SB LEFT	413	2	6	420	**165**	585	55	640
SB THRU	187	4	12	200	**0**	200	20	220
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**1405**				**165**	**1595**	**155**	**1750**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	2 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : AM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	550	0	0	550	**140**	690	60	750
EB THRU	0	0	0	5	**0**	5	5	10
EB RIGHT	104	0	0	105	**0**	105	10	115
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	129	0	0	130	**0**	130	10	140
NB RIGHT	22	0	0	20	**0**	20	5	25
SB LEFT	413	2	6	420	**0**	420	40	460
SB THRU	187	4	12	200	**0**	200	20	220
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**1405**				**140**	**1570**	**150**	**1720**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	3 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	319	0	0	320	**0**	320	30	350
EB THRU	2	0	0	5	**0**	5	5	10
EB RIGHT	53	0	0	55	**0**	55	5	60
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	145	1	3	150	**0**	150	15	165
NB RIGHT	15	1	3	20	**0**	20	5	25
SB LEFT	290	3	9	300	**165**	465	40	505
SB THRU	97	3	9	105	**0**	105	10	115
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**921**				**165**	**1120**	**110**	**1230**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	4 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	319	0	0	320	**140**	460	40	500
EB THRU	2	0	0	5	**0**	5	5	10
EB RIGHT	53	0	0	55	**0**	55	5	60
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	145	1	3	150	**0**	150	15	165
NB RIGHT	15	1	3	20	**0**	20	5	25
SB LEFT	290	3	9	300	**0**	300	25	325
SB THRU	97	3	9	105	**0**	105	10	115
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**921**				**140**	**1095**	**105**	**1200**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	5 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : 2 PM - 4 PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	370	0	0	370	**0**	370	35	405
EB THRU	5	0	0	5	**0**	5	5	10
EB RIGHT	50	0	0	50	**0**	50	5	55
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	160	8	24	185	**0**	185	15	200
NB RIGHT	15	1	2	15	**0**	15	5	20
SB LEFT	280	14	42	320	**165**	485	45	530
SB THRU	160	8	24	185	**0**	185	15	200
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**1040**				**165**	**1295**	**125**	**1420**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	6 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : MID-DAY PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	370	0	0	370	**140**	510	45	555
EB THRU	5	0	0	5	**0**	5	5	10
EB RIGHT	50	0	0	50	**0**	50	5	55
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	160	8	24	185	**0**	185	15	200
NB RIGHT	15	1	2	15	**0**	15	5	20
SB LEFT	280	14	42	320	**0**	320	30	350
SB THRU	160	8	24	185	**0**	185	15	200
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**1040**				**140**	**1270**	**120**	**1390**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	7 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1B, 1C

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	594	0	0	595	**0**	595	55	650
EB THRU	2	0	0	5	**0**	5	5	10
EB RIGHT	105	0	0	105	**0**	105	10	115
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	194	0	0	195	**0**	195	20	215
NB RIGHT	16	0	0	15	**0**	15	5	20
SB LEFT	414	0	0	415	**165**	580	50	630
SB THRU	165	0	0	165	**0**	165	15	180
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**1490**				**165**	**1660**	**160**	**1820**

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SUBJECT	BY	DATE	JOB NO.	SHEET OF
TURN MOVEMENT SUMMARY	MC	10-Sep-13	VV.110264.0000	8 OF 8

E/W STREET : I-210 FWY EB RAMPS
N/S STREET : WINDSOR AVE
CONDITION : PM PEAK HOUR

PROJECTED YEAR:
PROJECTED GROWTH PER YEAR:

INTERSECTION 7
ROUTE 1F, 1H

CONDITION DIAGRAMS

EXISTING GEOMETRICS

TURN MOVEMENTS

CONDITION	EXISTING AUTO TRAFFIC	EXISTING TRUCK TRAFFIC	PCE TRUCK VOLUME	PCE TRAFFIC NUMBERS	PCE PROJECT TRAFFIC	EXISTING + PROJECT TRAFFIC	GROWTH TRAFFIC	PROJECT CONDITIONS YEAR 2014 TRAFFIC
SCENERIO #								
I-210 FWY EB RAMPS								
EB LEFT	594	0	0	595	**140**	735	65	800
EB THRU	2	0	0	5	**0**	5	5	10
EB RIGHT	105	0	0	105	**0**	105	10	115
WB LEFT	0	0	0	0	**0**	0	0	0
WB THRU	0	0	0	0	**0**	0	0	0
WB RIGHT	0	0	0	0	**0**	0	0	0
WINDSOR AVE								
NB LEFT	0	0	0	0	**0**	0	0	0
NB THRU	194	0	0	195	**0**	195	20	215
NB RIGHT	16	0	0	15	**0**	15	5	20
SB LEFT	414	0	0	415	**0**	415	35	450
SB THRU	165	0	0	165	**0**	165	15	180
SB RIGHT	0	0	0	0	**0**	0	0	0
TOTALS	**1490**				**140**	**1635**	**155**	**1790**

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INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR
EAST-WEST STREET: I-210 EB RAMPS
JURISDICTION: PASADENA

DATE: 06-01-11

PEAK HOUR: 07:45AM

Windsor Ave (WB)
NORTH LEG

TOTAL: 606

TT = 5

TT% = 5/606 = 0.82% ≈ 1%

	~~191~~ 190	415	Total
	57	124	1st
	42	101	2nd
	42	95	3rd
	50	95	4th
Rt	Thru	Lt	

EAST LEG TOTAL: 0

Rt					
Thru					
Lt					
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
550	137	158	122	133	Lt
5	0	0	0	0	Thru
~~104~~ 105	31	21	29	23	Rt

WEST LEG TOTAL: 654

EB 210 Fwy

TT = 0

TT% = 0/654 = 0% ≈ 1%

PEAK HOUR FACTORS

NORTH LEG = 0.84
SOUTH LEG = 0.80
EAST LEG =
WEST LEG = 0.91

ALL LEGS = 0.93

	Lt	Thru	Rt
1st		28	2
2nd		39	8
3rd		32	9
4th		30	3
Total		~~129~~ 130	22 ~~20~~

TT = 0

TT% = 0/151 = 0% ≈ 1%

TOTAL: 151

SOUTH LEG
Windsor Ave (EB)

HOUR TOTAL: 1,411

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 EB RAMPS

TIME: 07:00AM-08:00AM DATE: 06-01-11

NORTH LEG

	137	463	Total
	19	83	1st
	27	123	2nd
	34	133	3rd
	57	124	4th
Rt	Thru	Lt	

Rt					
Thru					
Lt					
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
292	21	41	93	137	Lt
0	0	0	0	0	Thru
73	8	13	21	31	Rt

	Lt	Thru	Rt
1st		25	2
2nd		23	4
3rd		38	9
4th		28	2
Total		114	17

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 EB RAMPS

TIME: 08:00AM-09:00AM DATE: 06-01-11

NORTH LEG

	174	371	Total
	42	101	1st
	42	95	2nd
	50	95	3rd
	40	80	4th
	Rt	Thru	Lt

Rt					
Thru					
Lt					
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
540	158	122	133	127	Lt
1	0	0	0	1	Thru
103	21	29	23	30	Rt

	Lt	Thru	Rt
1st		39	8
2nd		32	9
3rd		30	3
4th		44	3
Total		145	23

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : WINDSOR PASADENA

EAST-WEST STREET : I-210 EB RAMPS 06-01-11

BEGINNING TIME : 07:00AM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
					WB NORTH LEG							
0	19	82	0	0	0	0	0	0	0	0	1	102
0	26	122	0	0	0	0	0	1	0	1	0	150
0	34	133	0	0	0	0	0	0	0	0	0	167
0	54	124	0	1	0	0	2	0	0	0	0	181
0	41	100	0	0	1	0	1	0	0	0	0	143
0	42	95	0	0	0	0	0	0	0	0	0	137
0	50	94	0	0	0	0	0	0	0	0	1	145
0	40	80	0	0 2	0	0	0 3	0	0	0 0	0	120
						TT= 2+3+0=5						
0	306	830	0	1	1	0	3	1	0	1	2	1145
					EB SOUTH LEG							
2	25	0	0	0	0	0	0	0	0	0	0	27
4	23	0	0	0	0	0	0	0	0	0	0	27
9	38	0	0	0	0	0	0	0	0	0	0	47
2	28	0	0	0	0	0	0	0	0	0	0	30
8	39	0	0	0	0	0	0	0	0	0	0	47
9	32	0	0	0	0	0	0	0	0	0	0	41
3	30	0	0	0	0	0	0	0	0	0	0	33
3	44	0	0	0 0	0	0	0 0	0	0	0 0	0	47
						TT= 0+0+0=0						
40	259	0	0	0	0	0	0	0	0	0	0	299
					EAST LEG							
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
					SB WEST LEG							
8	0	21	0	0	0	0	0	0	0	0	0	29
13	0	41	0	0	0	0	0	0	0	0	0	54
21	0	93	0	0	0	0	0	0	0	0	0	114
31	0	137	0	0	0	0	0	0	0	0	0	168
21	0	158	0	0	0	0	0	0	0	0	0	179
29	0	122	0	0	0	0	0	0	0	0	0	151
23	0	133	0	0	0	0	0	0	0	0	0	156
30	1	127	0	0 0	0	0	0 0	0	0	0 0	0	158
						TT= 0+0+0=0						
176	1	832	0	0	0	0	0	0	0	0	0	1009

Prepared by Newport Traffic Studies

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR
EAST-WEST STREET: I-210 EB RAMPS
JURISDICTION: PASADENA

DATE: 06-01-11

PEAK HOUR: 12:15PM

Windsor Ave (WB)
NORTH LEG

TOTAL: 393

TT = 6

TT% = 6/393 = 1.53% ≈ 2%

	100	293 (295)	Total
	30	66	1st
	28	71	2nd
	21	82	3rd
	21	74	4th
Rt	Thru	Lt	

EAST LEG TOTAL: 0

	1st	2nd	3rd	4th	Total
Rt					
Thru					
Lt					

Total	1st	2nd	3rd	4th	
319 (320)	74	89	78	78	Lt
2 (5)	0	1	0	1	Thru
53 (55)	12	13	11	17	Rt

WEST LEG TOTAL: 374
EB 210 Fwy

TT = 0

TT% = 0/374 = 0% ≈ 1%

PEAK HOUR FACTORS

NORTH LEG = 0.95
SOUTH LEG = 0.84
EAST LEG =
WEST LEG = 0.91

ALL LEGS = 0.97

	Lt	Thru	Rt
1st		42	6
2nd		31	6
3rd		35	1
4th		38	3
Total		146 (145)	16 (15)

TT = 2

TT% = 2/162 = 1.23% ≈ 1%

TOTAL: 162

SOUTH LEG
Windsor Ave (EB)

HOUR TOTAL: 929

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 EB RAMPS

TIME: 01:00PM-02:00PM DATE: 06-01-11

NORTH LEG

	81	297	Total
	21	74	1st
	23	82	2nd
	17	64	3rd
	20	77	4th

Rt Thru Lt

Rt					
Thru					
Lt					

1st 2nd 3rd 4th Total

Total	1st	2nd	3rd	4th	
312	78	73	89	72	Lt
1	1	0	0	0	Thru
52	17	14	11	10	Rt

	Lt	Thru	Rt
1st		38	3
2nd		24	4
3rd		28	3
4th		27	3
Total		117	13

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 EB RAMPS

TIME: 12:00PM-01:00PM DATE: 06-01-11

NORTH LEG

	100	267	Total
	21	48	1st
	30	66	2nd
	28	71	3rd
	21	82	4th
Rt	Thru	Lt	

Rt					
Thru					
Lt					
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
327	86	74	89	78	Lt
2	1	0	1	0	Thru
48	12	12	13	11	Rt

	Lt	Thru	Rt
1st		19	3
2nd		42	6
3rd		31	6
4th		35	1
Total		127	16

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : WINDSOR PASADENA

EAST-WEST STREET : I-210 EB RAMPS 06-01-11

BEGINNING TIME : 12:00PM

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
						WB NORTH LEG						
0	20	48	0	1	0	0	0	0	0	0	0	69
0	30	64	0	0	1	0	0	1	0	0	0	96
0	28	71	0	0	0	0	0	0	0	0	0	99
0	19	82	0	2	0	0	0	0	0	0	0	103
0	20	73	0	1	1	0	0	0	0	0	0	95
0	23	80	0	0	5 1	0	0	1 1	0	0	0 0	105
0	17	62	0	0	2	0	0	0	0	0	0	81
0	20	75	0	0	1	0	0	0	0	0	1	97
						TT= 5+1+0 = 6						
0	177	555	0	4	6	0	0	2	0	0	1	745
						EB SOUTH LEG						
3	19	0	0	0	0	0	0	0	0	0	0	22
6	42	0	0	0	0	0	0	0	0	0	0	48
5	31	0	1	0	0	0	0	0	0	0	0	37
1	34	0	0	1	0	0	0	0	0	0	0	36
3	38	0	0	0	0	0	0	0	0	0	0	41
4	24	0	0	0	2 0	0	0	0 0	0	0	0 0	28
3	27	0	0	1	0	0	0	0	0	0	0	31
3	27	0	0	0	0	0	0	0	0	0	0	30
						TT= 2+0+0 = 2						
28	242	0	1	2	0	0	0	0	0	0	0	273
						SB EAST LEG						
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
						WEST LEG						
12	1	86	0	0	0	0	0	0	0	0	0	99
12	0	74	0	0	0	0	0	0	0	0	0	86
13	1	89	0	0	0	0	0	0	0	0	0	103
11	0	78	0	0	0	0	0	0	0	0	0	89
17	1	78	0	0	0	0	0	0	0	0	0	96
14	0	73	0	0	0	0	0	0	0	0	0	87
11	0	89	0	0	0	0	0	0	0	0	0	100
10	0	72	0	0	0	0	0	0	0	0	0	82
						TT= 0+0+0 = 0						
100	3	639	0	0	0	0	0	0	0	0	0	742

Prepared by Newport Traffic Studies

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR/ ARROYO
EAST-WEST STREET: I-210 EB RAMPS
JURISDICTION: LA CANADA

DATE: 04-10-12

PEAK HOUR: 03:00PM

TOTAL: 443

NORTH LEG (SB)

	162	281	Total
	37	77	1st
	42	63	2nd
	44	71	3rd
	39	70	4th
Rt	Thru	Lt	

EAST LEG TOTAL: 0

	1st	2nd	3rd	4th	Total
Rt					
Thru					
Lt					

Total	1st	2nd	3rd	4th	
369	100	80	96	93	Lt
					Thru
50	8	11	16	15	Rt

WEST LEG TOTAL: 419
(EB)

PEAK HOUR FACTORS

NORTH LEG = 0.96
SOUTH LEG = 0.94
EAST LEG =
WEST LEG = 0.94

ALL LEGS = 0.95

	Lt	Thru	Rt
1st		36	6
2nd		44	3
3rd		41	5
4th		40	1
Total		161	15

TOTAL: 176

SOUTH LEG (NB)

HOUR TOTAL: 1,038

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR/ ARROYO

EAST-WEST STREET: I-210 EB RAMPS

TIME: 02:00PM-03:00PM DATE: 04-10-12

NORTH LEG

Rt	Thru	Lt	
	91	382	Total
	23	96	1st
	18	92	2nd
	27	93	3rd
	23	101	4th

	1st	2nd	3rd	4th	Total
Rt					
Thru					
Lt					

Total	1st	2nd	3rd	4th	
320	61	80	111	68	Lt
					Thru
41	9	14	10	8	Rt

	Lt	Thru	Rt
1st		36	2
2nd		27	5
3rd		22	3
4th		28	3
Total		113	13

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR/ ARROYO

EAST-WEST STREET: I-210 EB RAMPS

TIME: 03:00PM-04:00PM DATE: 04-10-12

NORTH LEG

	162	281	Total
	37	77	1st
	42	63	2nd
	44	71	3rd
	39	70	4th
	Rt	Thru	Lt

Rt					
Thru					
Lt					
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
369	100	80	96	93	Lt
					Thru
50	8	11	16	15	Rt

	Lt	Thru	Rt
1st		36	6
2nd		44	3
3rd		41	5
4th		40	1
Total		161	15

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURN COUNT

PEAK HOUR

NORTH-SOUTH STREET: WINDSOR
EAST-WEST STREET: I-210 EB RAMPS
JURISDICTION: PASADENA

DATE: 06-01-11

PEAK HOUR: 05:00PM

Windsor Ave (WB)

NORTH LEG

TOTAL: 579

	Rt	Thru	Lt	
		165	414 (415)	Total
		42	106	1st
		28	90	2nd
		40	109	3rd
		55	109	4th

TT = 0

TT% = 0/579 = 0% ≈ 1%

EAST LEG TOTAL: 0

	1st	2nd	3rd	4th	Total
Rt					
Thru					
Lt					

Total	1st	2nd	3rd	4th	
594 (595)	161	136	154	143	Lt
5 2	0	0	0	2	Thru
105	17	30	28	30	Rt

WEST LEG TOTAL: 701

EB 210 Fwy

TT = 2

TT% = 2/701 = 0.28% ≈ 1%

PEAK HOUR FACTORS

NORTH LEG = 0.88
SOUTH LEG = 0.73
EAST LEG =
WEST LEG = 0.96

ALL LEGS = 0.91

TT = 0

TT% = 0/210 = 0% ≈ 1%

	Lt	Thru	Rt	
1st		55	1	
2nd		33	6	
3rd		39	4	
4th		67	5	
Total		194 (195)	16 (15)	TOTAL: 210

SOUTH LEG

Windsor Ave (EB)

HOUR TOTAL: 1,490

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 EB RAMPS

TIME: 04:00PM-05:00PM DATE: 06-01-11

NORTH LEG

	158	332	Total
	38	85	1st
	41	67	2nd
	33	83	3rd
	46	97	4th
Rt	Thru	Lt	

Rt					
Thru					
Lt					
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
453	105	98	119	131	Lt
6	0	5	0	1	Thru
74	22	18	14	20	Rt

	Lt	Thru	Rt
1st		37	2
2nd		30	4
3rd		41	1
4th		48	7
Total		156	14

Prepared by NEWPORT TRAFFIC STUDIES

INTERSECTION TURNING COUNT

NORTH-SOUTH STREET: WINDSOR

EAST-WEST STREET: I-210 EB RAMPS

TIME: 05:00PM-06:00PM DATE: 06-01-11

NORTH LEG

	165	414	Total
	42	106	1st
	28	90	2nd
	40	109	3rd
	55	109	4th
Rt	Thru	Lt	

Rt					
Thru					
Lt					
	1st	2nd	3rd	4th	Total

Total	1st	2nd	3rd	4th	
594	161	136	154	143	Lt
2	0	0	0	2	Thru
105	17	30	28	30	Rt

	Lt	Thru	Rt
1st		55	1
2nd		33	6
3rd		39	4
4th		67	5
Total		194	16

Prepared by NEWPORT TRAFFIC STUDIES

SANBAG CLASSIFICATION SUMMARY

NORTH-SOUTH STREET : WINDSOR
EAST-WEST STREET : I-210 EB RAMPS
BEGINNING TIME : 04:00PM

PASADENA
06-01-11

AUTOS RT	AUTOS THRU	AUTOS LT	LARGE 2 AXLE RT	LARGE 2 AXLE THRU	LARGE 2 AXLE LT	3 AXLE RT	3 AXLE THRU	3 AXLE LT	4(+) AXLE RT	4(+) AXLE THRU	4(+) AXLE LT	TOTALS
					WB NORTH LEG							
0	38	85	0	0	0	0	0	0	0	0	0	123
0	41	67	0	0	0	0	0	0	0	0	0	108
0	33	82	0	0	1	0	0	0	0	0	0	116
0	46	97	0	0	0	0	0	0	0	0	0	143
0	42	106	0	0	0	0	0	0	0	0	0	148
0	28	90	0	0	0	0	0	0	0	0	0	118
0	40	109	0	0	0	0	0	0	0	0	0	149
0	55	109	0	0	0	0	0	0	0	0	0	164
						TT=0+0+0=0						
0	323	745	0	0	1	0	0	0	0	0	0	1069
					EB SOUTH LEG							
2	37	0	0	0	0	0	0	0	0	0	0	39
4	30	0	0	0	0	0	0	0	0	0	0	34
1	41	0	0	0	0	0	0	0	0	0	0	42
7	48	0	0	0	0	0	0	0	0	0	0	55
1	55	0	0	0	0	0	0	0	0	0	0	56
6	33	0	0	0	0	0	0	0	0	0	0	39
4	39	0	0	0	0	0	0	0	0	0	0	43
5	67	0	0	0	0	0	0	0	0	0	0	72
						TT=0+0+0=0						
30	350	0	0	0	0	0	0	0	0	0	0	380
					EAST LEG							
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
					SB WEST LEG							
22	0	105	0	0	0	0	0	0	0	0	0	127
18	4	97	0	1	1	0	0	0	0	0	0	121
14	0	119	0	0	0	0	0	0	0	0	0	133
20	1	130	0	0	1	0	0	0	0	0	0	152
17	0	161	0	0	2 0	0	0	0 0	0	0	0 0	178
30	0	136	0	0	0	0	0	0	0	0	0	166
28	0	154	0	0	0	0	0	0	0	0	0	182
30	2	143	0	0	0	0	0	0	0	0	0	175
						TT=2+0+0=2						
179	71	045	0	1	2	0	0	0	0	0	0	1234

Prepared by Newport Traffic Studies

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	550	5	105	0	0	0	0	130	20	415	190	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.95						0.98		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1662						3536		3335	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1662						3536		3335	1810	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	591	5	113	0	0	0	0	140	22	446	204	0
RTOR Reduction (vph)	0	32	0	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	361	316	0	0	0	0	0	147	0	446	204	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	14.6	14.6						17.3		9.8	31.1	
Effective Green, g (s)	14.6	14.6						17.3		9.8	31.1	
Actuated g/C Ratio	0.27	0.27						0.32		0.18	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	466	452						1139		609	1048	
v/s Ratio Prot								0.04		c0.13	c0.11	
v/s Ratio Perm	c0.21	0.19										
v/c Ratio	0.77	0.70						0.13		0.73	0.19	
Uniform Delay, d1	18.0	17.6						12.9		20.7	5.4	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	7.9	4.7						0.2		4.5	0.4	
Delay (s)	25.9	22.3						13.1		25.2	5.8	
Level of Service	C	C						B		C	A	
Approach Delay (s)		24.1			0.0			13.1			19.1	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	53.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

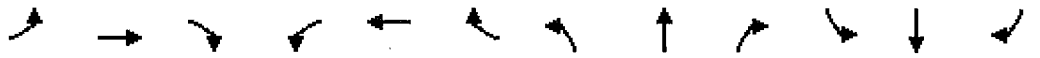
HCM Signalized Intersection Capacity Analysis
7: Windsor Ave & EB 210 Fwy

8/10/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	320	5	55	0	0	0	0	145	15	295	100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1669						3391		3335	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1669						3391		3335	1810	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	330	5	57	0	0	0	0	149	15	304	103	0
RTOR Reduction (vph)	0	33	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	198	161	0	0	0	0	0	154	0	304	103	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	10.7	10.7						16.1		6.0	26.1	
Effective Green, g (s)	10.7	10.7						16.1		6.0	26.1	
Actuated g/C Ratio	0.24	0.24						0.36		0.13	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	410	399						1219		447	1054	
v/s Ratio Prot								c0.05		c0.09	0.06	
v/s Ratio Perm	c0.12	0.10										
v/c Ratio	0.48	0.40						0.13		0.68	0.10	
Uniform Delay, d1	14.7	14.4						9.6		18.5	4.1	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.7						0.2		4.2	0.2	
Delay (s)	15.6	15.0						9.8		22.7	4.3	
Level of Service	B	B						A		C	A	
Approach Delay (s)		15.3			0.0			9.8			18.1	
Approach LOS		B			A			A			B	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	44.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	33.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	370	5	50	0	0	0	0	160	15	280	160	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1678						3393		3335	1810	
Flt Permitted	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1678						3393		3335	1810	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	389	5	53	0	0	0	0	168	16	295	168	0
RTOR Reduction (vph)	0	25	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	226	196	0	0	0	0	0	174	0	295	168	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	11.2	11.2						16.1		6.0	26.1	
Effective Green, g (s)	11.2	11.2						16.1		6.0	26.1	
Actuated g/C Ratio	0.25	0.25						0.36		0.13	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	424	415						1206		442	1043	
v/s Ratio Prot								0.05		c0.09	c0.09	
v/s Ratio Perm	c0.13	0.12										
v/c Ratio	0.53	0.47						0.14		0.67	0.16	
Uniform Delay, d1	14.8	14.5						9.9		18.7	4.5	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.9						0.3		3.8	0.3	
Delay (s)	16.1	15.4						10.2		22.5	4.8	
Level of Service	B	B						B		C	A	
Approach Delay (s)		15.7			0.0			10.2			16.1	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	14.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	45.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Windsor Ave & EB 210 Fwy

8/10/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	595	5	105	0	0	0	0	195	15	415	165	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.95						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1666						3572		3502	1900	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1666						3572		3502	1900	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	654	5	115	0	0	0	0	214	16	456	181	0
RTOR Reduction (vph)	0	27	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	392	355	0	0	0	0	0	221	0	456	181	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	17.3	17.3						17.5		10.6	32.1	
Effective Green, g (s)	17.3	17.3						17.5		10.6	32.1	
Actuated g/C Ratio	0.30	0.30						0.30		0.18	0.56	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	517	502						1089		647	1063	
v/s Ratio Prot								c0.06		c0.13	0.10	
v/s Ratio Perm	c0.23	0.21										
v/c Ratio	0.76	0.71						0.20		0.70	0.17	
Uniform Delay, d1	18.2	17.8						14.8		21.9	6.2	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	6.3	4.5						0.4		3.5	0.3	
Delay (s)	24.5	22.3						15.2		25.4	6.5	
Level of Service	C	C						B		C	A	
Approach Delay (s)		23.4			0.0			15.2			20.1	
Approach LOS		C			A			B			C	

Intersection Summary			
HCM Average Control Delay	20.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	57.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	550	5	105	0	0	0	0	130	20	470	190	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.95						0.98		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1662						3536		3045	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1662						3536		3045	1810	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	591	5	113	0	0	0	0	140	22	505	204	0
RTOR Reduction (vph)	0	32	0	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	361	316	0	0	0	0	0	147	0	505	204	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	15%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	14.6	14.6						17.1		10.0	31.1	
Effective Green, g (s)	14.6	14.6						17.1		10.0	31.1	
Actuated g/C Ratio	0.27	0.27						0.32		0.19	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	466	452						1126		567	1048	
v/s Ratio Prot								0.04		c0.17	c0.11	
v/s Ratio Perm	c0.21	0.19										
v/c Ratio	0.77	0.70						0.13		0.89	0.19	
Uniform Delay, d1	18.0	17.6						13.0		21.3	5.4	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	7.9	4.7						0.2		16.1	0.4	
Delay (s)	25.9	22.3						13.3		37.4	5.8	
Level of Service	C	C						B		D	A	
Approach Delay (s)		24.1			0.0			13.3			28.3	
Approach LOS		C			A			B			C	

Intersection Summary			
HCM Average Control Delay	24.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	53.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Windsor Ave & EB 210 Fwy

8/11/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	320	5	55	0	0	0	0	145	15	350	100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1669						3391		2943	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1669						3391		2943	1810	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	330	5	57	0	0	0	0	149	15	361	103	0
RTOR Reduction (vph)	0	33	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	198	161	0	0	0	0	0	154	0	361	103	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	5%	19%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	10.7	10.7						16.1		6.0	26.1	
Effective Green, g (s)	10.7	10.7						16.1		6.0	26.1	
Actuated g/C Ratio	0.24	0.24						0.36		0.13	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	410	399						1219		394	1054	
v/s Ratio Prot								c0.05		c0.12	0.06	
v/s Ratio Perm	c0.12	0.10										
v/c Ratio	0.48	0.40						0.13		0.92	0.10	
Uniform Delay, d1	14.7	14.4						9.6		19.2	4.1	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.7						0.2		25.5	0.2	
Delay (s)	15.6	15.0						9.8		44.7	4.3	
Level of Service	B	B						A		D	A	
Approach Delay (s)		15.3			0.0			9.8			35.7	
Approach LOS		B			A			A			D	

Intersection Summary			
HCM Average Control Delay	23.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	44.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Windsor Ave & EB 210 Fwy

8/11/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	370	5	50	0	0	0	0	160	15	335	160	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1678						3393		2943	1810	
Flt Permitted	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1678						3393		2943	1810	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	389	5	53	0	0	0	0	168	16	353	168	0
RTOR Reduction (vph)	0	25	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	226	196	0	0	0	0	0	174	0	353	168	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	5%	19%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	11.2	11.2						16.1		6.0	26.1	
Effective Green, g (s)	11.2	11.2						16.1		6.0	26.1	
Actuated g/C Ratio	0.25	0.25						0.36		0.13	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	424	415						1206		390	1043	
v/s Ratio Prot								0.05		c0.12	c0.09	
v/s Ratio Perm	c0.13	0.12										
v/c Ratio	0.53	0.47						0.14		0.91	0.16	
Uniform Delay, d1	14.8	14.5						9.9		19.4	4.5	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	1.3	0.9						0.3		23.8	0.3	
Delay (s)	16.1	15.4						10.2		43.1	4.8	
Level of Service	B	B						B		D	A	
Approach Delay (s)		15.7			0.0			10.2			30.8	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	45.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

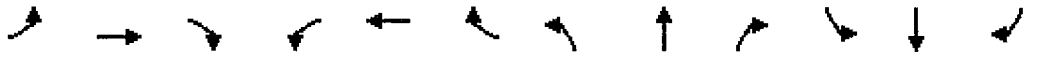
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	595	5	105	0	0	0	0	195	15	470	165	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.95						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1666						3572		3155	1900	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1666						3572		3155	1900	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	654	5	115	0	0	0	0	214	16	516	181	0
RTOR Reduction (vph)	0	27	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	392	355	0	0	0	0	0	221	0	516	181	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	11%	0%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	17.3	17.3						17.1		11.0	32.1	
Effective Green, g (s)	17.3	17.3						17.1		11.0	32.1	
Actuated g/C Ratio	0.30	0.30						0.30		0.19	0.56	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	517	502						1064		605	1063	
v/s Ratio Prot								c0.06		c0.16	0.10	
v/s Ratio Perm	c0.23	0.21										
v/c Ratio	0.76	0.71						0.21		0.85	0.17	
Uniform Delay, d1	18.2	17.8						15.1		22.4	6.2	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	6.3	4.5						0.4		11.2	0.3	
Delay (s)	24.5	22.3						15.5		33.6	6.5	
Level of Service	C	C						B		C	A	
Approach Delay (s)		23.4			0.0			15.5			26.6	
Approach LOS		C			A			B			C	

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	57.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	320	5	55	0	0	0	0	145	15	350	100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1669						3391		2943	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1669						3391		2943	1810	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	330	5	57	0	0	0	0	149	15	361	103	0
RTOR Reduction (vph)	0	33	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	198	161	0	0	0	0	0	154	0	361	103	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	5%	19%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	10.7	10.7						16.1		6.0	26.1	
Effective Green, g (s)	10.7	10.7						16.1		6.0	26.1	
Actuated g/C Ratio	0.24	0.24						0.36		0.13	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	410	399						1219		394	1054	
v/s Ratio Prot								c0.05		c0.12	0.06	
v/s Ratio Perm	c0.12	0.10										
v/c Ratio	0.48	0.40						0.13		0.92	0.10	
Uniform Delay, d1	14.7	14.4						9.6		19.2	4.1	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.7						0.2		25.5	0.2	
Delay (s)	15.6	15.0						9.8		44.7	4.3	
Level of Service	B	B						A		D	A	
Approach Delay (s)		15.3			0.0			9.8			35.7	
Approach LOS		B			A			A			D	

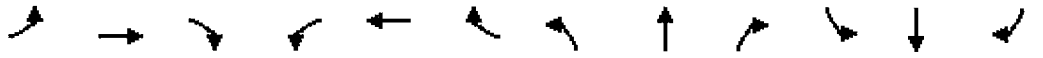
Intersection Summary			
HCM Average Control Delay	23.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	44.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	350	5	60	0	0	0	0	160	15	380	110	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1669						3395		2943	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1669						3395		2943	1810	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	361	5	62	0	0	0	0	165	15	392	113	0
RTOR Reduction (vph)	0	33	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	217	178	0	0	0	0	0	170	0	392	113	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	5%	19%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	11.0	11.0						16.1		6.0	26.1	
Effective Green, g (s)	11.0	11.0						16.1		6.0	26.1	
Actuated g/C Ratio	0.24	0.24						0.36		0.13	0.58	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	418	407						1212		392	1047	
v/s Ratio Prot								c0.05		c0.13	0.06	
v/s Ratio Perm	c0.13	0.11										
v/c Ratio	0.52	0.44						0.14		1.00	0.11	
Uniform Delay, d1	14.8	14.4						9.8		19.6	4.3	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.8						0.2		45.5	0.2	
Delay (s)	15.9	15.2						10.1		65.0	4.5	
Level of Service	B	B						B		E	A	
Approach Delay (s)		15.5			0.0			10.1			51.5	
Approach LOS		B			A			B			D	

Intersection Summary			
HCM Average Control Delay	30.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	45.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	405	5	55	0	0	0	0	175	15	365	175	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1678						3397		2943	1810	
Flt Permitted	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1678						3397		2943	1810	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	426	5	58	0	0	0	0	184	16	384	184	0
RTOR Reduction (vph)	0	25	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	247	217	0	0	0	0	0	190	0	384	184	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	5%	5%	19%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	11.8	11.8						16.1		6.0	26.1	
Effective Green, g (s)	11.8	11.8						16.1		6.0	26.1	
Actuated g/C Ratio	0.26	0.26						0.35		0.13	0.57	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	441	431						1192		385	1029	
v/s Ratio Prot								0.06		c0.13	c0.10	
v/s Ratio Perm	c0.14	0.13										
v/c Ratio	0.56	0.50						0.16		1.00	0.18	
Uniform Delay, d1	14.8	14.6						10.2		19.9	4.8	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	1.6	0.9						0.3		44.9	0.4	
Delay (s)	16.4	15.5						10.5		64.8	5.1	
Level of Service	B	B						B		E	A	
Approach Delay (s)		16.0			0.0			10.5			45.5	
Approach LOS		B			A			B			D	

Intersection Summary			
HCM Average Control Delay	28.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	45.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

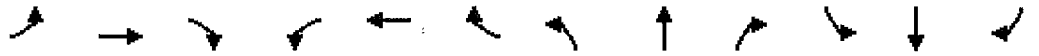
HCM Signalized Intersection Capacity Analysis
7: Windsor Ave & EB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	650	5	115	0	0	0	0	215	15	510	180	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.95						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1715	1666						3576		3155	1900	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1715	1666						3576		3155	1900	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	714	5	126	0	0	0	0	236	16	560	198	0
RTOR Reduction (vph)	0	27	0	0	0	0	0	8	0	0	0	0
Lane Group Flow (vph)	428	390	0	0	0	0	0	244	0	560	198	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	11%	0%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	18.1	18.1						17.1		11.0	32.1	
Effective Green, g (s)	18.1	18.1						17.1		11.0	32.1	
Actuated g/C Ratio	0.31	0.31						0.29		0.19	0.55	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	533	518						1051		596	1048	
v/s Ratio Prot								c0.07		c0.18	0.10	
v/s Ratio Perm	c0.25	0.23										
v/c Ratio	0.80	0.75						0.23		0.94	0.19	
Uniform Delay, d1	18.4	18.0						15.6		23.3	6.5	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	8.5	6.1						0.5		22.7	0.4	
Delay (s)	27.0	24.2						16.1		46.0	6.9	
Level of Service	C	C						B		D	A	
Approach Delay (s)		25.6			0.0			16.1			35.8	
Approach LOS		C			A			B			D	

Intersection Summary			
HCM Average Control Delay	28.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	58.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

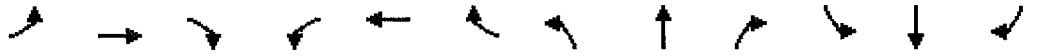
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	605	5	105	0	0	0	0	130	20	415	190	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.98		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1588	1580						3536		3335	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1588	1580						3536		3335	1810	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	651	5	113	0	0	0	0	140	22	446	204	0
RTOR Reduction (vph)	0	28	0	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	391	350	0	0	0	0	0	147	0	446	204	0
Heavy Vehicles (%)	8%	0%	0%	0%	0%	0%	0%	0%	0%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	15.4	15.4						17.2		9.8	31.0	
Effective Green, g (s)	15.4	15.4						17.2		9.8	31.0	
Actuated g/C Ratio	0.28	0.28						0.32		0.18	0.57	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	450	447						1118		601	1031	
v/s Ratio Prot								0.04		c0.13	c0.11	
v/s Ratio Perm	c0.25	0.22										
v/c Ratio	0.87	0.78						0.13		0.74	0.20	
Uniform Delay, d1	18.5	18.0						13.3		21.1	5.7	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	16.1	8.7						0.2		4.9	0.4	
Delay (s)	34.7	26.7						13.5		26.0	6.1	
Level of Service	C	C						B		C	A	
Approach Delay (s)		30.7			0.0			13.5			19.8	
Approach LOS		C			A			B			B	

Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	54.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	46.2%	ICU Level of Service	A
Analysis Period (min)	15		

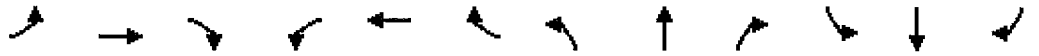
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	375	5	55	0	0	0	0	145	15	295	100	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1504	1522						3391		3335	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1504	1522						3391		3335	1810	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	387	5	57	0	0	0	0	149	15	304	103	0
RTOR Reduction (vph)	0	27	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	228	194	0	0	0	0	0	154	0	304	103	0
Heavy Vehicles (%)	14%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	11.9	11.9						16.1		6.0	26.1	
Effective Green, g (s)	11.9	11.9						16.1		6.0	26.1	
Actuated g/C Ratio	0.26	0.26						0.35		0.13	0.57	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	389	394						1187		435	1027	
v/s Ratio Prot								c0.05		c0.09	0.06	
v/s Ratio Perm	c0.15	0.13										
v/c Ratio	0.59	0.49						0.13		0.70	0.10	
Uniform Delay, d1	14.9	14.5						10.2		19.1	4.6	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	2.3	1.0						0.2		4.9	0.2	
Delay (s)	17.2	15.4						10.4		24.0	4.8	
Level of Service	B	B						B		C	A	
Approach Delay (s)		16.3			0.0			10.4			19.1	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	46.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.1%	ICU Level of Service	A
Analysis Period (min)	15		

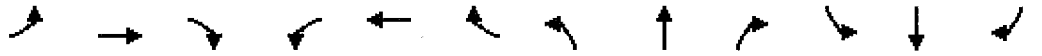
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	425	5	50	0	0	0	0	160	15	280	160	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.97						0.99		1.00	1.00	
Flt Protected	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (prot)	1531	1541						3393		3335	1810	
Flt Permitted	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (perm)	1531	1541						3393		3335	1810	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	447	5	53	0	0	0	0	168	16	295	168	0
RTOR Reduction (vph)	0	20	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	255	230	0	0	0	0	0	174	0	295	168	0
Heavy Vehicles (%)	12%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	12.5	12.5						16.1		6.0	26.1	
Effective Green, g (s)	12.5	12.5						16.1		6.0	26.1	
Actuated g/C Ratio	0.27	0.27						0.35		0.13	0.56	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	411	413						1172		429	1014	
v/s Ratio Prot								0.05		c0.09	c0.09	
v/s Ratio Perm	c0.17	0.15										
v/c Ratio	0.62	0.56						0.15		0.69	0.17	
Uniform Delay, d1	15.0	14.7						10.5		19.4	5.0	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	2.9	1.6						0.3		4.5	0.4	
Delay (s)	17.9	16.3						10.8		23.9	5.3	
Level of Service	B	B						B		C	A	
Approach Delay (s)		17.1			0.0			10.8			17.2	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	46.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	650	5	105	0	0	0	0	195	15	415	165	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1588	1581						3572		3502	1900	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1588	1581						3572		3502	1900	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	714	5	115	0	0	0	0	214	16	456	181	0
RTOR Reduction (vph)	0	24	0	0	0	0	0	9	0	0	0	0
Lane Group Flow (vph)	421	389	0	0	0	0	0	221	0	456	181	0
Heavy Vehicles (%)	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	18.5	18.5						17.5		10.6	32.1	
Effective Green, g (s)	18.5	18.5						17.5		10.6	32.1	
Actuated g/C Ratio	0.32	0.32						0.30		0.18	0.55	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	501	499						1067		633	1041	
v/s Ratio Prot								c0.06		c0.13	0.10	
v/s Ratio Perm	c0.27	0.25										
v/c Ratio	0.84	0.78						0.21		0.72	0.17	
Uniform Delay, d1	18.7	18.2						15.4		22.6	6.6	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	12.0	7.6						0.4		4.0	0.4	
Delay (s)	30.7	25.8						15.8		26.6	7.0	
Level of Service	C	C						B		C	A	
Approach Delay (s)		28.3			0.0			15.8			21.1	
Approach LOS		C			A			B			C	

Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	58.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Windsor Ave & EB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	660	5	115	0	0	0	0	140	20	450	205	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.95						0.98		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1588	1580						3541		3335	1810	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1588	1580						3541		3335	1810	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	710	5	124	0	0	0	0	151	22	484	220	0
RTOR Reduction (vph)	0	28	0	0	0	0	0	15	0	0	0	0
Lane Group Flow (vph)	426	385	0	0	0	0	0	158	0	484	220	0
Heavy Vehicles (%)	8%	0%	0%	0%	0%	0%	0%	0%	0%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	15.9	15.9						17.0		10.0	31.0	
Effective Green, g (s)	15.9	15.9						17.0		10.0	31.0	
Actuated g/C Ratio	0.29	0.29						0.31		0.18	0.56	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	460	458						1096		607	1022	
v/s Ratio Prot								0.04		c0.15	c0.12	
v/s Ratio Perm	c0.27	0.24										
v/c Ratio	0.93	0.84						0.14		0.80	0.22	
Uniform Delay, d1	18.9	18.3						13.7		21.5	5.9	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	24.6	12.7						0.3		7.2	0.5	
Delay (s)	43.5	31.0						14.0		28.7	6.4	
Level of Service	D	C						B		C	A	
Approach Delay (s)		37.4			0.0			14.0			21.7	
Approach LOS		D			A			B			C	

Intersection Summary			
HCM Average Control Delay	28.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	54.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
7: Windsor Ave & EB 210 Fwy

8/14/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	425	5	50	0	0	0	0	160	15	280	160	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.97						0.99		1.00	1.00	
Flt Protected	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (prot)	1531	1541						3393		3335	1810	
Flt Permitted	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (perm)	1531	1541						3393		3335	1810	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	447	5	53	0	0	0	0	168	16	295	168	0
RTOR Reduction (vph)	0	20	0	0	0	0	0	10	0	0	0	0
Lane Group Flow (vph)	255	230	0	0	0	0	0	174	0	295	168	0
Heavy Vehicles (%)	12%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	12.5	12.5						16.1		6.0	26.1	
Effective Green, g (s)	12.5	12.5						16.1		6.0	26.1	
Actuated g/C Ratio	0.27	0.27						0.35		0.13	0.56	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	411	413						1172		429	1014	
v/s Ratio Prot								0.05		c0.09	c0.09	
v/s Ratio Perm	c0.17	0.15										
v/c Ratio	0.62	0.56						0.15		0.69	0.17	
Uniform Delay, d1	15.0	14.7						10.5		19.4	5.0	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	2.9	1.6						0.3		4.5	0.4	
Delay (s)	17.9	16.3						10.8		23.9	5.3	
Level of Service	B	B						B		C	A	
Approach Delay (s)		17.1			0.0			10.8			17.2	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	16.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	46.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	465	5	55	0	0	0	0	175	15	305	175	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.97						0.99		1.00	1.00	
Flt Protected	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (prot)	1531	1541						3397		3335	1810	
Flt Permitted	0.95	0.96						1.00		0.95	1.00	
Satd. Flow (perm)	1531	1541						3397		3335	1810	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	489	5	58	0	0	0	0	184	16	321	184	0
RTOR Reduction (vph)	0	21	0	0	0	0	0	11	0	0	0	0
Lane Group Flow (vph)	279	252	0	0	0	0	0	189	0	321	184	0
Heavy Vehicles (%)	12%	0%	0%	0%	0%	0%	0%	5%	5%	5%	5%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	13.0	13.0						16.1		6.0	26.1	
Effective Green, g (s)	13.0	13.0						16.1		6.0	26.1	
Actuated g/C Ratio	0.28	0.28						0.34		0.13	0.55	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	423	425						1161		425	1003	
v/s Ratio Prot								0.06		c0.10	c0.10	
v/s Ratio Perm	c0.18	0.16										
v/c Ratio	0.66	0.59						0.16		0.76	0.18	
Uniform Delay, d1	15.1	14.8						10.8		19.8	5.2	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	3.7	2.2						0.3		7.5	0.4	
Delay (s)	18.8	17.0						11.1		27.3	5.6	
Level of Service	B	B						B		C	A	
Approach Delay (s)		17.9			0.0			11.1			19.4	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	47.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	38.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	710	5	115	0	0	0	0	215	15	450	180	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0						4.0		4.0	4.0	
Lane Util. Factor	0.95	0.95						0.95		0.97	1.00	
Frt	1.00	0.96						0.99		1.00	1.00	
Flt Protected	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (prot)	1588	1580						3576		3502	1900	
Flt Permitted	0.95	0.97						1.00		0.95	1.00	
Satd. Flow (perm)	1588	1580						3576		3502	1900	
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	780	5	126	0	0	0	0	236	16	495	198	0
RTOR Reduction (vph)	0	24	0	0	0	0	0	8	0	0	0	0
Lane Group Flow (vph)	460	427	0	0	0	0	0	244	0	495	198	0
Heavy Vehicles (%)	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA						NA		Prot	NA	
Protected Phases		4						2		1	6	
Permitted Phases	4											
Actuated Green, G (s)	19.3	19.3						17.2		10.8	32.0	
Effective Green, g (s)	19.3	19.3						17.2		10.8	32.0	
Actuated g/C Ratio	0.33	0.33						0.29		0.18	0.54	
Clearance Time (s)	4.0	4.0						4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0						3.0		3.0	3.0	
Lane Grp Cap (vph)	517	514						1037		638	1025	
v/s Ratio Prot								c0.07		c0.14	0.10	
v/s Ratio Perm	c0.29	0.27										
v/c Ratio	0.89	0.83						0.24		0.78	0.19	
Uniform Delay, d1	19.0	18.5						16.0		23.1	7.0	
Progression Factor	1.00	1.00						1.00		1.00	1.00	
Incremental Delay, d2	16.9	11.0						0.5		5.9	0.4	
Delay (s)	35.9	29.5						16.6		29.0	7.4	
Level of Service	D	C						B		C	A	
Approach Delay (s)		32.7			0.0			16.6			22.8	
Approach LOS		C			A			B			C	

Intersection Summary			
HCM Average Control Delay	26.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	59.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

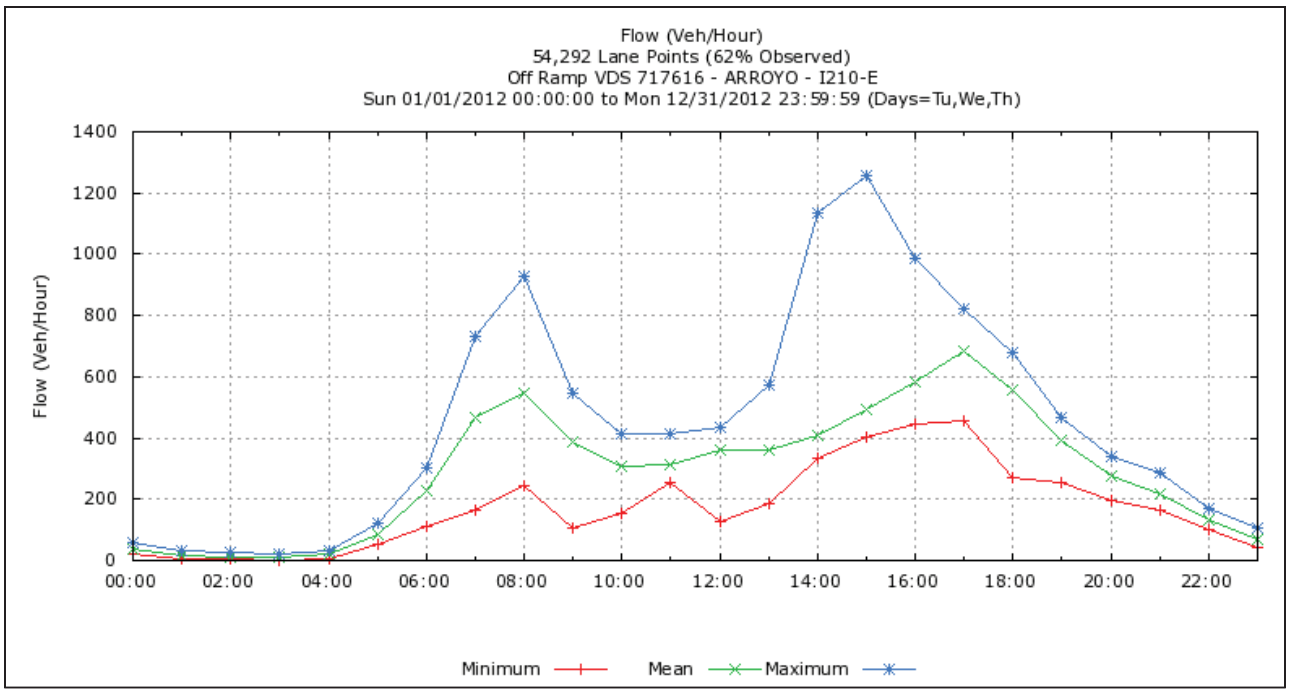
- ***Caltrans Data and Traffic Growth Factor Analysis***

Caltrans Traffic Data accecced at
https://dot.ca.gov/programs/traffic-operations/census

07	210	LA	R	0	LOS ANGELES, JCT. RTE. 5				7300	91000	84000	
07	210	LA	R	0.843	LOS ANGELES, YARNELL STREET	7300	91000	84000	7000	89000	82000	
07	210	LA	R	1.924	LOS ANGELES, ROXFORD STREET	7000	89000	82000	6900	88000	82000	
07	210	LA	R	3.275	LOS ANGELES, POLK STREET	6900	88000	82000	8300	98000	95000	
07	210	LA	R	4.110	LOS ANGELES, HUBBARD STREET	8300	98000	95000	10000	127000	117000	
07	210	LA	R	4.936	LOS ANGELES, MACLAY STREET	10000	127000	117000	11400	142000	131000	
07	210	LA	R	5.911	LOS ANGELES, JCT. RTE. 118	11400	142000	131000	12000	131000	129000	
07	210	LA	R	7.822	LOS ANGELES, OSBORNE STREET/FOOTHILL BLVD	12000	131000	129000	12100	132000	126000	
07	210	LA	R	9.444	LOS ANGELES, WHEATLAND AVENUE	12100	132000	126000	12000	132000	127000	
07	210	LA	R	11.084	LOS ANGELES, SUNLAND BOULEVARD	12000	132000	127000	11300	125000	120000	
07	210	LA	R	14.173	LOS ANGELES,LA TUNA CANYON ROAD	11300	125000	120000	11800	132000	127000	
07	210	LA	R	15.619	GLENDALE, LOWELL AVENUE	11800	132000	127000	15300	165000	156000	
07	210	LA	R	16.773	GLENDALE, PENNSYLVANIA AVENUE	15300	165000	156000	16100	174000	166000	
07	210	LA	R	17.383	LA CRESCENTA AVENUE	16100	174000	166000	17900	194000	186000	
07	210	LA	R	18.872	LA CANADA-FLINTRIDGE, WEST JCT. RTE. 2	17900	194000	186000	12000	133000	131000	
07	210	LA	R	19.881	LA CANADA-FLINTRIDGE, EAST JCT. RTE. 2	12000	133000	131000	14100	128000	126000	
07	210	LA	R	20.600	LA CANADA-FLINTRIDGE, GOULD AVE/FOOTHILL BLVD	14100	128000	126000	12600	116000	114000	
07	210	LA	R	20.854	LA CANADA-FLINTRIDGE, HAMPTON AVE/FOOTHILL BLVD	12600	116000	114000	13800	130000	127000	
07	210	LA	R	21.532	LA CANADA-FLINTRIDGE, BERKSHIRE PLACE	13800	130000	127000	13300	128000	125000	
07	210	LA	R	22.494	PASADENA, ARROYO BOULEVARD	13300	128000	125000	12400	121000	119000	
07	210	LA	R	23.191	PASADENA, LINCOLN BOULEVARD	12400	121000	119000	14000	139000	136000	
07	210	LA	R	24.060	PASADENA, MOUNTAIN STREET	14000	139000	136000	14000	146000	143000	
07	210	LA	R	24.962	PASADENA, JCT. RTES. 134/710	14000	146000	143000	23600	339000	329000	
07	210	LA	R	26.326	PASADENA, LAKE AVENUE	23600	339000	329000	22500	341000	331000	
07	210	LA	R	26.941	PASADENA, HILL AVENUE	22500	341000	331000	20200	324000	313000	
07	210	LA	R	27.409	PASADENA, ALLEN AVENUE	20200	324000	313000	21200	337000	325000	
07	210	LA	R	28.249	PASADENA, ALTADENA DRIVE	21200	337000	325000	19700	315000	303000	
07	210	LA	R	28.680	PASADENA, SAN GABRIEL BOULEVARD	19700	315000	303000	20100	316000	301000	
07	210	LA	R	29.293	PASADENA, SIERRA MADRE VILLA	20100	316000	301000	19200	301000	285000	
07	210	LA	R	29.486	PASADENA, ROSEMEAD BOULEVARD	19200	301000	285000	19600	283000	274000	

Caltrans Traffic Data accecced at
https://dot.ca.gov/programs/traffic-operations/census

DISTRICT	RTE	RTE_SFX	CNTY	PM_PFX	PM	PM_SFX	DESCRIPTION	BACK_PEAK_HOUR	BACK_PEAK_MADT	BACK_AADT	AHEAD_PEAK_HOUR	AHEAD_PEAK_MADT	AHEAD_AADT
12	605		ORA		3.092		SEAL BEACH, JCT. RTE. 22				3250	47000	44700
12	605		ORA	R	0		JCT. RTE. 405	3250	47000	44700	11700	172000	162400
12	605		ORA	R	1.405		LOS ALAMITOS, KATELLA AVENUE	11600	169000	159800	14100	173000	167000
12	605		ORA	R	1.643		ORANGE/LOS ANGELES COUNTY LINE	14800	177000	170000			
07	605		LA	R	0		ORANGE/LOS ANGELES COUNTY LINE				14800	177000	170000
07	605		LA	R	0.287		LONG BEACH, SPRING STREET	14800	177000	170000	15400	195000	187000
07	605		LA	R	1.740		LAKEWOOD, CARSON STREET	15400	195000	187000	15700	208000	202000
07	605		LA	R	2.866		CERRITOS, DEL AMO BOULEVARD	15700	208000	202000	17500	224000	218000
07	605		LA	R	3.753		CERRITOS, SOUTH STREET	17500	224000	218000	18900	253000	246000
07	605		LA	R	5.046		CERRITOS, JCT. RTE. 91	18900	253000	246000	21500	307000	301000
07	605		LA	R	5.811		NORWALK, ALONDRA BOULEVARD	21500	307000	301000	20900	309000	303000
07	605		LA	R	7.653		NORWALK, JCT. RTE. 105	20900	309000	303000	18100	317000	299000
07	605		LA	R	9.612		SANTA FE SPRINGS, JCT. RTE. 5	18100	317000	299000	17400	268000	248000
07	605		LA	R	10.245		SANTA FE SPRINGS, TELEGRAPH ROAD	17400	268000	248000	15900	245000	227000
07	605		LA	R	11.543		SLAUSON AVENUE	15900	245000	227000	16400	249000	230000
07	605		LA	R	12.048		WASHINGTON BOULEVARD	16400	249000	230000	17300	260000	240000
07	605		LA	R	13.569		WHITTIER, JCT. RTE. 72	17300	260000	240000	15700	260000	248000
07	605		LA	R	14.407		PICO RIVERA, BEVERLY BOULEVARD	15700	260000	248000	16300	264000	252000
07	605		LA	R	15.565		PICO RIVERA, ROSE HILLS ROAD	16300	264000	252000	17000	271000	259000
07	605		LA	R	16.648		INDUSTRY, PECK ROAD	17000	271000	259000	16100	264000	253000
07	605		LA	R	17.407		INDUSTRY, JCT. RTE. 60	16100	264000	253000	15200	240000	230000
07	605		LA	R	19.389		INDUSTRY, VALLEY BOULEVARD	15200	240000	230000	16500	249000	238000
07	605		LA	R	20.189		BALDWIN PARK, JCT. RTE. 10	16500	249000	238000	14100	201000	197000
07	605		LA		21.074		BALDWIN PARK, RAMONA BOULEVARD	14100	201000	197000	13800	194000	190000
07	605		LA		22.153		IRWINDALE, LOWER AZUSA ROAD/LOS ANGELES STREET	13800	194000	190000	13100	180000	176000
07	605		LA		23.515		IRWINDALE, LIVE OAK AVENUE	13100	180000	176000	13400	148000	146000
07	605		LA		23.958		IRWINDALE, ARROW HIGHWAY	13400	148000	146000	14600	161000	160000
07	605		LA		26		JCT. RTE. 210	14600	161000	160000			


Flow (Veh/Hour)
54,292 Lane Points (62% Observed)
Off Ramp VDS 717616 - ARROYO - I210-E
Sun 01/01/2012 00:00:00 to Mon 12/31/2012 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1400
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

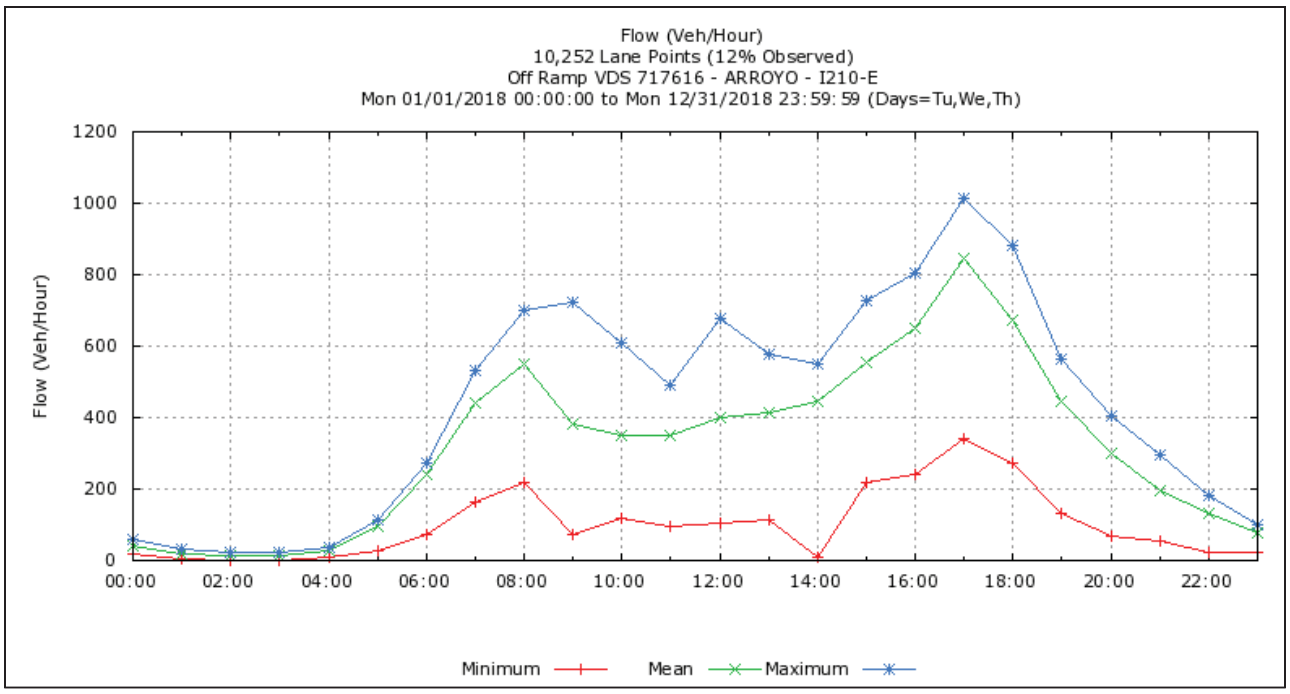
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	19.00	35.26	58.00	3,672	61.9
01:00	3.00	17.83	33.00	3,672	61.8
02:00	6.00	12.79	25.00	3,672	62.1
03:00	2.00	9.16	20.00	3,672	61.8
04:00	6.00	20.59	33.00	3,672	61.4
05:00	52.00	87.34	120.00	3,672	61.8
06:00	112.00	229.47	301.00	3,672	62.0
07:00	164.00	468.01	733.00	3,672	61.8
08:00	246.00	548.58	929.00	3,672	60.8
09:00	107.00	386.69	545.00	3,672	60.8
10:00	155.00	310.22	411.00	3,672	61.0
11:00	253.00	314.21	416.00	3,672	61.3
12:00	125.00	359.32	433.00	3,672	61.0
13:00	184.00	358.74	574.00	3,672	61.1
14:00	334.00	406.22	1,136.00	3,672	61.4
15:00	403.00	493.65	1,257.00	3,672	61.4
16:00	448.00	580.70	985.00	3,672	61.4
17:00	457.00	682.36	821.00	3,672	61.4
18:00	272.00	559.25	677.00	3,672	61.8
19:00	252.00	390.45	466.00	3,672	62.1
20:00	197.00	278.26	340.00	3,672	62.1
21:00	162.00	217.43	287.00	3,672	62.1
22:00	99.00	133.22	170.00	3,672	62.1
23:00	40.00	68.46	108.00	3,672	62.0

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=717616&s_time_id=1325376000&s_time_id_f=01%2F01%2F2012&e_time_id=1356998340&e_time_id_f=12%2F31%2F2012&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 12:04
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	88,128 Lane Points
Data Quality	61.6% Observed
Segment Type	VDS
Segment Name	Off Ramp VDS 717616 - ARROYO
start date	01/01/2012 00:00:00
end date	12/31/2012 23:59:59


Flow (Veh/Hour)
10,252 Lane Points (12% Observed)
Off Ramp VDS 717616 - ARROYO - I210-E
Mon 01/01/2018 00:00:00 to Mon 12/31/2018 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

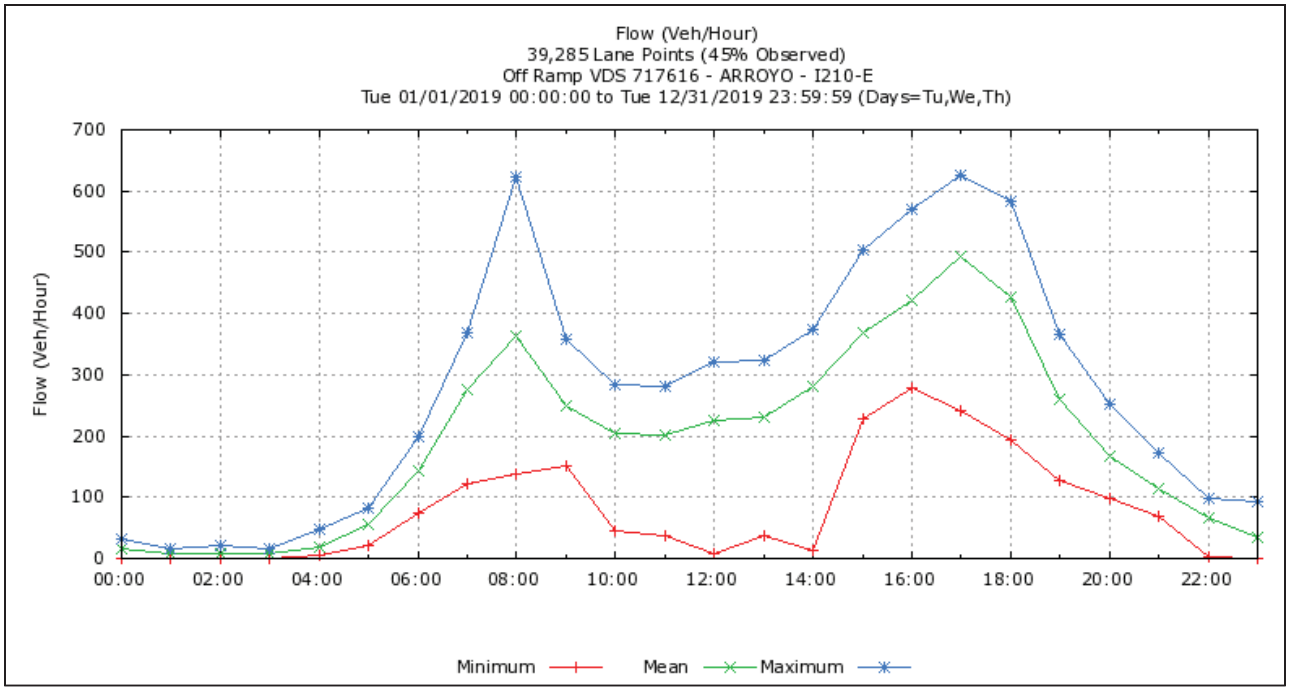
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	16.00	39.00	59.00	3,672	12.1
01:00	6.00	20.21	30.00	3,670	12.1
02:00	1.00	14.00	22.00	3,670	12.0
03:00	1.00	15.79	23.00	3,672	12.1
04:00	8.00	28.84	37.00	3,670	12.0
05:00	29.00	93.32	113.00	3,672	12.1
06:00	74.00	239.16	274.00	3,672	12.1
07:00	162.00	443.16	534.00	3,670	12.1
08:00	219.00	550.95	699.00	3,672	12.1
09:00	74.00	383.37	724.00	3,672	11.2
10:00	120.00	351.16	610.00	3,672	11.7
11:00	94.00	351.63	491.00	3,672	12.0
12:00	103.00	401.42	678.00	3,670	12.1
13:00	114.00	413.00	579.00	3,672	12.1
14:00	8.00	444.05	551.00	3,672	11.5
15:00	217.00	556.39	725.00	3,672	11.4
16:00	241.00	649.67	806.00	3,670	11.2
17:00	339.00	846.18	1,013.00	3,672	10.7
18:00	272.00	670.89	880.00	3,672	11.1
19:00	133.00	446.50	563.00	3,672	11.4
20:00	67.00	298.83	406.00	3,672	11.4
21:00	54.00	194.61	295.00	3,672	11.1
22:00	24.00	133.35	181.00	3,672	10.8
23:00	22.00	78.12	100.00	3,672	10.8

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=717616&s_time_id=1514764800&s_time_id_f=01%2F01%2F2018&e_time_id=1546300740&e_time_id_f=12%2F31%2F2018&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 13:21
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	88,116 Lane Points
Data Quality	11.6% Observed
Segment Type	VDS
Segment Name	Off Ramp VDS 717616 - ARROYO
start date	01/01/2018 00:00:00
end date	12/31/2018 23:59:59


Flow (Veh/Hour)
39,285 Lane Points (45% Observed)
Off Ramp VDS 717616 - ARROYO - I210-E
Tue 01/01/2019 00:00:00 to Tue 12/31/2019 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
700
600
500
400
300
200
100
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

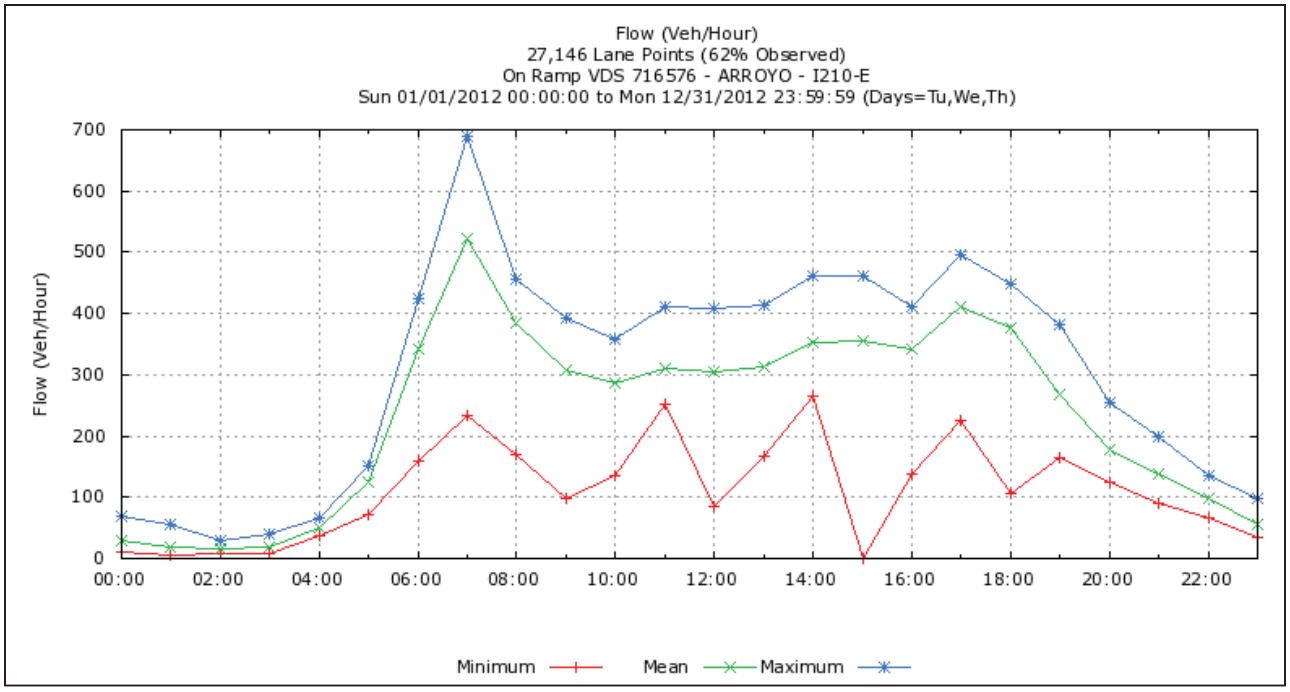
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	0.00	16.40	33.00	3,672	45.0
01:00	1.00	7.94	17.00	3,672	45.0
02:00	0.00	7.82	22.00	3,672	45.1
03:00	0.00	6.76	17.00	3,670	45.0
04:00	5.00	18.63	48.00	3,672	45.0
05:00	21.00	55.70	83.00	3,670	45.0
06:00	73.00	144.22	199.00	3,670	44.9
07:00	123.00	274.86	368.00	3,672	45.0
08:00	139.00	364.12	624.00	3,672	45.0
09:00	152.00	248.83	359.00	3,672	44.4
10:00	44.00	204.46	284.00	3,672	43.6
11:00	36.00	200.61	280.00	3,672	43.4
12:00	8.00	224.95	321.00	3,670	43.8
13:00	36.00	230.19	323.00	3,668	44.0
14:00	13.00	282.18	375.00	3,672	44.3
15:00	229.00	368.36	505.00	3,672	44.5
16:00	279.00	422.20	571.00	3,672	44.6
17:00	240.00	494.43	625.00	3,672	44.6
18:00	193.00	425.72	583.00	3,672	44.6
19:00	126.00	259.42	365.00	3,670	44.7
20:00	97.00	167.46	252.00	3,672	44.6
21:00	68.00	112.92	173.00	3,672	44.5
22:00	2.00	66.85	99.00	3,668	44.7
23:00	0.00	35.61	93.00	3,672	44.7

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=717616&s_time_id=1546300800&s_time_id_f=01%2F01%2F2019&e_time_id=1577836740&e_time_id_f=12%2F31%2F2019&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/23/2020 14:47
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	88,110 Lane Points
Data Quality	44.6% Observed
Segment Type	VDS
Segment Name	Off Ramp VDS 717616 - ARROYO
start date	01/01/2019 00:00:00
end date	12/31/2019 23:59:59


Flow (Veh/Hour)
27,146 Lane Points (62% Observed)
On Ramp VDS 716576 - ARROYO - I210-E
Sun 01/01/2012 00:00:00 to Mon 12/31/2012 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
700
600
500
400
300
200
100
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

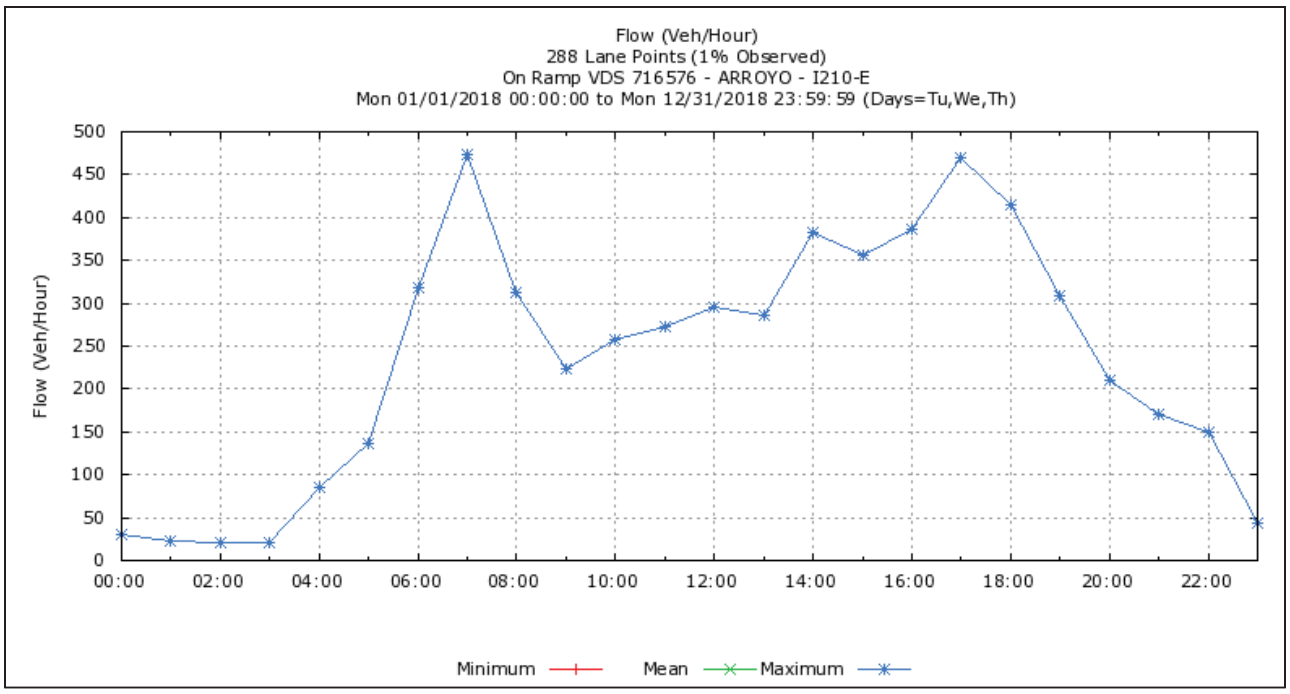
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	11.00	29.59	70.00	1,836	61.9
01:00	6.00	18.86	55.00	1,836	61.8
02:00	7.00	15.71	29.00	1,836	62.1
03:00	9.00	19.51	41.00	1,836	61.8
04:00	36.00	49.18	66.00	1,836	61.4
05:00	71.00	124.69	152.00	1,836	61.8
06:00	160.00	341.98	423.00	1,836	62.0
07:00	234.00	522.67	689.00	1,836	61.8
08:00	170.00	383.31	457.00	1,836	60.8
09:00	98.00	307.53	393.00	1,836	60.8
10:00	136.00	287.54	359.00	1,836	61.0
11:00	252.00	311.27	412.00	1,836	61.3
12:00	86.00	303.84	408.00	1,836	61.0
13:00	167.00	312.86	414.00	1,836	61.1
14:00	266.00	353.69	462.00	1,836	61.4
15:00	0.00	354.62	461.00	1,836	61.4
16:00	137.00	341.22	411.00	1,836	61.4
17:00	226.00	411.26	495.00	1,836	61.4
18:00	106.00	375.35	448.00	1,836	61.8
19:00	165.00	269.03	383.00	1,836	62.1
20:00	125.00	178.46	254.00	1,836	62.1
21:00	91.00	138.25	198.00	1,836	62.1
22:00	67.00	98.07	134.00	1,836	62.1
23:00	35.00	54.60	98.00	1,836	62.0

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716576&s_time_id=1325376000&s_time_id_f=01%2F01%2F2012&e_time_id=1356998340&e_time_id_f=12%2F31%2F2012&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 12:04
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,064 Lane Points
Data Quality	61.6% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716576 - ARROYO
start date	01/01/2012 00:00:00
end date	12/31/2012 23:59:59


Flow (Veh/Hour)
288 Lane Points (1% Observed)
On Ramp VDS 716576 - ARROYO - I210-E
Mon 01/01/2018 00:00:00 to Mon 12/31/2018 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
500
450
400
350
300
250
200
150
100
50
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

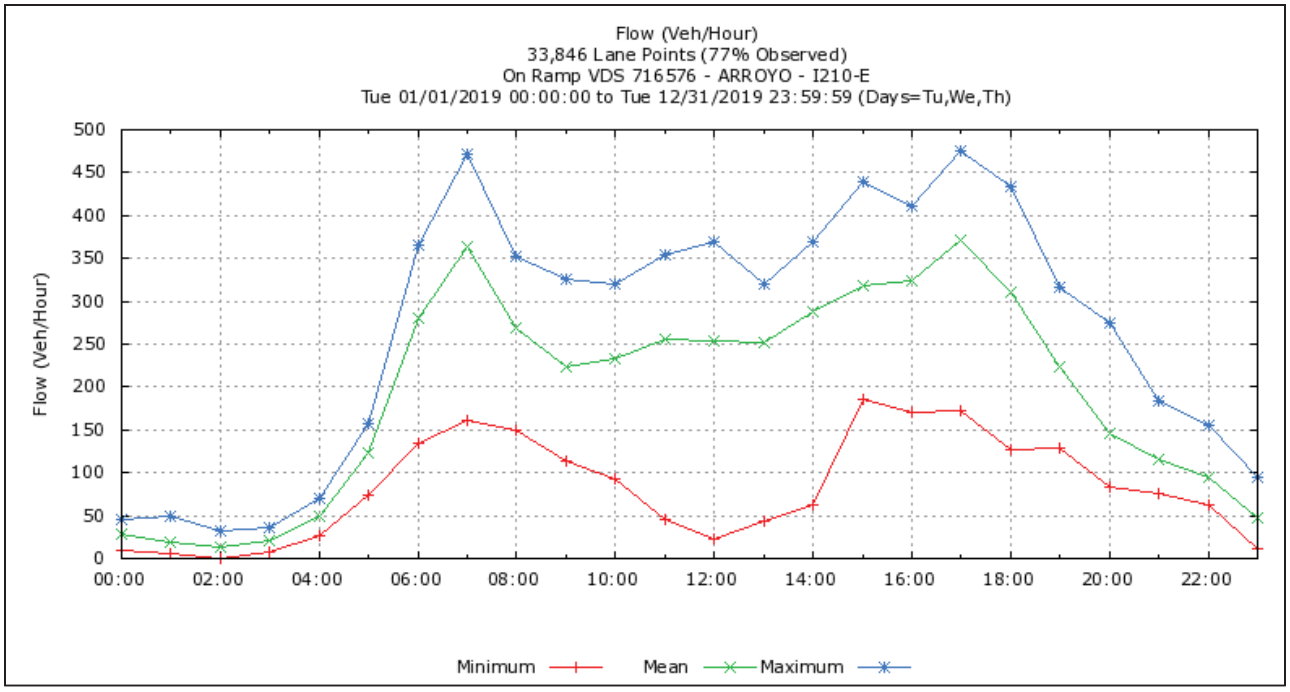
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	30.00	30.00	30.00	1,836	0.7
01:00	23.00	23.00	23.00	1,835	0.7
02:00	20.00	20.00	20.00	1,835	0.7
03:00	21.00	21.00	21.00	1,836	0.7
04:00	86.00	86.00	86.00	1,835	0.7
05:00	137.00	137.00	137.00	1,836	0.7
06:00	319.00	319.00	319.00	1,836	0.7
07:00	474.00	474.00	474.00	1,835	0.7
08:00	313.00	313.00	313.00	1,835	0.7
09:00	224.00	224.00	224.00	1,836	0.7
10:00	258.00	258.00	258.00	1,836	0.7
11:00	273.00	273.00	273.00	1,836	0.7
12:00	296.00	296.00	296.00	1,835	0.7
13:00	286.00	286.00	286.00	1,836	0.7
14:00	382.00	382.00	382.00	1,836	0.7
15:00	357.00	357.00	357.00	1,836	0.7
16:00	387.00	387.00	387.00	1,835	0.7
17:00	470.00	470.00	470.00	1,836	0.7
18:00	414.00	414.00	414.00	1,836	0.7
19:00	308.00	308.00	308.00	1,836	0.7
20:00	210.00	210.00	210.00	1,836	0.7
21:00	171.00	171.00	171.00	1,836	0.7
22:00	149.00	149.00	149.00	1,836	0.7
23:00	44.00	44.00	44.00	1,836	0.7

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716576&s_time_id=1514764800&s_time_id_f=01%2F01%2F2018&e_time_id=1546300740&e_time_id_f=12%2F31%2F2018&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 13:22
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,057 Lane Points
Data Quality	0.7% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716576 - ARROYO
start date	01/01/2018 00:00:00
end date	12/31/2018 23:59:59


Flow (Veh/Hour)
33,846 Lane Points (77% Observed)
On Ramp VDS 716576 - ARROYO - I210-E
Tue 01/01/2019 00:00:00 to Tue 12/31/2019 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
500
450
400
350
300
250
200
150
100
50
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	9.00	28.41	46.00	1,836	77.7
01:00	6.00	19.30	49.00	1,836	77.7
02:00	0.00	13.68	33.00	1,836	77.6
03:00	7.00	20.50	36.00	1,835	77.7
04:00	27.00	48.97	70.00	1,836	77.7
05:00	74.00	123.71	158.00	1,835	77.6
06:00	134.00	280.39	365.00	1,835	77.3
07:00	161.00	363.18	471.00	1,836	77.5
08:00	150.00	268.94	352.00	1,836	77.5
09:00	113.00	223.74	326.00	1,836	76.5
10:00	93.00	232.62	320.00	1,836	75.1
11:00	45.00	254.97	355.00	1,836	74.9
12:00	23.00	252.97	369.00	1,835	75.3
13:00	43.00	251.76	320.00	1,834	75.6
14:00	62.00	287.10	370.00	1,836	76.7
15:00	186.00	318.14	440.00	1,836	76.7
16:00	171.00	324.11	411.00	1,836	76.9
17:00	172.00	371.23	476.00	1,836	76.7
18:00	126.00	310.27	434.00	1,836	76.9
19:00	129.00	223.56	317.00	1,835	76.9
20:00	83.00	145.17	275.00	1,836	76.7
21:00	76.00	116.27	184.00	1,836	76.6
22:00	62.00	94.31	155.00	1,834	77.0
23:00	11.00	47.90	94.00	1,836	76.9

PeMS Report Description

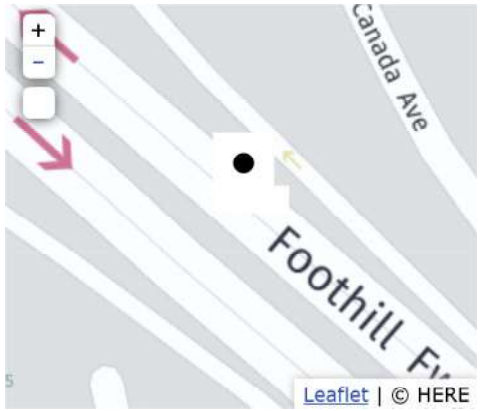
Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716576&s_time_id=1546300800&s_time_id_f=01%2F01%2F2019&e_time_id=1577836740&e_time_id_f=12%2F31%2F2019&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 12:04
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,055 Lane Points
Data Quality	76.8% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716576 - ARROYO
start date	01/01/2019 00:00:00
end date	12/31/2019 23:59:59

Off Ramp Traffic Census Station 73177 - WB OFF TO ARROYO BLVD

Current Location



Maps Real-Time | Performance | Inventory

I210-W @ CA PM 22.618 (Abs PM 22.6)
District 7, Los Angeles County , City of Pasadena

Station Detail

Date Added 01/01/2005

Aliases 07LA 210 R022618 F, 35610

Leg F: I210-W @ CA PM 22.618

Assoc. VDS	763880
Sensor Type	Unknown
Retrieval Method	Unknown

Data Inventory

Traffic Volumes

J F M A M J J A S O N D

12
05
02
96

Volumes | AADT/Peak Hour | Events

Volumes > Time Series

ABOUT THIS REPORT

From 03/01/2012
Max Range: 1 month

To 03/31/2012

Time of Day All / 07:00 to 08:59

Include Days Su Mo Tu We Th Fr Sa Holidays

Direction Both

Quantity Observed Volume

Granularity Hour

DRAW PLOT | VIEW TABLE | EXPORT TEXT | EXPORT to XLS

N/A N/A N/A

		Data Quality	
Hour	**4 Lanes**	**% Observed**	**% Estimated**
03/01/2012 07:00	360	100	0
03/01/2012 08:00	388	100	0
03/06/2012 07:00	276	100	0
03/06/2012 08:00	391	100	0
03/07/2012 07:00	0	100	0
03/07/2012 08:00	0	100	0
03/08/2012 07:00	0	100	0
03/08/2012 08:00	0	100	0
03/13/2012 07:00	293	100	0
03/13/2012 08:00	393	100	0
03/14/2012 07:00	307	100	0
03/14/2012 08:00	382	100	0
03/15/2012 07:00	254	100	0
03/15/2012 08:00	340	100	0
03/20/2012 07:00	300	100	0
03/20/2012 08:00	335	100	0
03/21/2012 07:00	312	100	0
03/21/2012 08:00	374	100	0
03/22/2012 07:00	310	100	0
03/22/2012 08:00	399	100	0
03/27/2012 07:00	300	100	0
03/27/2012 08:00	379	100	0
Total	**7,412**	**2,600**	**0**

Quick Links

View this page for a nearby Traffic Census Station

View another Traffic Census Station Go

Tools

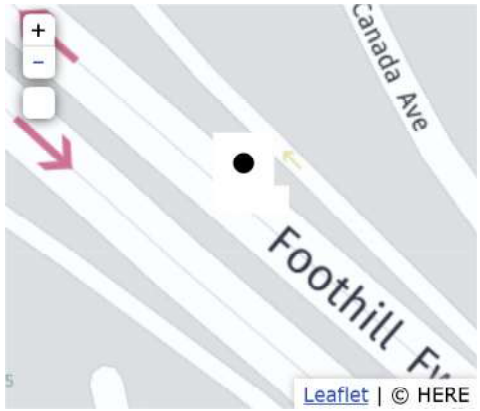
Holidays
Data Clearinghouse
PeMS User Manual
Transit PeMS User Manual
Lane Closure Manual
District TCR Training Guide
PeMS Forum (External Site)

		Data Quality	
Hour	**4 Lanes**	**% Observed**	**% Estimated**
03/28/2012 07:00	304	100	0
03/28/2012 08:00	342	100	0
03/29/2012 07:00	282	100	0
03/29/2012 08:00	391	100	0
Total	**7,412**	**2,600**	**0**

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Off Ramp Traffic Census Station 73177 - WB OFF TO ARROYO BLVD

Current Location



Maps Real-Time | Performance | Inventory

I210-W @ CA PM 22.618 (Abs PM 22.6)
District 7, Los Angeles County , City of Pasadena

Station Detail

Date Added 01/01/2005

Aliases 07LA 210 R022618 F, 35610

Leg F: I210-W @ CA PM 22.618

Assoc. VDS	763880
Sensor Type	Unknown
Retrieval Method	Unknown

Data Inventory

Traffic Volumes

	J	F	M	A	M	J	J	A	S	O	N	D
12												
05												
02												
96												

Volumes | AADT/Peak Hour | Events

Volumes > Time Series

ABOUT THIS REPORT

From 03/01/2012
Max Range: 1 month

To 03/31/2012

Time of Day
All
16:00 to 17:59

Include Days
Su Mo Tu We Th Fr Sa Holidays

Direction Both

Quantity Observed Volume

Granularity Hour

DRAW PLOT | VIEW TABLE | EXPORT TEXT | EXPORT to XLS

N/A N/A N/A

		Data Quality	
Hour	**4 Lanes**	**% Observed**	**% Estimated**
03/01/2012 16:00	602	100	0
03/01/2012 17:00	753	100	0
03/06/2012 16:00	530	100	0
03/06/2012 17:00	703	100	0
03/07/2012 16:00	502	100	0
03/07/2012 17:00	696	100	0
03/08/2012 16:00	606	100	0
03/08/2012 17:00	0	100	0
03/13/2012 16:00	560	100	0
03/13/2012 17:00	724	100	0
03/14/2012 16:00	584	100	0
03/14/2012 17:00	699	100	0
03/15/2012 16:00	573	100	0
03/15/2012 17:00	708	100	0
03/20/2012 16:00	536	100	0
03/20/2012 17:00	690	100	0
03/21/2012 16:00	538	100	0
03/21/2012 17:00	688	100	0
03/22/2012 16:00	603	100	0
03/22/2012 17:00	651	100	0
03/27/2012 16:00	585	100	0
03/27/2012 17:00	722	100	0
Total	**15,812**	**2,600**	**0**

Quick Links

View this page for a nearby Traffic Census Station

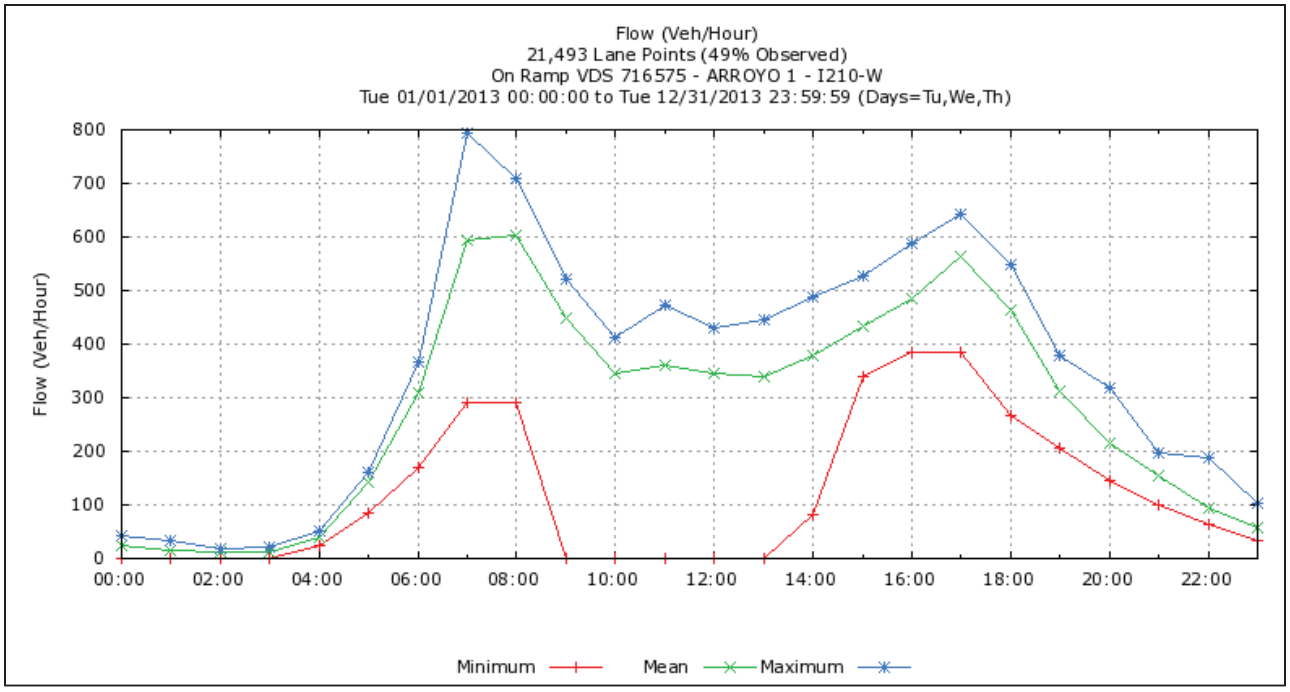
View another Traffic Census Station Go

Tools

Holidays
Data Clearinghouse
PeMS User Manual
Transit PeMS User Manual
Lane Closure Manual
District TCR Training Guide
PeMS Forum (External Site)

		Data Quality	
Hour	**4 Lanes**	**% Observed**	**% Estimated**
03/28/2012 16:00	572	100	0
03/28/2012 17:00	687	100	0
03/29/2012 16:00	601	100	0
03/29/2012 17:00	699	100	0
Total	**15,812**	**2,600**	**0**

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Flow (Veh/Hour)
21,493 Lane Points (49% Observed)
On Ramp VDS 716575 - ARROYO 1 - I210-W
Tue 01/01/2013 00:00:00 to Tue 12/31/2013 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
800
700
600
500
400
300
200
100
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

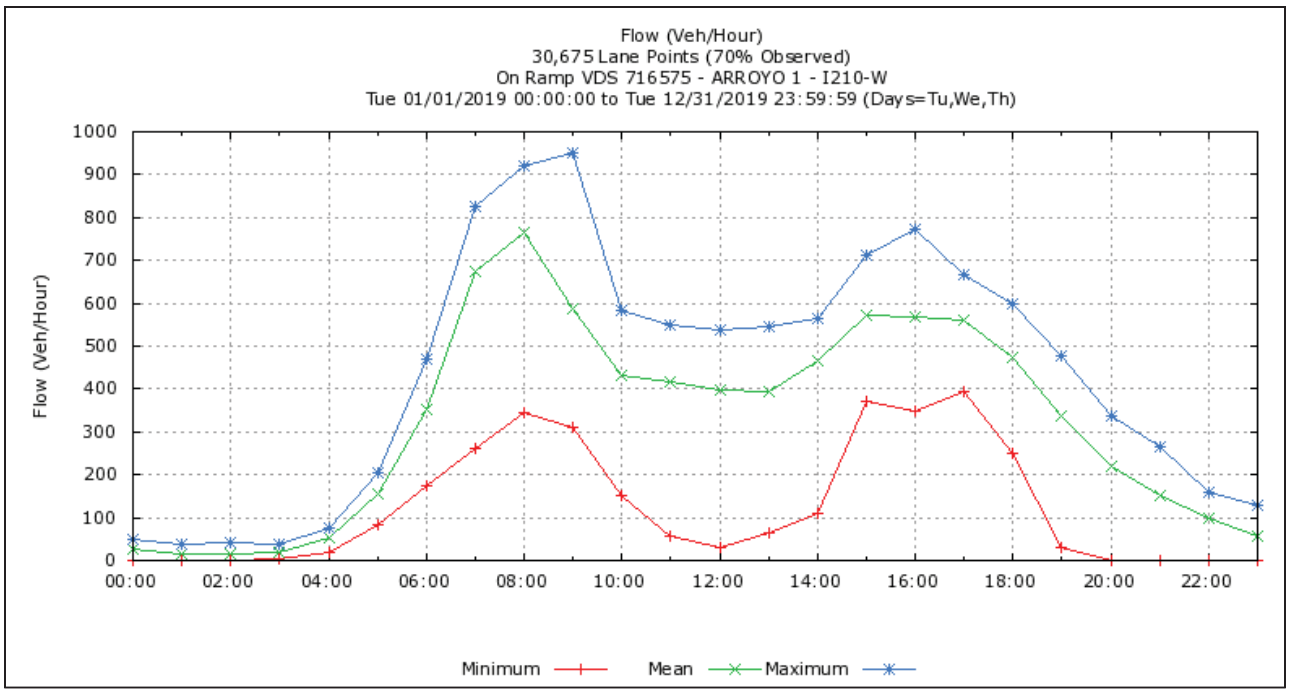
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	0.00	25.09	42.00	1,836	48.3
01:00	0.00	14.12	33.00	1,836	47.9
02:00	0.00	10.88	18.00	1,836	48.5
03:00	0.00	12.72	21.00	1,836	48.4
04:00	25.00	38.99	51.00	1,836	48.4
05:00	85.00	142.25	162.00	1,836	48.9
06:00	170.00	310.39	368.00	1,836	49.0
07:00	291.00	593.63	793.00	1,836	49.0
08:00	291.00	603.11	708.00	1,836	49.0
09:00	1.00	448.89	521.00	1,836	48.9
10:00	0.00	345.83	412.00	1,836	48.6
11:00	0.00	359.80	474.00	1,836	48.9
12:00	0.00	345.24	429.00	1,836	48.9
13:00	1.00	339.96	445.00	1,836	49.0
14:00	82.00	377.88	489.00	1,836	48.5
15:00	338.00	432.73	528.00	1,836	48.9
16:00	386.00	486.16	587.00	1,836	48.7
17:00	385.00	563.05	641.00	1,836	49.0
18:00	266.00	463.63	547.00	1,836	48.9
19:00	205.00	311.47	379.00	1,836	49.0
20:00	144.00	214.25	319.00	1,836	49.0
21:00	99.00	155.68	198.00	1,836	49.0
22:00	63.00	93.47	189.00	1,836	49.0
23:00	33.00	56.24	104.00	1,836	49.0

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716575&s_time_id=1356998400&s_time_id_f=01%2F01%2F2013&e_time_id=1388534340&e_time_id_f=12%2F31%2F2013&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 13:19
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,064 Lane Points
Data Quality	48.8% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716575 - ARROYO 1
start date	01/01/2013 00:00:00
end date	12/31/2013 23:59:59


Flow (Veh/Hour)
30,675 Lane Points (70% Observed)
On Ramp VDS 716575 - ARROYO 1 - I210-W
Tue 01/01/2019 00:00:00 to Tue 12/31/2019 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1000
900
800
700
600
500
400
300
200
100
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

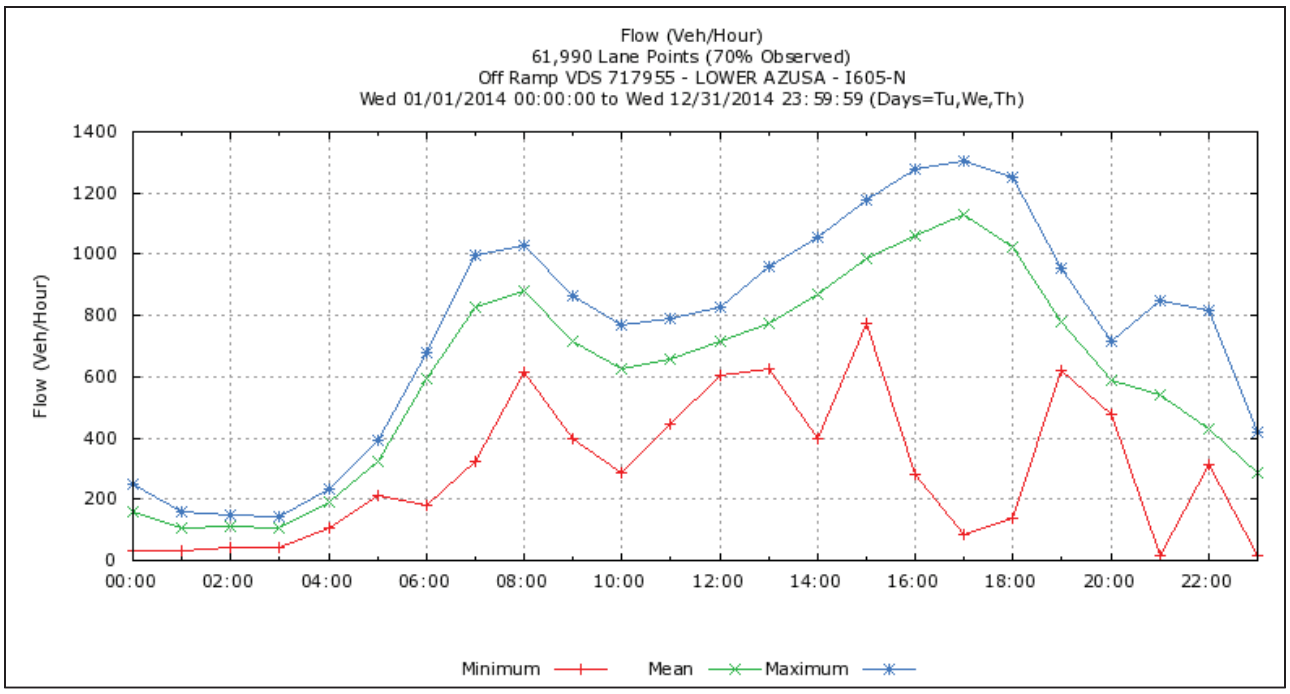
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	0.00	24.81	48.00	1,836	70.3
01:00	0.00	14.30	38.00	1,836	70.4
02:00	0.00	14.24	43.00	1,836	70.4
03:00	4.00	17.59	36.00	1,835	70.4
04:00	20.00	52.72	77.00	1,836	70.5
05:00	85.00	156.17	204.00	1,835	70.4
06:00	175.00	353.75	471.00	1,835	70.1
07:00	262.00	673.68	826.00	1,836	70.4
08:00	345.00	763.36	919.00	1,836	70.3
09:00	310.00	585.85	949.00	1,836	69.3
10:00	151.00	430.74	585.00	1,836	67.9
11:00	55.00	416.90	548.00	1,836	67.7
12:00	32.00	397.35	538.00	1,835	68.1
13:00	63.00	392.25	544.00	1,834	68.4
14:00	109.00	467.03	566.00	1,836	69.6
15:00	373.00	572.08	712.00	1,836	69.6
16:00	349.00	568.71	774.00	1,836	69.7
17:00	394.00	560.99	668.00	1,836	69.6
18:00	249.00	474.63	598.00	1,835	69.6
19:00	29.00	336.74	478.00	1,835	69.8
20:00	0.00	221.16	336.00	1,836	69.6
21:00	0.00	151.56	267.00	1,836	69.4
22:00	0.00	99.40	158.00	1,834	69.8
23:00	0.00	56.46	130.00	1,836	69.8

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716575&s_time_id=1546300800&s_time_id_f=01%2F01%2F2019&e_time_id=1577836740&e_time_id_f=12%2F31%2F2019&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/23/2020 14:46
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,054 Lane Points
Data Quality	69.6% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716575 - ARROYO 1
start date	01/01/2019 00:00:00
end date	12/31/2019 23:59:59


Flow (Veh/Hour)
61,990 Lane Points (70% Observed)
Off Ramp VDS 717955 - LOWER AZUSA - I605-N
Wed 01/01/2014 00:00:00 to Wed 12/31/2014 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1400
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

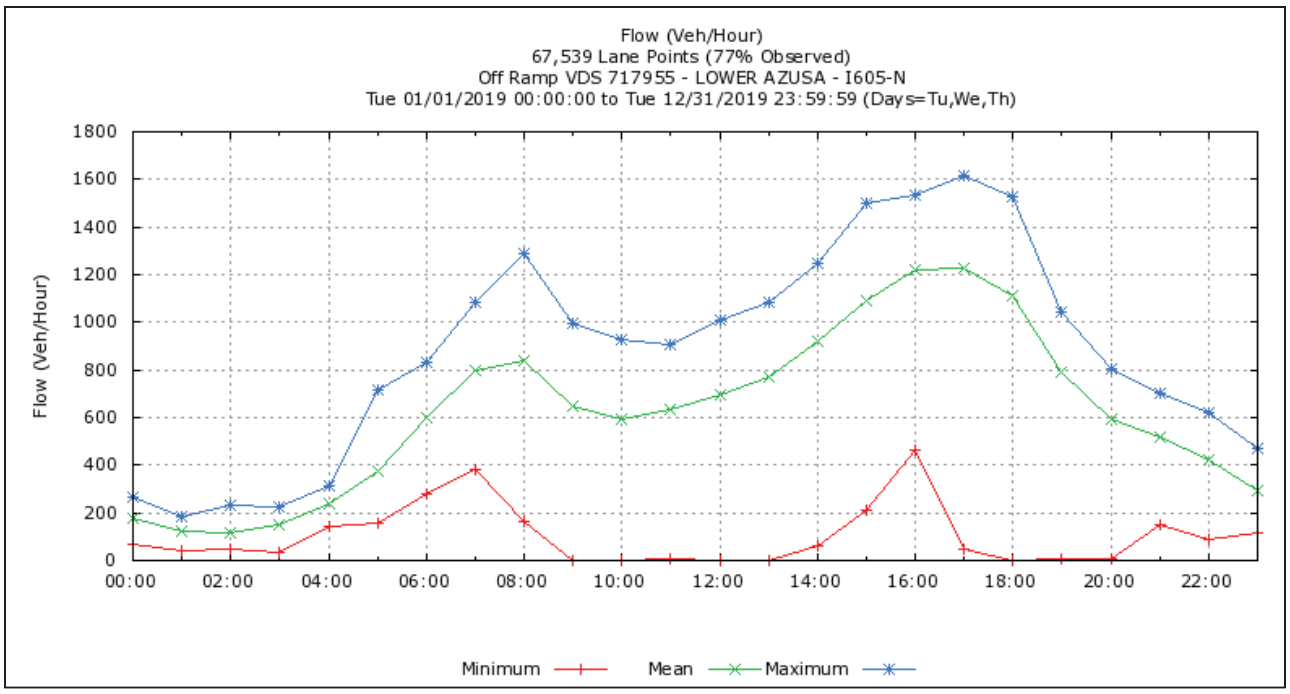
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	30.00	158.09	251.00	3,672	71.5
01:00	33.00	106.59	159.00	3,672	71.6
02:00	45.00	109.15	148.00	3,672	71.8
03:00	41.00	105.94	143.00	3,672	71.8
04:00	104.00	191.03	233.00	3,672	71.7
05:00	213.00	324.56	390.00	3,672	71.3
06:00	179.00	591.77	678.00	3,672	71.7
07:00	322.00	829.33	995.00	3,672	71.6
08:00	615.00	882.91	1,031.00	3,672	70.9
09:00	396.00	715.78	863.00	3,672	71.3
10:00	287.00	624.98	767.00	3,672	70.8
11:00	445.00	659.64	790.00	3,672	69.3
12:00	607.00	716.00	828.00	3,672	69.6
13:00	628.00	773.23	959.00	3,672	69.7
14:00	400.00	871.69	1,055.00	3,672	69.6
15:00	772.00	987.36	1,177.00	3,672	69.0
16:00	281.00	1,062.36	1,277.00	3,672	68.9
17:00	86.00	1,130.35	1,305.00	3,672	68.4
18:00	136.00	1,024.20	1,250.00	3,672	69.3
19:00	621.00	780.44	953.00	3,672	69.3
20:00	475.00	589.50	714.00	3,672	69.8
21:00	17.00	539.38	848.00	3,672	69.9
22:00	313.00	432.09	815.00	3,672	69.6
23:00	17.00	284.06	418.00	3,672	69.9

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=717955&s_time_id=1388534400&s_time_id_f=01%2F01%2F2014&e_time_id=1420070340&e_time_id_f=12%2F31%2F2014&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 11:22
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	88,128 Lane Points
Data Quality	70.3% Observed
Segment Type	VDS
Segment Name	Off Ramp VDS 717955 - LOWER AZUSA
start date	01/01/2014 00:00:00
end date	12/31/2014 23:59:59


Flow (Veh/Hour)
67,539 Lane Points (77% Observed)
Off Ramp VDS 717955 - LOWER AZUSA - I605-N
Tue 01/01/2019 00:00:00 to Tue 12/31/2019 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1800
1600
1400
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

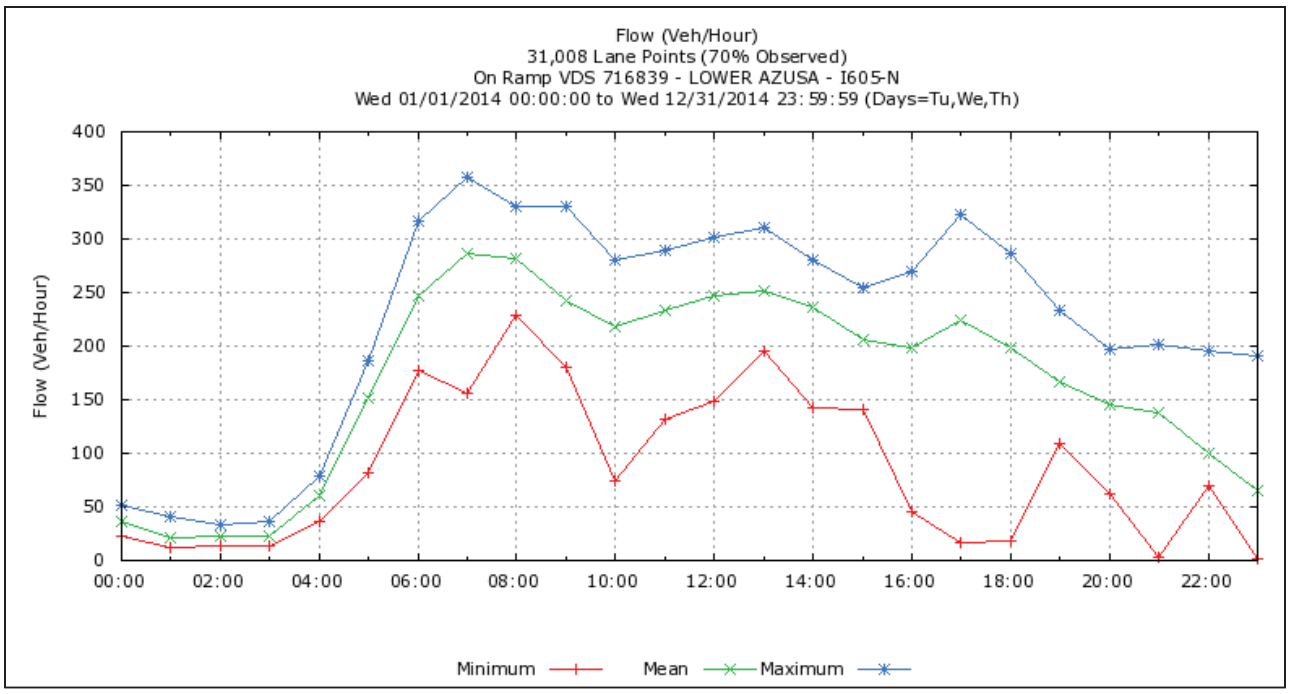
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	69.00	179.96	266.00	3,672	77.9
01:00	40.00	122.41	184.00	3,672	77.5
02:00	49.00	119.24	234.00	3,670	77.1
03:00	31.00	150.47	225.00	3,670	76.3
04:00	140.00	236.78	311.00	3,672	75.8
05:00	156.00	377.87	713.00	3,668	76.2
06:00	279.00	600.10	831.00	3,670	76.1
07:00	382.00	797.78	1,084.00	3,672	76.1
08:00	167.00	840.38	1,289.00	3,672	75.4
09:00	2.00	644.61	993.00	3,672	74.7
10:00	0.00	591.75	924.00	3,672	73.4
11:00	7.00	631.46	910.00	3,672	74.2
12:00	0.00	696.75	1,006.00	3,670	75.0
13:00	0.00	770.90	1,086.00	3,668	76.2
14:00	60.00	919.94	1,246.00	3,672	76.0
15:00	210.00	1,093.33	1,501.00	3,672	75.9
16:00	461.00	1,220.21	1,534.00	3,670	76.3
17:00	50.00	1,230.11	1,616.00	3,670	76.5
18:00	1.00	1,113.89	1,528.00	3,672	77.4
19:00	6.00	789.17	1,043.00	3,668	79.0
20:00	6.00	595.49	806.00	3,672	79.5
21:00	153.00	520.37	702.00	3,672	79.7
22:00	92.00	419.77	622.00	3,670	78.9
23:00	116.00	290.86	472.00	3,672	78.8

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=717955&s_time_id=1546300800&s_time_id_f=01%2F01%2F2019&e_time_id=1577836740&e_time_id_f=12%2F31%2F2019&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/23/2020 14:37
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	88,102 Lane Points
Data Quality	76.7% Observed
Segment Type	VDS
Segment Name	Off Ramp VDS 717955 - LOWER AZUSA
start date	01/01/2019 00:00:00
end date	12/31/2019 23:59:59


Flow (Veh/Hour)
31,008 Lane Points (70% Observed)
On Ramp VDS 716839 - LOWER AZUSA - I605-N
Wed 01/01/2014 00:00:00 to Wed 12/31/2014 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
400
350
300
250
200
150
100
50
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

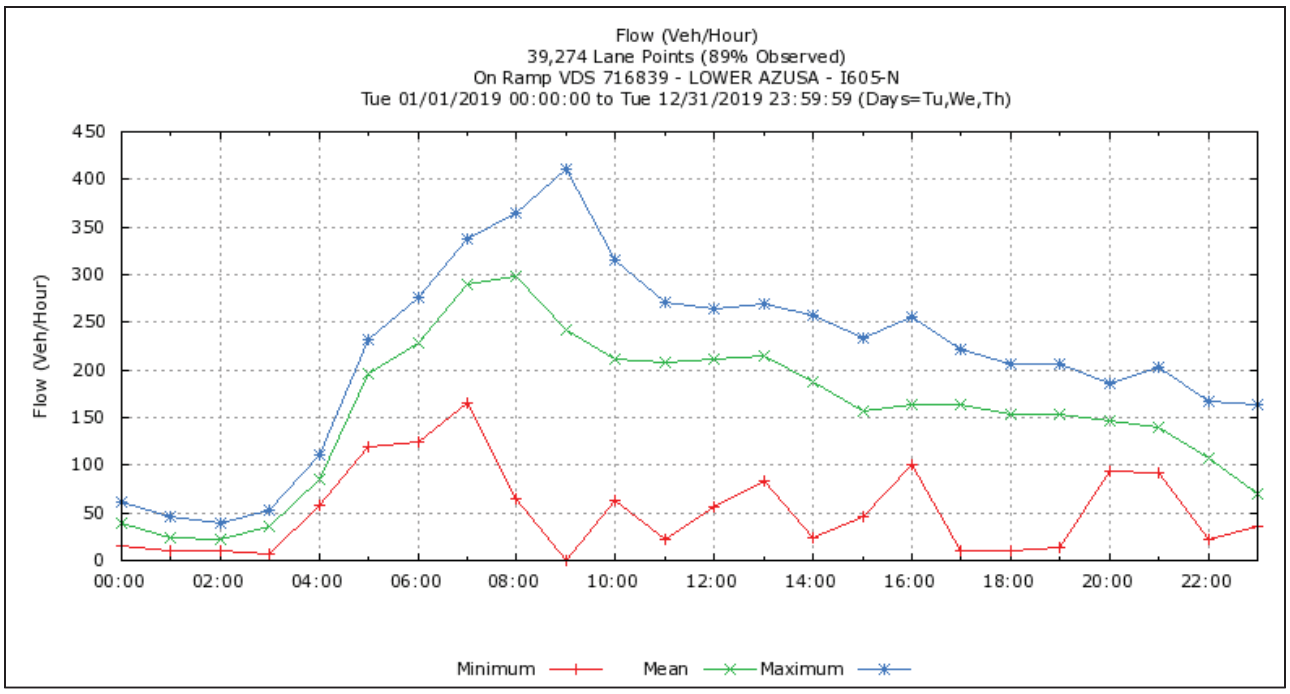
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	23.00	36.07	52.00	1,836	71.5
01:00	12.00	21.79	41.00	1,836	71.6
02:00	13.00	22.68	34.00	1,836	71.8
03:00	13.00	23.34	37.00	1,836	71.8
04:00	36.00	60.90	79.00	1,836	71.7
05:00	82.00	152.21	186.00	1,836	71.3
06:00	177.00	246.95	317.00	1,836	71.7
07:00	156.00	286.44	358.00	1,836	71.6
08:00	229.00	282.28	331.00	1,836	70.9
09:00	181.00	242.14	331.00	1,836	71.4
10:00	74.00	218.84	280.00	1,836	70.8
11:00	132.00	232.62	289.00	1,836	69.3
12:00	148.00	246.45	302.00	1,836	69.6
13:00	195.00	250.91	310.00	1,836	69.7
14:00	143.00	236.16	281.00	1,836	69.7
15:00	141.00	206.36	255.00	1,836	69.0
16:00	45.00	197.98	269.00	1,836	68.9
17:00	17.00	224.63	323.00	1,836	68.5
18:00	18.00	198.48	287.00	1,836	69.4
19:00	109.00	167.33	233.00	1,836	69.7
20:00	62.00	144.98	197.00	1,836	69.8
21:00	3.00	137.65	201.00	1,836	69.9
22:00	69.00	100.24	195.00	1,836	69.7
23:00	1.00	65.49	191.00	1,836	69.9

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716839&s_time_id=1388534400&s_time_id_f=01%2F01%2F2014&e_time_id=1420070340&e_time_id_f=12%2F31%2F2014&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 11:32
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,064 Lane Points
Data Quality	70.4% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716839 - LOWER AZUSA
start date	01/01/2014 00:00:00
end date	12/31/2014 23:59:59


Flow (Veh/Hour)
39,274 Lane Points (89% Observed)
On Ramp VDS 716839 - LOWER AZUSA - I605-N
Tue 01/01/2019 00:00:00 to Tue 12/31/2019 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
450
400
350
300
250
200
150
100
50
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

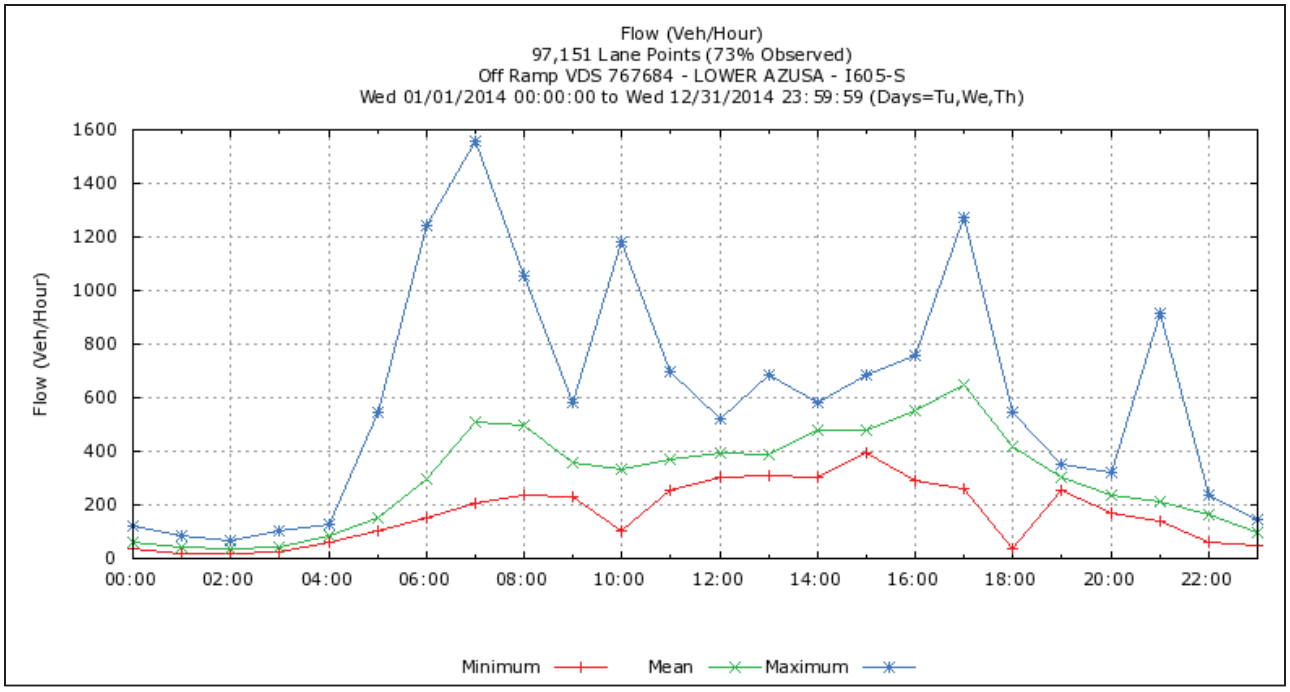
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	15.00	39.49	61.00	1,836	90.6
01:00	10.00	24.42	46.00	1,836	90.2
02:00	10.00	22.99	40.00	1,835	89.9
03:00	6.00	34.96	52.00	1,835	89.0
04:00	58.00	85.24	111.00	1,836	88.5
05:00	120.00	196.35	232.00	1,834	88.9
06:00	125.00	228.17	276.00	1,835	88.9
07:00	166.00	289.08	337.00	1,836	88.9
08:00	65.00	298.48	364.00	1,836	88.0
09:00	0.00	242.43	411.00	1,836	87.3
10:00	63.00	211.86	315.00	1,836	85.6
11:00	23.00	207.57	271.00	1,836	85.9
12:00	56.00	210.83	265.00	1,835	86.6
13:00	83.00	214.04	270.00	1,834	88.0
14:00	24.00	187.35	257.00	1,836	87.8
15:00	46.00	156.11	233.00	1,836	87.7
16:00	101.00	163.67	255.00	1,835	88.4
17:00	11.00	163.62	221.00	1,835	88.7
18:00	11.00	153.51	206.00	1,836	89.7
19:00	13.00	153.53	207.00	1,834	92.0
20:00	93.00	147.06	186.00	1,836	92.6
21:00	92.00	140.32	202.00	1,836	92.8
22:00	22.00	106.96	167.00	1,835	91.9
23:00	36.00	69.55	164.00	1,836	91.8

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716839&s_time_id=1546300800&s_time_id_f=01%2F01%2F2019&e_time_id=1577836740&e_time_id_f=12%2F31%2F2019&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 11:31
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,051 Lane Points
Data Quality	89.2% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716839 - LOWER AZUSA
start date	01/01/2019 00:00:00
end date	12/31/2019 23:59:59


Flow (Veh/Hour)
97,151 Lane Points (73% Observed)
Off Ramp VDS 767684 - LOWER AZUSA - I605-S
Wed 01/01/2014 00:00:00 to Wed 12/31/2014 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1600
1400
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

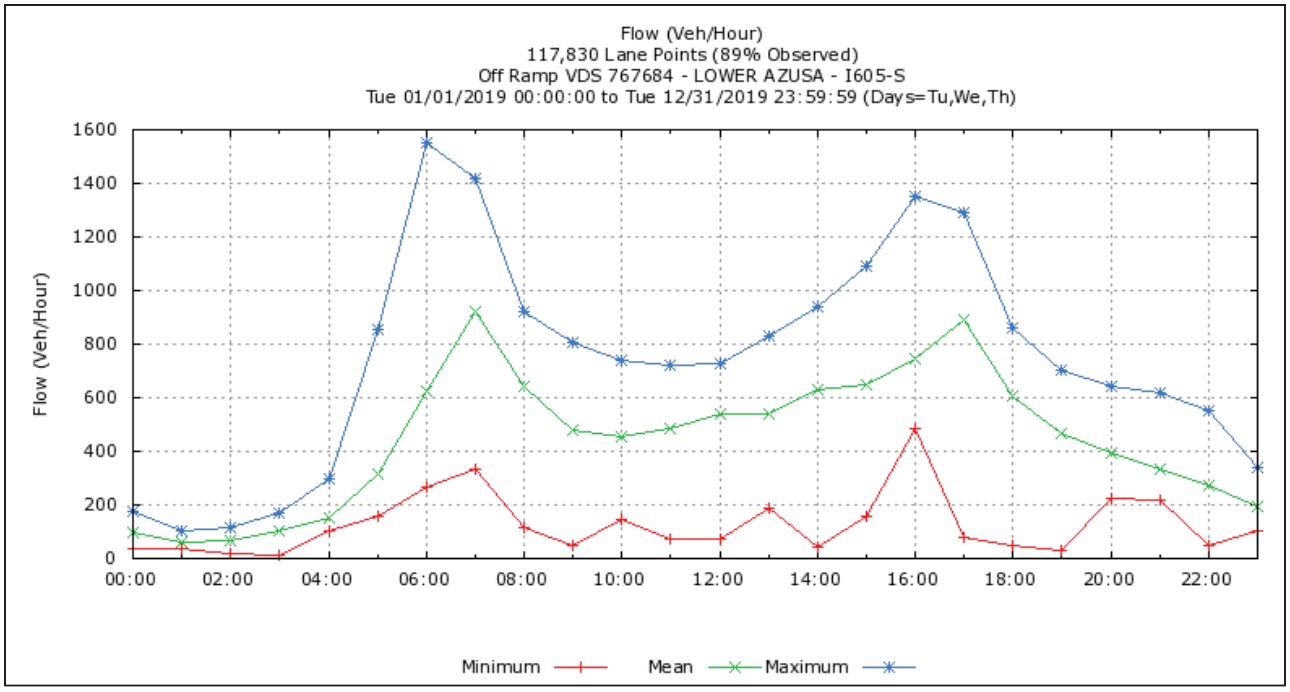
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	35.00	59.13	124.00	5,508	74.3
01:00	21.00	40.03	83.00	5,508	74.1
02:00	20.00	36.56	69.00	5,508	74.3
03:00	27.00	44.34	101.00	5,508	74.3
04:00	60.00	85.44	127.00	5,508	74.3
05:00	106.00	148.54	545.00	5,508	74.2
06:00	154.00	299.16	1,243.00	5,508	74.3
07:00	205.00	509.98	1,555.00	5,508	74.2
08:00	235.00	494.95	1,055.00	5,508	73.6
09:00	232.00	358.75	582.00	5,508	74.4
10:00	103.00	332.96	1,180.00	5,508	73.8
11:00	253.00	366.96	696.00	5,508	72.9
12:00	303.00	391.10	524.00	5,508	73.0
13:00	311.00	386.17	687.00	5,508	73.0
14:00	305.00	479.40	580.00	5,508	73.4
15:00	393.00	476.75	682.00	5,508	73.0
16:00	289.00	554.07	758.00	5,508	72.7
17:00	262.00	646.10	1,275.00	5,508	72.3
18:00	35.00	416.48	543.00	5,508	72.5
19:00	256.00	303.60	349.00	5,508	73.0
20:00	170.00	239.02	320.00	5,508	73.2
21:00	137.00	213.62	918.00	5,508	73.1
22:00	62.00	160.90	238.00	5,508	72.9
23:00	49.00	99.66	143.00	5,508	73.0

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=767684&s_time_id=1388534400&s_time_id_f=01%2F01%2F2014&e_time_id=1420070340&e_time_id_f=12%2F31%2F2014&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 11:24
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	132,192 Lane Points
Data Quality	73.5% Observed
Segment Type	VDS
Segment Name	Off Ramp VDS 767684 - LOWER AZUSA
start date	01/01/2014 00:00:00
end date	12/31/2014 23:59:59


Flow (Veh/Hour)
117,830 Lane Points (89% Observed)
Off Ramp VDS 767684 - LOWER AZUSA - I605-S
Tue 01/01/2019 00:00:00 to Tue 12/31/2019 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1600
1400
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

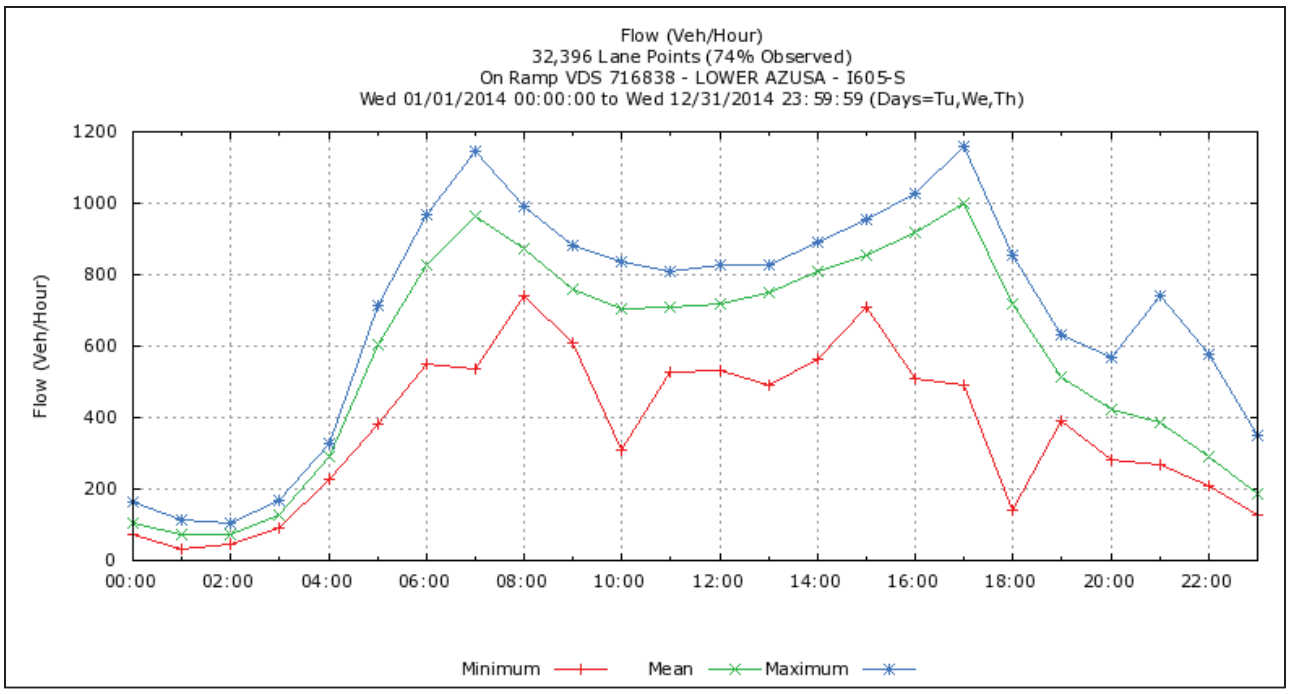
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	36.00	94.13	173.00	5,508	90.6
01:00	39.00	62.73	105.00	5,508	90.2
02:00	20.00	66.43	113.00	5,505	89.9
03:00	12.00	104.86	171.00	5,505	89.0
04:00	106.00	153.03	298.00	5,508	88.5
05:00	158.00	315.60	854.00	5,505	88.9
06:00	267.00	626.64	1,552.00	5,505	88.9
07:00	331.00	923.63	1,420.00	5,508	88.9
08:00	115.00	641.86	922.00	5,508	88.0
09:00	50.00	480.80	809.00	5,508	87.2
10:00	144.00	456.22	737.00	5,505	85.6
11:00	70.00	484.44	723.00	5,508	85.9
12:00	75.00	540.38	726.00	5,505	86.9
13:00	190.00	541.57	830.00	5,502	88.1
14:00	45.00	628.55	937.00	5,508	87.8
15:00	159.00	647.72	1,090.00	5,508	87.7
16:00	482.00	745.02	1,349.00	5,505	88.4
17:00	79.00	890.28	1,289.00	5,508	88.7
18:00	48.00	605.01	862.00	5,508	89.6
19:00	30.00	467.92	703.00	5,502	92.0
20:00	223.00	392.24	641.00	5,508	92.6
21:00	219.00	336.25	619.00	5,508	92.8
22:00	48.00	272.14	551.00	5,505	91.9
23:00	101.00	195.73	342.00	5,508	91.8

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=767684&s_time_id=1546300800&s_time_id_f=01%2F01%2F2019&e_time_id=1577836740&e_time_id_f=12%2F31%2F2019&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/23/2020 14:38
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	132,156 Lane Points
Data Quality	89.2% Observed
Segment Type	VDS
Segment Name	Off Ramp VDS 767684 - LOWER AZUSA
start date	01/01/2019 00:00:00
end date	12/31/2019 23:59:59


Flow (Veh/Hour)
32,396 Lane Points (74% Observed)
On Ramp VDS 716838 - LOWER AZUSA - I605-S
Wed 01/01/2014 00:00:00 to Wed 12/31/2014 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

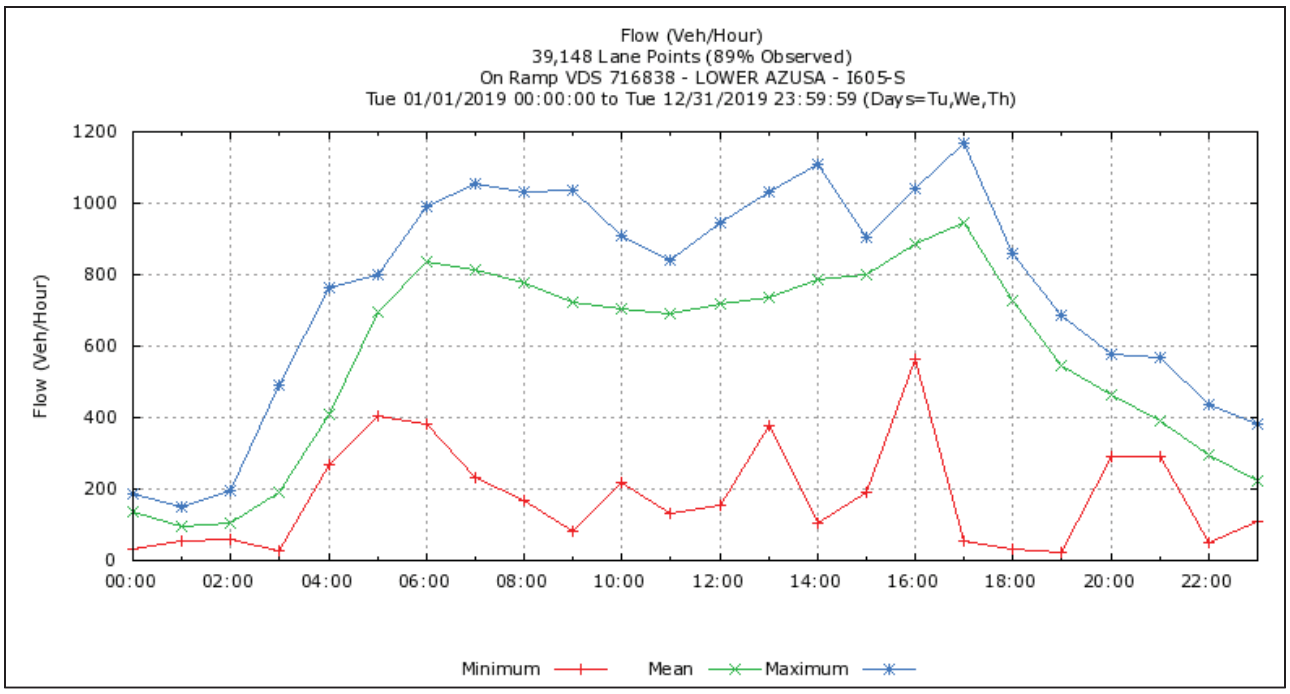
Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	71.00	102.88	164.00	1,836	74.3
01:00	34.00	71.50	115.00	1,836	74.2
02:00	46.00	72.53	103.00	1,836	74.4
03:00	92.00	128.41	167.00	1,836	74.3
04:00	225.00	288.72	329.00	1,836	74.3
05:00	380.00	604.25	712.00	1,836	74.2
06:00	548.00	825.85	970.00	1,836	74.3
07:00	538.00	961.91	1,144.00	1,836	74.2
08:00	740.00	872.00	992.00	1,836	73.6
09:00	607.00	759.02	884.00	1,836	74.4
10:00	310.00	704.68	836.00	1,836	73.8
11:00	526.00	710.12	807.00	1,836	72.9
12:00	532.00	720.04	827.00	1,836	73.0
13:00	493.00	748.43	826.00	1,836	73.0
14:00	565.00	807.63	890.00	1,836	73.4
15:00	710.00	852.34	953.00	1,836	73.0
16:00	510.00	917.12	1,029.00	1,836	72.7
17:00	492.00	1,001.50	1,158.00	1,836	72.3
18:00	139.00	720.26	856.00	1,836	72.5
19:00	389.00	514.02	634.00	1,836	73.0
20:00	284.00	421.52	569.00	1,836	73.2
21:00	267.00	386.92	743.00	1,836	73.1
22:00	208.00	292.42	579.00	1,836	72.9
23:00	129.00	186.92	352.00	1,836	73.1

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716838&s_time_id=1388534400&s_time_id_f=01%2F01%2F2014&e_time_id=1420070340&e_time_id_f=12%2F31%2F2014&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/24/2020 11:27
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,064 Lane Points
Data Quality	73.5% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716838 - LOWER AZUSA
start date	01/01/2014 00:00:00
end date	12/31/2014 23:59:59


Flow (Veh/Hour)
39,148 Lane Points (89% Observed)
On Ramp VDS 716838 - LOWER AZUSA - I605-S
Tue 01/01/2019 00:00:00 to Tue 12/31/2019 23:59:59 (Days=Tu,We,Th)
Flow (Veh/Hour)
1200
1000
800
600
400
200
0
00:00
02:00
04:00
06:00
08:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
Minimum
Mean
Maximum

Time	Minimum	Mean	Maximum	# Lane Points	% Observed
00:00	33.00	136.16	186.00	1,836	90.0
01:00	54.00	94.68	152.00	1,836	89.1
02:00	61.00	102.70	196.00	1,835	88.8
03:00	28.00	189.37	491.00	1,835	88.6
04:00	267.00	407.92	762.00	1,836	88.2
05:00	403.00	696.54	798.00	1,835	88.4
06:00	383.00	834.70	989.00	1,835	88.9
07:00	232.00	814.85	1,056.00	1,836	88.6
08:00	167.00	775.68	1,032.00	1,836	87.7
09:00	80.00	722.96	1,038.00	1,836	86.8
10:00	220.00	703.80	911.00	1,835	85.2
11:00	134.00	692.07	841.00	1,836	85.7
12:00	153.00	718.52	946.00	1,835	86.9
13:00	377.00	737.20	1,033.00	1,834	87.9
14:00	103.00	784.47	1,108.00	1,836	87.8
15:00	192.00	800.38	904.00	1,836	87.7
16:00	562.00	885.24	1,042.00	1,835	88.4
17:00	55.00	946.04	1,169.00	1,836	88.7
18:00	30.00	726.01	861.00	1,836	89.6
19:00	23.00	544.86	685.00	1,835	91.6
20:00	293.00	462.46	576.00	1,836	92.4
21:00	293.00	389.87	569.00	1,836	92.7
22:00	52.00	296.61	438.00	1,835	91.7
23:00	111.00	223.82	384.00	1,836	91.4

PeMS Report Description

Report	Aggregates>Time of Day
Report link	http://pems.dot.ca.gov/?report_form=1&dnode=VDS&content=loops&tab=det_tod&station_id=716838&s_time_id=1546300800&s_time_id_f=01%2F01%2F2019&e_time_id=1577836740&e_time_id_f=12%2F31%2F2019&dow_2=on&dow_3=on&dow_4=on&q=flow&fn=1&pct1=25&pct2=75
Report generated	04/23/2020 14:40
PeMS version	caltrans_pems-19.0.0

Report Parameters

Parameter	Value
Quantity	Flow
Data	44,053 Lane Points
Data Quality	88.9% Observed
Segment Type	VDS
Segment Name	On Ramp VDS 716838 - LOWER AZUSA
start date	01/01/2019 00:00:00
end date	12/31/2019 23:59:59

									AM PEAK							PM PEAK						
DI	RTE	CO	PRE	PM	CS	LEG	YR	Dir	1 WAY PHV	% K	% D	% KD	HR	DAY	MNTH	Dir	1 WAY PHV	% K	% D	% KD	HR	DAY	MNTH
09	202	KER	R	2.16	922	A	17	W	567	7.67	73.35	5.62	5	WED	JUN	E	621	11.57	53.21	6.16	15	FRI	SEP
09	202	KER	R	5.5	968	A	17	W	527	7.57	72.49	5.49	5	THU	JUN	W	622	8.85	73.18	6.47	17	WED	MAR
09	202	KER		8.87	606	B	17	W	682	8.42	54.69	4.61	12	FRI	JUN	W	821	10.07	55.06	5.54	14	FRI	SEP
09	202	KER		12.01	932	B	17	E	789	7.88	75.21	5.93	6	FRI	MAR	W	888	10.21	65.39	6.67	16	THU	MAR
09	203	MNO	R	4.47	959	B	17	W	559	14.57	84.31	12.29	6	MON	JUL	E	601	16.04	82.33	13.21	15	SAT	FEB
09	203	MNO		5.75	103	B	17	E	873	12.98	51.69	6.71	10	FRI	AUG	E	874	10.56	63.61	6.72	15	SUN	MAR
09	203	MNO		6.866	108	B	17	E	620	12.65	65.26	8.26	8	MON	AUG	E	555	10.32	71.61	7.39	13	SUN	FEB
09	203	MNO	R	8.56	921	B	17	E	785	12.33	75.63	9.33	9	SUN	AUG	W	677	13.15	61.16	8.04	15	SAT	MAY
06	204	KER		2.069	139	A	15	N	1449	6.84	63.25	4.33	7	MON	SEP	N	1590	9.43	50.33	4.75	17	THU	DEC
06	204	KER		6.258	204	B	15	S	2418	10.62	56.55	6	7	THU	MAR	N	2232	10.43	53.16	5.54	16	TUE	MAR
06	204	KER		6.752	141	B	15	S	2001	10.96	66.79	7.32	7	WED	SEP	S	1590	9.94	58.56	5.82	15	WED	SEP
10	205	SJ	R	8.127	121	A	16	W	5000	4.49	85.81	3.85	4	WED	JUN	E	5091	6.4	61.29	3.92	15	WED	DEC
07	210	LA	R	3.57	527	O	16	E	4716	7.92	62.58	4.96	7	THU	FEB	W	4464	8.61	54.49	4.69	17	FRI	APR
07	210	LA	R	17.7	544	O	15	E	9561	7.4	69.52	5.14	6	MON	APR	W	10066	8.81	61.47	5.42	17	THU	OCT
07	210	LA	R	42.66	761	O	15	W	8832	6.88	51.19	3.52	11	SAT	AUG	E	8959	6.47	55.21	3.57	15	TUE	MAY
07	210	LA	R	46.21	128	O	17	W	7473	6.3	60.77	3.83	7	TUE	MAY	W	6836	6.9	50.74	3.5	13	SUN	APR
07	210	LA	R	51.85	495	B	15	W	6965	6.39	62.97	4.03	7	THU	SEP	E	7255	6.64	63.19	4.19	16	THU	NOV
08	210	SBD		0	200	A	17	W	7078	6.38	62.1	3.96	7	FRI	FEB	E	6755	6.48	58.36	3.78	15	WED	DEC
08	210	SBD	R	31.7	757	A	17	E	3793	7.17	53.81	3.86	7	FRI	APR	E	3547	7.18	50.27	3.61	17	TUE	OCT
01	211	HUM	R	77.05	148	A	16	N	308	9.76	55.6	5.43	8	WED	APR	S	331	9.96	58.58	5.83	13	SAT	OCT
08	215	RIV	R	15.52	603	B	17	S	4887	6.76	61	4.12	7	WED	JUN	N	4938	7.58	55	4.17	17	FRI	JUN
08	215	RIV	R	38.34	803	A	17	N	8269	6.04	57.98	3.5	12	SAT	JUL	N	8997	6.34	60.14	3.81	17	THU	MAR
08	215	SBD		14.10	606	A	17	S	3132	7.09	65.21	4.62	7	THU	MAR	N	3068	7.75	58.45	4.53	17	TUE	APR
06	216	TUL	R	.488	142	A	17	W	697	9.21	54.88	5.05	7	TUE	APR	E	828	9.95	60.31	6	17	TUE	OCT
06	216	TUL		2.46	171	A	17	W	317	12.68	59.92	7.6	11	SUN	FEB	W	224	9.01	59.57	5.37	13	SUN	JAN
06	216	TUL		11.73	831	B	17	W	229	9.33	61.73	5.76	7	THU	OCT	E	221	9.66	57.55	5.56	16	THU	OCT
06	216	TUL		14.01	143	B	17	W	301	9.51	59.72	5.68	7	THU	APR	E	301	9.76	58.22	5.68	16	THU	APR
06	216	TUL		14.01	144	A	17	W	265	10.02	57.48	5.76	7	TUE	JAN	E	280	11.52	52.83	6.09	16	THU	APR
06	216	TUL		19.25	145	B	17	E	64	8.2	63.37	5.19	7	THU	JUL	E	80	10.63	61.07	6.49	17	WED	APR
05	217	SB		.464	126	A	17	W	1053	10.57	81.82	8.65	8	WED	OCT	E	1086	11.71	76.16	8.92	17	MON	JAN
05	218	MON	R	0	269	A	16	E	1087	8.26	52.34	4.32	8	TUE	NOV	W	1299	8.19	63.12	5.17	16	FRI	FEB
03	220	SAC		3.114	922	B	17	E	97	22.37	59.15	13.23	12	SAT	JUL	W	60	14.6	56.08	8.19	15	FRI	JUL
01	222	MEN		.96	733	A	15	E	349	9.34	51.25	4.79	12	TUE	APR	E	410	11.03	51	5.62	16	WED	APR

									AM PEAK							PM PEAK						
DI	RTE	CO	PRE	PM	CS	LEG	YR	Dir	1 WAY PHV	% K	% D	% KD	HR	DAY	MNTH	Dir	1 WAY PHV	% K	% D	% KD	HR	DAY	MNTH
07	605	LA	R	2.31	220	O	16	N	7651	7.42	50.43	3.74	7	WED	APR	N	8860	7.52	57.66	4.34	17	MON	OCT
07	605	LA	R	8.9	485	B	15	S	9482	5.88	54.85	3.22	6	THU	APR	S	9636	5.8	56.48	3.28	17	WED	APR
07	605	LA		22.92	547	O	15	S	5933	6.63	54.69	3.62	7	WED	MAY	N	5701	6.85	50.83	3.48	14	SAT	OCT
04	680	ALA	M	1.961	39	A	15	S	6856	8.98	56.75	5.1	9	THU	AUG	S	5717	7.88	53.96	4.25	17	TUE	SEP
04	680	ALA	R	20.06	157	A	15	N	6867	7.28	55.93	4.07	9	WED	NOV	N	7978	7.91	59.85	4.73	18	TUE	NOV
04	680	CC	R	.01	557	A	15	S	6653	7.57	51.37	3.89	8	TUE	AUG	S	7380	7.48	57.68	4.31	16	FRI	MAY
04	680	CC	R	.02	900	O	17	S	6272	6.37	53.58	3.41	7	THU	AUG	S	6632	6.41	56.35	3.61	16	THU	DEC
04	680	CC	R	6.764	419	O	15	S	6575	7.89	55.32	4.37	7	THU	FEB	N	6055	7.6	52.88	4.02	14	FRI	MAY
04	680	CC	R	18.71	301	B	15	S	9880	5.64	70.94	4	6	TUE	MAY	N	10782	6.5	67.15	4.37	17	THU	MAY
07	710	LA		7.6	37	A	17	N	8515	10.82	55.66	6.02	6	TUE	OCT	N	8299	11.51	51.01	5.87	16	FRI	OCT
07	710	LA		10.31	38	A	15	S	7252	7.47	52.77	3.94	7	MON	APR	N	6714	7.1	51.39	3.65	16	MON	MAY
07	710	LA	R	27.11	436	A	16	S	2258	8.12	61.03	4.95	7	WED	FEB	N	1971	7.36	58.77	4.32	17	WED	MAR
04	780	SOL		6.656	341	A	15	E	2665	8.03	55.25	4.44	7	WED	MAR	W	2883	8.77	54.72	4.8	17	THU	FEB
11	805	SD		.647	922	A	17	S	2947	6.79	65.5	4.45	10	SAT	DEC	S	3495	8.05	65.47	5.27	15	THU	DEC
11	805	SD		1.805	681	A	17	N	9517	8.33	67.46	5.62	12	SAT	JUL	N	10511	9.18	67.59	6.21	17	THU	JUL
11	805	SD		5.542	684	O	17	N	6908	5.99	63.95	3.83	6	MON	SEP	S	8092	7.93	56.53	4.48	15	THU	AUG
11	805	SD		8.854	924	B	17	N	10576	6.52	68.11	4.44	6	TUE	APR	S	11609	7.53	64.81	4.88	16	FRI	SEP
11	805	SD		8.854	944	A	17	N	9833	6.34	70.87	4.49	6	FRI	MAR	S	9770	7.8	57.29	4.47	15	FRI	OCT
11	805	SD		11.10	925	B	17	N	9576	5.77	73.35	4.23	6	WED	JAN	S	10077	7.21	61.85	4.46	15	THU	JAN
11	805	SD		16.43	927	B	17	N	7628	5.41	73.66	3.98	6	MON	JUN	S	9183	7.8	61.47	4.8	14	FRI	APR
11	805	SD		23.65	929	B	17	N	7754	5.75	70.64	4.06	6	WED	MAY	S	8756	7.94	57.8	4.59	14	FRI	JUN
11	805	SD		24.44	683	X	17	N	8892	6.98	65.45	4.57	6	WED	JUL	S	9221	7.75	61.15	4.74	14	FRI	MAY
11	805	SD		28.50	930	B	17	S	7327	7.27	61.61	4.48	8	WED	NOV	N	6906	6.94	60.89	4.22	16	WED	JUN
11	905	SD		3.207	932	A	17	W	2533	8.17	52.31	4.28	7	WED	APR	E	2872	8.87	54.66	4.85	15	THU	FEB
11	905	SD		5.164	942	A	17	E	4089	7.81	63.72	4.97	7	MON	DEC	W	4200	9.29	54.98	5.11	16	THU	DEC
11	905	SD	R	11.37	127	A	17	W	1531	5.72	75.09	4.29	7	THU	NOV	E	1748	7.57	64.79	4.9	16	TUE	JAN

YR	D_C_R	PP	POSTMILE	PS	DESCRIPTION	ADT_2009	ADT_2010	ADT_2011	ADT_2012	ADT_2013	ADT_2014	ADT_2015	ADT_2016	ADT_2017	ADT_2018	CREATE_DATE
2018	07-LA-210	R	22.292		WB ON FROM ARROYO BLVD	5,800				6,100			7,694			04/24/2019
2018	07-LA-210	R	22.353		EB OFF TO ARROYO BLVD	6,200			6,501	6,400			7,631			04/24/2019
2018	07-LA-210	R	22.618		WB OFF TO ARROYO BLVD					5,100						04/24/2019
2018	07-LA-210	R	22.642		EB ON FROM ARROYO BLVD	5,300			5,300				4,722			04/24/2019
2018	07-LA-605		21.951		SB ON FR LOWER AZUSA/LA ST			12,701	12,700		12,861	12,370			14,733	04/24/2019
2018	07-LA-605		21.980		NB OFF TO LOWER AZUSA/LA ST			12,701	12,700		12,861	12,490			16,346	04/24/2019
2018	07-LA-605		22.315		SB OFF TO LOWER AZUSA/LA ST						3,941	4,370		8,309	8,212	04/24/2019
2018	07-LA-605		22.366		NB ON FR LOWER AZUSA/LA ST	4,150		3,901	3,900		3,901	4,130		3,806		04/24/2019

Table 1 - Caltrans Data and Traffic Growth Factors

Freeway	Direction	Ramp	Year	Data Source	AM Vol	PM Vol	Growth % AM	Growth % PM	ID	Year	Data Source	AADT	AM KD%	AM Vol	PM KD%	PM Vol	Growth % ADT	Growth % AM	Growth % PM	Notes
I-210	WB	Windsor Off-Ramp	2012	PeMS	399	753			Census 73177	2013	Caltrans Ramp Volumes	5100	2.26%	115	5.42%	276	No other data set avaiable			
I-210	WB	Windsor On-Ramp	2019	PeMS	763	561	3.49%		VDS 716575	2016	Caltrans Ramp Volumes	7694	2.26%	174	5.42%	417	6.9%	6.9%	6.9%	
			2013	PeMS	603	563			no data earlier than 2013	2013		6100	2.26%	138	5.42%	331				
I-210	EB	Windsor Off-Ramp	2019	PeMS	364	494			VDS 717616	2016	Caltrans Ramp Volumes	7631	5.14%	392	3.39%	259	5.4%	5.4%	5.4%	
			2018	PeMS	551	846	0.06%	3.23%												
			2012	PeMS	549	682				2013		6400	5.14%	329	3.39%	217				
I-210	EB	Windsor On-Ramp	2019	PeMS	363	371			VDS 716576	2016	Caltrans Ramp Volumes	4722	5.14%	243	3.39%	160	-4.1%	-4.1%	-4.1%	
			2018	PeMS	474	470	-1.72%	2.09%												
			2012	PeMS	523	411				2013		5300	5.14%	272	3.39%	180				
I-605	SB	Lower Azusa Off-Ramp	2019	PeMS	923	890	8.95%	5.48%	VDS 767684	2018	Caltrans Ramp Volumes	8212	3.62%	297	3.37%	277	13.0%	13.0%	13.0%	
			2014	PeMS	510	646				2014		3941	3.62%	143	3.37%	133				
I-605	SB	Lower Azusa On-Ramp	2019	PeMS	815	946	-3.61%	-1.18%	VDS 716838	2018	Caltrans Ramp Volumes	14733	3.62%	533	3.37%	496	3.2%	3.2%	3.2%	
			2014	PeMS	962	1002				2014		12861	3.62%	466	3.37%	433				
I-605	NB	Lower Azusa Off-Ramp	2019	PeMS	840	1230	-1.02%	1.63%	VDS 717955	2018	Caltrans Ramp Volumes	16346	3.00%	491	3.48%	569	5.3%	5.3%	5.3%	
			2014	PeMS	883	1130				2014		12861	3.00%	386	3.48%	448				
I-605	NB	Lower Azusa On-Ramp	2019	PeMS	298	164	0.81%	-7.44%	VDS 716839	2017	Caltrans Ramp Volumes	3806	3.00%	114	3.48%	132	-0.8%	-0.8%	-0.8%	
			2014	PeMS	286	225				2014		3901	3.00%	117	3.48%	136				

RSA 26	**West Covina**		
	growth factors	per year rate	as %
2010	1.000		
2015	1.023	0.0046	0.46
2020	1.046	0.0046	0.46
2025	1.066	0.004	0.4
2030	1.086		
2035	1.106		

RSA 25	**Pasadena**		
	growth factors	per year rate	as %
2010	1.000		
2015	1.041	0.0082	0.82
2020	1.082	0.0082	0.82
2025	1.098	0.0032	0.32
2030	1.115		
2035	1.131		

- ***Estimated PCE AM and PM Peak Hour Voumes***

Base AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	45	630	0	0	665	585	0	0	0	10	10	645	0.950
2	Windsor Avenue	I-210 eastbound ramps	0	140	25	470	210	0	600	10	115	0	0	0	0.930
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	101	150	370	0	466	422	566	942	0	0.988
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	406	320	316	0	0	0	272	298	0	0	1131	167	0.976

Existing Year 2019 AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	47	656	0	0	692	609	0	0	0	10	10	671	
2	Windsor Avenue	I-210 eastbound ramps	0	146	26	489	219	0	625	10	120	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	105	156	386	0	485	439	589	981	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	423	333	329	0	0	0	284	310	0	0	1177	174	

Peak Project Traffic AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	0	0	0	0	90	0	0	0	0	0	0	90	
2	Windsor Avenue	I-210 eastbound ramps	0	0	0	90	0	0	0	0	0	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	90	0	0	0	0	0	0	0	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	0	0	0	0	0	0	0	90	0	0	0	90	

Existing Year 2019 plus Peak Project Traffic AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	47	656	0	0	782	609	0	0	0	10	10	761	
2	Windsor Avenue	I-210 eastbound ramps	0	146	26	579	219	0	625	10	120	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	195	156	386	0	485	439	589	981	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	423	333	329	0	0	0	284	400	0	0	1177	264	

Cumulative Project Traffic (Devil's Gate Option 1) AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	0	150	0	0	0	150	0	0	0	0	0	0	
2	Windsor Avenue	I-210 eastbound ramps	0	0	0	0	0	0	150	0	0	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	0	0	0	0	0	0	0	0	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	0	0	0	0	0	0	0	0	0	0	0	0	

Cumulative Project Traffic (Devil's Gate Option 2) AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	0	0	0	0	150	0	0	0	0	0	0	150	
2	Windsor Avenue	I-210 eastbound ramps	0	0	0	150	0	0	0	0	0	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	0	0	0	0	0	0	0	0	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	0	0	0	0	0	0	0	0	0	0	0	0	

Cumulative Year (Ambient Growth) 2022 AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	47	664	0	0	701	616	0	0	0	11	11	680	
2	Windsor Avenue	I-210 eastbound ramps	0	147	26	495	221	0	632	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	107	158	390	0	491	444	597	993	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	428	337	333	0	0	0	287	314	0	0	1191	176	

Cumulative Year 2022 plus (Devil's Gate Option 1) AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	47	814	0	0	701	766	0	0	0	11	11	680	
2	Windsor Avenue	I-210 eastbound ramps	0	147	26	495	221	0	782	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	107	158	390	0	491	444	597	993	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	428	337	333	0	0	0	287	314	0	0	1191	176	

Cumulative Year 2022 plus (Devil's Gate Option 2) AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	47	664	0	0	851	616	0	0	0	11	11	830	
2	Windsor Avenue	I-210 eastbound ramps	0	147	26	645	221	0	632	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	107	158	390	0	491	444	597	993	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	428	337	333	0	0	0	287	314	0	0	1191	176	

Cumulative Year 2022 plus (Devil's Gate Option 1) plus Peak Project Traffic AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	47	814	0	0	791	766	0	0	0	11	11	770	
2	Windsor Avenue	I-210 eastbound ramps	0	147	26	585	221	0	782	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	197	158	390	0	491	444	597	993	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	428	337	333	0	0	0	287	404	0	0	1191	266	

Cumulative Year 2022 plus (Devil's Gate Option 2) plus Peak Project Traffic AM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	47	664	0	0	851	616	0	0	0	11	11	830	
2	Windsor Avenue	I-210 eastbound ramps	0	147	26	645	221	0	632	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	107	158	390	0	491	444	597	993	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	428	337	333	0	0	0	287	314	0	0	1191	176	

Estimated PM Peak Hour Traffic Volumes

Base PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	110	750	0	0	615	485	0	0	0	30	10	455	0.960
2	Windsor Avenue	I-210 eastbound ramps	0	215	20	465	180	0	650	10	115	0	0	0	0.910
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	151	312	287	0	923	575	301	661	0	0.915
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	433	314	586	0	0	0	318	747	0	0	518	128	0.962

Existing Year 2019 PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	115	781	0	0	640	505	0	0	0	31	10	474	
2	Windsor Avenue	I-210 eastbound ramps	0	224	21	484	187	0	677	10	120	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	157	325	299	0	961	598	313	688	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	451	327	610	0	0	0	331	777	0	0	539	134	

Peak Project Traffic PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	0	0	0	0	90	0	0	0	0	0	0	90	
2	Windsor Avenue	I-210 eastbound ramps	0	0	0	90	0	0	0	0	0	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	90	0	0	0	0	0	0	0	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	0	0	0	0	0	0	0	90	0	0	0	90	

Existing Year 2019 plus Peak Project Traffic PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	115	781	0	0	730	505	0	0	0	31	10	564	
2	Windsor Avenue	I-210 eastbound ramps	0	224	21	574	187	0	677	10	120	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	247	325	299	0	961	598	313	688	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	451	327	610	0	0	0	331	867	0	0	539	224	

Cumulative Project Traffic (Devil's Gate Option 1) PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	0	150	0	0	0	150	0	0	0	0	0	0	
2	Windsor Avenue	I-210 eastbound ramps	0	0	0	0	0	0	150	0	0	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	0	0	0	0	0	0	0	0	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	0	0	0	0	0	0	0	0	0	0	0	0	

Cumulative Project Traffic (Devil's Gate Option 2) PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	0	0	0	0	150	0	0	0	0	0	0	150	
2	Windsor Avenue	I-210 eastbound ramps	0	0	0	150	0	0	0	0	0	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	0	0	0	0	0	0	0	0	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	0	0	0	0	0	0	0	0	0	0	0	0	

Cumulative Year (Ambient Growth) 2022 PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	116	790	0	0	648	511	0	0	0	32	11	479	
2	Windsor Avenue	I-210 eastbound ramps	0	227	21	490	190	0	685	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	159	329	303	0	973	606	317	696	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	456	331	617	0	0	0	335	787	0	0	545	135	

Cumulative Year 2022 plus (Devil's Gate Option 1) PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	116	940	0	0	648	661	0	0	0	32	11	479	
2	Windsor Avenue	I-210 eastbound ramps	0	227	21	490	190	0	835	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	159	329	303	0	973	606	317	696	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	456	331	617	0	0	0	335	787	0	0	545	135	

Cumulative Year 2022 plus (Devil's Gate Option 2) PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	116	790	0	0	798	511	0	0	0	32	11	629	
2	Windsor Avenue	I-210 eastbound ramps	0	227	21	640	190	0	685	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	159	329	303	0	973	606	317	696	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	456	331	617	0	0	0	335	787	0	0	545	135	

Cumulative Year 2022 plus (Devil's Gate Option 1) plus Peak Project Traffic PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	116	940	0	0	738	661	0	0	0	32	11	569	
2	Windsor Avenue	I-210 eastbound ramps	0	227	21	580	190	0	835	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	249	329	303	0	973	606	317	696	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	456	331	617	0	0	0	335	877	0	0	545	225	

Cumulative Year 2022 plus (Devil's Gate Option 2) plus Peak Project Traffic PM

			Movement												PHF
Int. ID	N/S Street Name	E/W Street Name	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	PHF
1	Windsor Avenue	I-210 westbound ramps	116	790	0	0	798	511	0	0	0	32	11	629	
2	Windsor Avenue	I-210 eastbound ramps	0	227	21	640	190	0	685	11	121	0	0	0	
3	I-605 southbound ramps-Rivergrade Rd	Lower Azusa Road	0	0	0	159	329	303	0	973	606	317	696	0	
4	I-605 northbound ramps-Rivergrade Rd	Los Angeles Street	456	331	617	0	0	0	335	787	0	0	545	135	

- ***Signal Timing Data***

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Transparity System Parameters

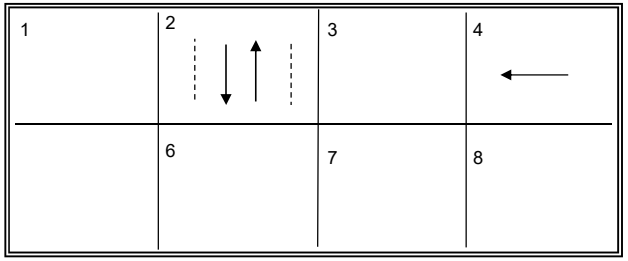
Group Assignment: **Arroyo Boulevard**
Field Master Assignment: **NONE**
System Reference Number: **0**
Commications Channel: **TWP**
Drop Address: **1**
Area Number: **7**
Area Address: **100**

N/S Street Name: **Arroyo Boulevard**
E/W Street Name: **210 WB Off-ramp**

Notes:
Serial Number: 5485 McCain

		DATE
SUPERSEDED TIMING SHEET		2/13/1991
TIMING BY:	CALTRANS	11/24/2014
REVIEWED BY:	CALTRANS	12/22/2014
IMPLEMENTED BY:	CALTRANS	12/22/2014

CHANGE	BY	DATE
2070 Controller change	CALTRANS	12/22/2014
Firmware upgrade -2033	CALTRANS	7/7/2016



- PHASE DIAGRAM-

Exclusive Ped Phase		
Excl Ped Assignment	_____	Note: Set the Exclusive Ped Outputs on the "Outputs / General" page
Exclusive Walk	0	
Exclusive FDW	0	
All Red Clear	0.0	

Walk Output	0
Don't Walk Output	0

N

		Phase 1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	10	0	10	0	0	0	0
	Extension	0.0	2.5	0.0	4.0	0.0	0.0	0.0	0.0
	Max	0	40	0	30	0	0	0	0
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	4.0	4.4	4.0	4.1	4.0	4.0	4.0	4.0
	Red Clear	0.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0
Pedestrian Timing	Walk	0	5	0	0	0	0	0	0
	Ped Clear - FDW	0	15	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0.0	2.5	0.0	4.0	0.0	0.0	0.0	0.0
	Max Gap	0.0	2.5	0.0	4.0	0.0	0.0	0.0	0.0
	Reduce Every	0.0	1.7	0.0	1.7	0.0	0.0	0.0	0.0

Phase Timing - Bank 1

	Phase 1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 1

Red Lock	_____	Red Rest	_____
Yellow Lock	_2_____	Dual Entry	_____
Simultaneous Gap	12345678	Sequential Timing	12345678
Rest In Walk	_____	Inhibit Ped Reservice	_____
Advance Walk	_____	Semi-Actuated	_____
Flashing Walk	_____	Guaranteed Passage	_____
Max Extension	_____	Conditional Service	_____

Phase Functions - Page 1

Minimum Recall	_2_____	Soft Recall	_____
Ped Recall	_2_____	External Recall	_____
Maximum Recall	_____	Manual Control Calls	12345678
Green Flash	_____	Fast Green Flash	_____
Overlap Green Flash	_____	Fast Overlap G. Flash	_____
PPLT FYA	_____	Semi Act	_____

Phase Functions - Page 2

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Phase Timing - Bank 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	0	0	0	0	0	0	0
	Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max	0	0	0	0	0	0	0	0
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	Red Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0	0	0	0	0	0	0	0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0	0	0	0	0	0	0	0
	Max Gap	0	0	0	0	0	0	0	0
	Reduce Every	0	0	0	0	0	0	0	0

Phase Timing - Bank 3

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	0	0	0	0	0	0	0
	Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max	0	0	0	0	0	0	0	0
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	Red Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 2

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 3

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Note: Set the Limited Service Interval on the "Utilities / Misc" page

Clear Phases	_2__5___
Delay	0
Clear Time	5

Railroad - 1

Clear Phases	___4__7_
Limited Service Phases	123__6__
Delay	0
Clear Time	5

Railroad - 2

Railroad Preempt Parameters

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 1

	Delay	Clear	Clear Phases
EV - A	0	5	_2__5___
EV - B	0	5	___4__7__
EV - C	0	5	1___6__
EV - D	0	5	__3___8

Emergency Vehicle Preempt

SE - 1	
SE - 2	
EV - A	
EV - B	
EV - C	
EV - D	

Preempt Priority

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 2

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Transition Type	0.3
Coord Extra Functions	
Phase 1 - Minimum	0
Phase 2 - Minimum	25
Phase 3 - Minimum	0
Phase 4 - Minimum	18
Phase 5 - Minimum	0
Phase 6 - Minimum	0
Phase 7 - Minimum	0
Phase 8 - Minimum	0

Note: The *Ring-Barrier Sum* of these Minimums will be the Minimum Cycle Length During Transition

Coordination - General

Coord Extra
1 = Programmed Walk Time for Sync Phases
2 = Always Terminate Sync Phase Peds
3 = Use "Floating Force Off"
4 =
5 = Use "Start of Green" for Sync Point

Transition Type
0.X = Shortway
1.X = Lengthen Only
2.X = Shorten Only
X.1 thru X.4 = Number of Cycles to get "In Step"

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Cycle	45	45	45	0	0	0	0	120	120
Offset - 1	29	25	25	0	0	0	0	29	29
Offset - 2	0	0	0	0	0	0	0	0	0
Offset - 3	0	0	0	0	0	0	0	0	0
Zone Offset	0	0	0	0	0	0	0	0	0
Ring Offset	0	0	0	0	0	0	0	0	0
Hold Release	255	255	255	255	255	255	255	255	255
Ped Adjust	0	0	0	0	0	0	0	0	0
Force Off - 1	0	0	0	0	0	0	0	0	0
Force Off - 2	0	0	0	0	0	0	0	0	0
Force Off - 3	0	0	0	0	0	0	0	0	0
Force Off - 4	29	25	25	0	0	0	0	25	25
Force Off - 5	0	0	0	0	0	0	0	0	0
Force Off - 6	0	0	0	0	0	0	0	0	0
Force Off - 7	0	0	0	0	0	0	0	0	0
Force Off - 8	0	0	0	0	0	0	0	0	0

Coordination - Cycle, Offsets, & Force Offs

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Perm 1 - Begin	0	0	0	0	0	0	0	0	0
Perm 1 - End	10	10	10		0	0	0	10	10
Perm 1 - Veh Phases	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678
Perm 1 - Ped Phases	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678
Perm 2 - Begin	0	0	0	0	0	0	0	0	0
Perm 2 - End	0	0	0	0	0	0	0	0	0
Perm 2 - Veh Phases	0	0	0	0	0	0	0	0	0
Perm 2 - Ped Phases	0	0	0	0	0	0	0	0	0
Perm 3 - Begin	0	0	0	0	0	0	0	0	0
Perm 3 - End	0	0	0	0	0	0	0	0	0
Perm 3 - Veh Phases	0	0	0	0	0	0	0	0	0
Perm 3 - Ped Phases	0	0	0	0	0	0	0	0	0
Max Inhibit Phases	0	0	0	0	0	0	0	0	0
Max Recall Phases	0	0	0	0	0	0	0	0	0
Sync Phases	_2_____	_2_____	_2_____	_2_____	_2_____	_2_____	_2_____	_2_____	_2_____
Lag Phases	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8	_2_4_6_8
Pre-Timed Phases	0	0	0	0	0	0	0	0	0

Coordination - Permissives & Phase Sequence

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

	Overlap Number							
	1	2	3	4	5	6	7	8
Load Switch Number	9	0	0	0	0	0	0	0
Vehicle Set 1								
Vehicle Set 2								
Vehicle Set 3								
Negative Vehicle								
Negative Ped								
Green Omit								
Green Clear Omit								
Green Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow Change	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Red Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlaps

	AND 1	AND 2	AND 3	AND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

AND Gates

	NAND 1	NAND 2	NAND 3	NAND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

NAND Gates

	OR 1	OR 2	OR 3	OR 4	OR 5	OR 6
Input - A	0	0	0	0	0	0
Input - B	0	0	0	0	0	0
Output	0	0	0	0	0	0

2 Input - OR Gates

	OR 7	OR 8
Input - A	0	0
Input - B	0	0
Input - C	0	0
Input - D	0	0
Output	0	0

4 Input - OR Gates

	NOT 1	NOT 2	NOT 3	NOT 4
Input	0	0	0	0
Output	0	0	0	0

NOT Gates (Inverters)

	DELAY 1	DELAY 2	DELAY 3	DELAY 4	DELAY 5	DELAY 6
Input	0	0	0	0	0	0
Delay Time	0	0	0	0	0	0
Output	0	0	0	0	0	0

DELAY Gates

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Det. #	C-1 Pin #	Delay	Carry-over	Phase Assignments	Detector Attributes	Detector Set Assignments	Input File Slots	
1	39	0.0	0.0	_2_____	___45_7_	123____	2I2U	NBLT
2	40	0.0	0.0	_____6__	___45_7_	123____	6J2U	
3	41	0.0	0.0	___4____	___45_7_	123____	4I6U	WBLT
4	42	0.0	0.0	_____8	___45_7_	123____	8J6U	
5	43	0.0	0.0	_2_____	___45_7_	123____	2I2L	
6	44	0.0	0.0	_____6__	___45_7_	123____	6J2L	
7	45	5.0	0.0	___4____	___45_7_	123____	4I6L	WBRT
8	46	0.0	0.0	_____8	___45_7_	123____	8J6L	
9	47	0.0	1.0	_2_____	____67_	123____	2I4U/L	
10	48	0.0	1.0	_____6__	____67_	123____	6J4U/L	
11	49	0.0	1.0	___4____	____67_	123____	4I8U/L	
12	50	0.0	1.0	_____8	____67_	123____	8J8U/L	
13	55	0.0	0.0	____5___	___45_7_	123____	5J1U/L	
14	56	0.0	0.0	1_____	___45_7_	123____	1I1U/L	
15	57	0.0	0.0	_____7_	___45_7_	123____	7J5U/L	
16	58	0.0	0.0	__3____	___45_7_	123____	3I5U/L	
17	59	0.0	0.0	____5___	___45_7_	123____	5J9U	
18	60	0.0	0.0	_____	___45_7_	123____	^{1}I9U	
19	61	0.0	0.0	_____7_	___45_7_	123____	7J9L	
20	62	0.0	0.0	_____	___45_7_	123____	^{3}I9L	
21	63	0.0	0.0	_2_____	___45_7_	123____	2I3U	
22	64	0.0	0.0	_____6__	___45_7_	123____	6J3U	
23	65	0.0	0.0	___4____	___45_7_	123____	4I7U	
24	66	0.0	0.0	_____8	___45_7_	123____	8J7U	
25	67	0.0	0.0	_2_____	_2_____	123____	2I12U	φ2 PED
26	68	0.0	0.0	_____	_2_____	123____	6I13U	φ6 PED
27	69	0.0	0.0	_____	_2_____	123____	4I12L	φ4 PED
28	70	0.0	0.0	_____	_2_____	123____	8I13L	φ8 PED
29	76	0.0	0.0	_2_____	___45_7_	123____	2I3L	
30	77	0.0	0.0	_____6__	___45_7_	123____	6J3L	
31	78	0.0	0.0	___4____	___45_7_	123____	4I7L	
32	79	0.0	0.0	_____8	___45_7_	123____	8J7L	
	54	0.0	0.0	_____	___45_7_	123____	J11U	
	75	0.0	0.0	_____	___45_7_	123____	J11L	

Detector Assignments

	C-1 Pin #
Flash Sense	81
External Permit - 1	0
External Permit - 2	0
Exclusive Ped Omit	0
Max. Term Inhibit	0
Max. 2	0
External Lag Phases	0
External Max. Recall	0
Stop Time	82
Manual Control Enable	80
Manual Cont. Advance	53
External Min. Recall	0

General Inputs

	C-1 Pin #
Plan 1	0
Plan 2	0
Plan 3	0
Plan 4	0
Plan 5	0
Plan 6	0
Plan 7	0
Plan 8	0
Plan 9	0
Free	0
Flash	0

Coordination Plan Inputs

	C-1 Pin #
Railroad - 1	0
Railroad - 2	0
Special Event - 1	0
Special Event - 2	0
Gate Down	0
EV - A	71
EV - B	0
EV - C	0
EV - D	0

Preempt Inputs

	C-1 Pin #
Phase Bank - 2	0
Phase Bank - 3	0
Detector Set - 2	0
Detector Set - 3	0
Overlap Vehicle Set - 2	0
Overlap Vehicle Set - 3	0

Bank & Set Inputs

	C-1 Pin #
Door Ajar	
UPS Battery	
UPS Power	
Cabinet Temperature	

	C-1 Pin #
Alarm - 1	
Alarm - 2	
Alarm - 3	
Alarm - 4	

Alarm Inputs

Detector Attributes
1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Detector Assignments
1 = Detector Set 1
2 = Detector Set 2
3 = Detector Set 3
4 =
5 =
6 = Failure - Min Recall
7 = Failure - Max Recall
8 = Report on Failure

SYSTEM DETECTORS

DIR	LANE	DESCRIPTION	C1 PIN	SLOT	DIR	LANE	DESCRIPTION	C1 PIN	SLOT
		SYS DET # 1	60	I9U			SYS DET # 5	54	J11U
		SYS DET # 2	62	I9L			SYS DET # 6	75	J11L
		SYS DET # 3	59	J9U			SYS DET # 7	47	I4U
		SYS DET # 4	61	J9L			SYS DET # 8	49	I8U

Department of Transportation - California Caltrans

NTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

	C-1 Pin #
Advance Warning - 1	0
Advance Warning - 2	0
Detector Failure	0
Flasher - Alternating 1	0
Flasher - Alternating 2	0
Fast Flasher	0
On Line	0
Exclusive - Walk	0
Exclusive - Don't Walk	0

General Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Time of Day Outputs

	C-1 Pin #
Plan - 1	0
Plan - 2	0
Plan - 3	0
Plan - 4	0
Plan - 5	0
Plan - 6	0
Plan - 7	0
Plan - 8	0
Plan - 9	0
Free	0
Flash	

Coordination Plan Out

	Ped Phase
Ped 2-P Loadswitch	2
Ped 4-P Loadswitch	
Ped 6-P Loadswitch	
Ped 8-P Loadswitch	

Ped Loadswitch Assignment

	C-1 Pin #
Dial - 2	0
Dial - 3	0
Offset - 1	0
Offset - 2	0
Offset - 3	0
Free	0
Flash	0

Seven Wire Outputs

	C-1 Pin #	
	On	Flash
Railroad - 1	0	
Railroad - 2	0	
Special Event - 1	0	
Special Event - 2	0	
Preempt Failure	0	
EV - A	0	
EV - B	0	
EV - C	0	
EV - D	0	
Any Preempt	0	

Preemption Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Event Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Function Output

	Phase Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0
Walk	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0

Phase Output Redirection

	Overlap Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0

Overlap Output Redirection

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Event	Day of Week	Season	Hour	Minute	Plan	Offset
0	1234567	12345678	5	0	1	1
1	_23456_	12345678	6	30	2	1
2	_23456_	12345678	14	0	3	1
3	1234567	12345678	22	0	E	1
4	_____		0	0	0	0
5	_____		0	0	0	0
6	_____		0	0	0	0
7	_____		0	0	0	0
8	_____		0	0	0	0
9	_____		0	0	0	0
10	_____		0	0	0	0
11	_____		0	0	0	0
12	_____		0	0	0	0
13	_____		0	0	0	0
14	_____		0	0	0	0
15	_____		0	0	0	0
16	_____		0	0	0	0
17	_____		0	0	0	0
18	_____		0	0	0	0
19	_____		0	0	0	0
20	_____		0	0	0	0
21	_____		0	0	0	0
22	_____		0	0	0	0
23	_____		0	0	0	0
24	_____		0	0	0	0
25	_____		0	0	0	0
26	_____		0	0	0	0
27	_____		0	0	0	0
28	_____		0	0	0	0
29	_____		0	0	0	0
30	_____		0	0	0	0
31	_____		0	0	0	0

Time Base Coordination Events

Event	Day of Week	Season	Hour	Minute	Funct.	Phase / Bits
0	_____		0	0	0	_____
1	_____		0	0	0	_____
2	_____		0	0	0	_____
3	_____		0	0	0	_____
4	_____		0	0	0	_____
5	_____		0	0	0	_____
6	_____		0	0	0	_____
7	_____		0	0	0	_____
8	_____		0	0	0	_____
9	_____		0	0	0	_____
10	_____		0	0	0	_____
11	_____		0	0	0	_____
12	_____		0	0	0	_____
13	_____		0	0	0	_____
14	_____		0	0	0	_____
15	_____		0	0	0	_____

Time of Day Function Events

TOD Functions

0 = Permitted Phases
1 = Red Lock
2 = Yellow Lock
3 = Vehicle Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Vehicle Max Recall
10 = Soft Recall
11= Max Extension 2
12 = Conditional Service
13 = Lag Free Phases
14, Bit 1 = Local Override
14, Bit 4 = Disable Det Off Monitoring
15 = TOD Outputs

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

#	Holiday Type	Day	Month	Year
0	_____	0	0	0
1	_____	0	0	0
2	_____	0	0	0
3	_____	0	0	0
4	_____	0	0	0
5	_____	0	0	0
6	_____	0	0	0
7	_____	0	0	0
8	_____	0	0	0
9	_____	0	0	0
10	_____	0	0	0
11	_____	0	0	0
12	_____	0	0	0
13	_____	0	0	0
14	_____	0	0	0
15	_____	0	0	0
16	_____	0	0	0
17	_____	0	0	0
18	_____	0	0	0
19	_____	0	0	0
20	_____	0	0	0
21	_____	0	0	0
22	_____	0	0	0
23	_____	0	0	0
24	_____	0	0	0
25	_____	0	0	0
26	_____	0	0	0
27	_____	0	0	0
28	_____	0	0	0
29	_____	0	0	0
30	_____	0	0	0
31	_____	0	0	0

Holiday Dates

Event	Holiday Type	Hour	Minute	Plan	Offset
0	_____	0	0	0	0
1	_____	0	0	0	0
2	_____	0	0	0	0
3	_____	0	0	0	0
4	_____	0	0	0	0
5	_____	0	0	0	0
6	_____	0	0	0	0
7	_____	0	0	0	0
8	_____	0	0	0	0
9	_____	0	0	0	0
10	_____	0	0	0	0
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0
16	_____	0	0	0	0
17	_____	0	0	0	0
18	_____	0	0	0	0
19	_____	0	0	0	0
20	_____	0	0	0	0
21	_____	0	0	0	0
22	_____	0	0	0	0
23	_____	0	0	0	0
24	_____	0	0	0	0
25	_____	0	0	0	0
26	_____	0	0	0	0
27	_____	0	0	0	0
28	_____	0	0	0	0
29	_____	0	0	0	0
30	_____	0	0	0	0
31	_____	0	0	0	0

Holiday Time Base Coordination Events

Event	Holiday Type	Hour	Minute	Funct.	Phase / Bits
0	_____	0	0	0	_____
1	_____	0	0	0	_____
2	_____	0	0	0	_____
3	_____	0	0	0	_____
4	_____	0	0	0	_____
5	_____	0	0	0	_____
6	_____	0	0	0	_____
7	_____	0	0	0	_____
8	_____	0	0	0	_____
9	_____	0	0	0	_____
10	_____	0	0	0	_____
11	_____	0	0	0	_____
12	_____	0	0	0	_____
13	_____	0	0	0	_____
14	_____	0	0	0	_____
15	_____	0	0	0	_____

Holiday Time of Day Function Events

Season #	Start Month	Start Day	End Month	End Day
1	1	1	12	31
2				
3				
4				
5				
6				
7				
8				

Season Definitions

Department of Transportation - California Caltrans

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Red Start Time	4.0
Yellow Start Phases	___4____
First Green Phases	_2_____
Startup Vehicle Calls	_2_4___
Startup Ped Calls	_2_4___

Startup

Max ON Time	7
Max OFF Time	255
Chatter	45

Detector Check

	Sign 1	Sign 2
Phase Number	0	0
Time Before Yellow	0.0	0.0

Advance Warning Signs

Flash Entry Phases	_____
Flash Phases Yellow	_____
Flash Overlaps Yellow	_____
Flash Type	

Flash Setup

Exclusive Phases	_____
Protect / Permissive	_____
Disable Yellow Range	_____
Extra One	1_3_5___
Lag Phases - Free	_2_4_6_8

Configuration

Permitted Phases	_2_4___
Restricted Phases	_____
Disable Overlap Range	_____
Extra Two	___4____

Configuration

Keyboard Beep	0
Backlight Timeout	0
Spec Evnt 1 - Ltd Serv Interval	0
Spec Evnt 2 - Ltd Serv Interval	0
Red Revert	4.0

Miscellaneous

Spring Month (Begin)	3
Spring Week (Begin)	2
Fall Month (End)	11
Fall Week (End)	1

Daylight Savings Time

Manual Plan	0
Manual Offset	0

Manual

Manual Plan
1 thru 9 = Coordination Plan 1 thru 9
14 = Free
15 = Flash

Extra One
1 =
2 =
3 = Auto Daylight Savings
4 = Solid FDW on EV
5 = Extended Status
6 = International Ped
7 =
8 =

Extra Two
1 =
2 =
3 = Disable Min Walk
4 = QuicNet Pro System
5 = Ignor P/P on EV
6 =
7 =
8 =

Address	NONE			
Area Number	NONE			
Area Address	NONE			
IP Port	0			
IP Address	0	0	0	0
Subnet Mask	0	0	0	0
Gateway	0	0	0	0

Ethernet Port Address

Flash Type
0 = All On-Off (12345678-0)
1 = Main-Side (1256-3478)
2 = Ping Pong (1234-5678
3 = Ring Pairs (1638-5247)

CHANNEL	TPS / PAIR	TRUNK	NETWORK	PAIRS
H95		T1		

	Serial Port Port 1	Port 2	Port 3	Port 4
Address	1			
Area Number	7			
Area Address	100			
Comm Time Out	15			
CTS Delay	15			
RTS Hold	5			
Baud Rate	1200			
Data Format	8,1			

Communications Parameters

T1 CIRCUIT ID 20FDDA510876-0
TEL PHONE ADDRESS: 2023 N Arroyo Blvd /Seg

City of Pasadena - Department of Transportation - TMC

INTERSECTION: 210 WB OFF-RAMP @ ARROYO BOULEVARD - NO. 700

Event	Day of Week	Direction (+-)	Hour	Minute	Headway
0	_____	_ _ _ _	0	0	0
1	_____	_ _ _ _	0	0	0
2	_____	_ _ _ _	0	0	0
3	_____	_ _ _ _	0	0	0
4	_____	_ _ _ _	0	0	0
5	_____	_ _ _ _	0	0	0
6	_____	_ _ _ _	0	0	0
7	_____	_ _ _ _	0	0	0
8	_____	_ _ _ _	0	0	0
9	_____	_ _ _ _	0	0	0
10	_____	_ _ _ _	0	0	0

Headway Schedule

	Phase Number							
	1	2	3	4	5	6	7	8
A	0	0	0	0	0	0	0	0
B	0	0	0	0	0	0	0	0
C	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0

Non Priority Phase Max Adjustment

Display Menu
1 = Unit Status
2 = Loop/Bus Comm
3 = TPS Comm Status
4 = Request/Headway
5 = Priority Status
6 = Ram Checksum

Direction	A	B	C	D
Delay	0	0	0	0
Early Green	0	0	0	0
Green Extension	0	0	0	0

Bus Priority Timing

	Direction
A	_____
B	_____
C	_____
D	_____

Bus Priority Phases

	Direction
A	_____
B	_____
C	_____
D	_____

Bus Priority Phases

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

Transparity System Parameters

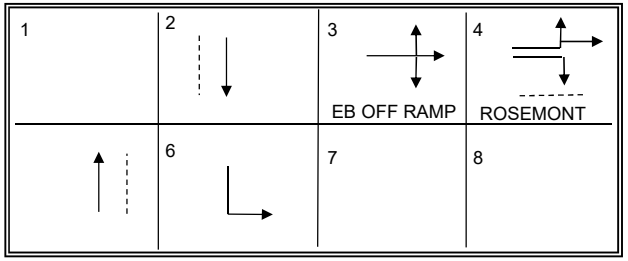
Group Assignment: **Arroyo Boulevard**
Field Master Assignment: **NONE**
System Reference Number: **NONE**
Commications Channel: **TWP**
Drop Address: **2**
Area Number: **7**
Area Address: **1**

N/S Street Name: **Arroyo Boulevard**
E/W Street Name: **Rosemont Avenue**

Notes:
Serial Number: 5485 McCain

		DATE
SUPERSEDED TIMING SHEET		10/22/1991
TIMING BY:	CALTRANS	12/22/2014
REVIEWED BY:	CALTRANS	12/22/2014
IMPLEMENTED BY:	CALTRANS	12/22/2014

CHANGE	BY	DATE
2070 Controller change	CALTRANS	12/22/2014
Firmware upgrade - 2033	CALTRANS	7/7/2016



- PHASE DIAGRAM-

OLA=Load Switch 7
OLB=Load Switch 8



		Phase 1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	10	10	7	6	10	0	0
	Extension	0.0	3.0	5.5	4.0	4.0	3.0	0.0	0.0
	Max	0	30	30	30	25	15	0	0
	Max 2	0	60	60	60	30	30	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	4.0	4.4	4.1	4.1	4.4	4.4	4.0	4.0
	Red Clear	0.0	0.5	0.5	0.5	0.5	0.5	0.0	0.0
Pedestrian Timing	Walk	0	6	0	5	6	0	0	0
	Ped Clear - FDW	0	10	0	20	13	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0.0	3.0	5.5	4.0	4.0	3.0	0.0	0.0
	Max Gap	0.0	3.0	5.5	4.0	4.0	3.0	0.0	0.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 1

Excl Ped Assignment	
Exclusive Walk	0
Exclusive FDW	0
All Red Clear	0.0

Note: Set the Exclusive Ped Outputs on the "Outputs / General" page

Walk Output	0
Don't Walk Output	0

Exclusive Ped Phase

	Phase 1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 1

Red Lock		Red Rest	
Yellow Lock	5	Dual Entry	
Simultaneous Gap	12345678	Sequential Timing	12345678
Rest In Walk		Inhibit Ped Reservice	
Advance Walk		Semi-Actuated	
Flashing Walk		Guaranteed Passage	
Max Extension		Conditional Service	

Phase Functions - Page 1

Minimum Recall	2 6	Soft Recall	
Ped Recall	2	External Recall	
Maximum Recall		Manual Control Calls	12345678
Green Flash		Fast Green Flash	
Overlap Green Flash		Fast Overlap G. Flash	
PPLT FYA		Semi Act	

Phase Functions - Page 2

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	0	0	0	0	0	0	0
	Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max	0	0	0	0	0	0	0	0
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	Red Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 2

		Phase							
		1	2	3	4	5	6	7	8
Basic Phase Timing	Min Green	0	0	0	0	0	0	0	0
	Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max	0	0	0	0	0	0	0	0
	Max 2	0	0	0	0	0	0	0	0
	Cond Serve Check	0	0	0	0	0	0	0	0
Clear	Yellow Change	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	Red Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian Timing	Walk	0	0	0	0	0	0	0	0
	Ped Clear - FDW	0	0	0	0	0	0	0	0
	Adv / Delay Walk	0	0	0	0	0	0	0	0
	PE Min Ped FDW	0	0	0	0	0	0	0	0
Volume Density	Type 3 Disconnect	0	0	0	0	0	0	0	0
	Added per Vehicle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Added Initial	0	0	0	0	0	0	0	0
	Min Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Max Gap	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Reduce Every	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Phase Timing - Bank 3

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 2

	Phase							
	1	2	3	4	5	6	7	8
Alternate Walk	0	0	0	0	0	0	0	0
Alternate Ped Clear	0	0	0	0	0	0	0	0
Alternate Minimum	0	0	0	0	0	0	0	0
Alternate Extension	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Alternate Timing - Bank 3

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

Note: Set the Limited Service Interval on the "Utilities / Misc" page

Clear Phases	_2__5___
Delay	0
Clear Time	5

Railroad - 1

Clear Phases	___4__7_
Limited Service Phases	123__6__
Delay	0
Clear Time	5

Railroad - 2

Railroad Preempt Parameters

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 1

	Delay	Clear	Clear Phases
EV - A	0	5	_2__5___
EV - B	0	5	___4___7_
EV - C	0	5	1____6__
EV - D	0	5	__3____8

Emergency Vehicle Preempt

SE - 1	
SE - 2	
EV - A	
EV - B	
EV - C	
EV - D	

Preempt Priority

Step	Time	Clear	Ped Call	Hold	Advance	Force Off	Vehicle Call	Permit	Ped Omit	Output
0	0									
1	0									
2	0									
3	0									
4	0									
5	0									
6	0									
7	0									
8	0									
9	0									
10	0									
11	0									
12	0									
13	0									
14	0									
15	0									

Special Event Sequence - 2

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

Transition Type	0.3
Coord Extra Functions	
Phase 1 - Minimum	0
Phase 2 - Minimum	18
Phase 3 - Minimum	15
Phase 4 - Minimum	23
Phase 5 - Minimum	18
Phase 6 - Minimum	15
Phase 7 - Minimum	0
Phase 8 - Minimum	0

Note: The *Ring-Barrier Sum* of these Minimums will be the Minimum Cycle Length During Transition

Coordination - General

Coord Extra
1 = Programmed Walk Time for Sync Phases
2 = Always Terminate Sync Phase Peds
3 = Use "Floating Force Off"
4 =
5 = Use "Start of Green" for Sync Point

Transition Type
0.X = Shortway
1.X = Lengthen Only
2.X = Shorten Only
X.1 thru X.4 = Number of Cycles to get "In Step"

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Cycle	100	100	100	0	0	0	0	150	150
Offset - 1	21	16	10	0	0	0	0	21	21
Offset - 2	0	0	0	0	0	0	0	0	0
Offset - 3	0	0	0	0	0	0	0	0	0
Zone Offset	0	0	0	0	0	0	0	0	0
Ring Offset	0	0	0	0	0	0	0	0	0
Hold Release	255	255	255	255	255	255	255	255	255
Ped Adjust	0	0	0	0	0	0	0	0	0
Force Off - 1	0	0	0	0	0	0	0	0	0
Force Off - 2	0	0	0	0	0	0	0	0	0
Force Off - 3	85	85	85	0	0	0	0	135	135
Force Off - 4	60	60	60	0	0	0	0	64	110
Force Off - 5	29	29	29	0	0	0	0	29	29
Force Off - 6	0	0	0	0	0	0	0	0	0
Force Off - 7	0	0	0	0	0	0	0	0	0
Force Off - 8	0	0	0	0	0	0	0	0	0

Coordination - Cycle, Offsets, & Force Offs

	Coordination Plan								
	1	2	3	4	5	6	7	8	9
Perm 1 - Begin	0	0	0	0	0	0	0	0	0
Perm 1 - End	29	29	29	0	0	0	0	29	29
Perm 1 - Veh Phases	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678
Perm 1 - Ped Phases	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678
Perm 2 - Begin	0	0	0	0	0	0	0	0	0
Perm 2 - End	0	0	0	0	0	0	0	0	0
Perm 2 - Veh Phases	0	0	0	0	0	0	0	0	0
Perm 2 - Ped Phases	0	0	0	0	0	0	0	0	0
Perm 3 - Begin	0	0	0	0	0	0	0	0	0
Perm 3 - End	0	0	0	0	0	0	0	0	0
Perm 3 - Veh Phases	0	0	0	0	0	0	0	0	0
Perm 3 - Ped Phases	0	0	0	0	0	0	0	0	0
Max Inhibit Phases	0	0	0	0	0	0	0	0	0
Max Recall Phases	0	0	0	0	0	0	0	0	0
Sync Phases	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__	_2___6__
Lag Phases	_23_5__8	_23_5__8	_23_5__8	_23_5__8	_23_5__8	_23_5__8	_23_5__8	_23_5__8	_23_5__8
Pre-Timed Phases									

Coordination - Permissives & Phase Sequence

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

	Overlap Number							
	1	2	3	4	5	6	7	8
Load Switch Number	0	0	0	0	0	0	7	8
Vehicle Set 1							_23_5___	___45___
Vehicle Set 2							_23_5___	___45___
Vehicle Set 3							_23_5___	___45___
Negative Vehicle							___4____	__3__6__
Negative Ped							___4____	
Green Omit								
Green Clear Omit								
Green Clearance	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0
Yellow Change	4.0	4.0	4.0	4.0	4.0	4.0	4.4	4.4
Red Clearance	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5

Overlaps

	AND 1	AND 2	AND 3	AND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

AND Gates

	NAND 1	NAND 2	NAND 3	NAND 4
Input - A	0	0	0	0
Input - B	0	0	0	0
Output	0	0	0	0

NAND Gates

	OR 1	OR 2	OR 3	OR 4	OR 5	OR 6
Input - A	0	0	0	0	0	0
Input - B	0	0	0	0	0	0
Output	0	0	0	0	0	0

2 Input - OR Gates

	OR 7	OR 8
Input - A	0	0
Input - B	0	0
Input - C	0	0
Input - D	0	0
Output	0	0

4 Input - OR Gates

	NOT 1	NOT 2	NOT 3	NOT 4
Input	210	0	0	0
Output	212	0	0	0

NOT Gates (Inverters)

	DELAY 1	DELAY 2	DELAY 3	DELAY 4	DELAY 5	DELAY 6
Input	0	0	0	0	0	0
Delay Time	0	0	0	0	0	0
Output	0	0	0	0	0	0

DELAY Gates

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

Det. #	C-1 Pin #	Delay	Carry-over	Phase Assignments	Detector Attributes	Detector Set Assignments	Input File Slots	
1	39	0.0	0.0	_2_____	___45_7_	123_____	2I2U	
2	40	0.0	0.0	_____6__	___45_7_	123_____	6J2U	
3	41	0.0	0.0	___4____	___45_7_	123____8	4I6U	EBLT, ROSEMONT AVE
4	42	0.0	0.0	_______8	___45_7_	123_____	8J6U	
5	43	0.0	0.0	_2_____	___45_7_	123_____	2I2L	
6	44	0.0	0.0	_____6__	___45_7_	123_____	6J2L	
7	45	5.0	0.0	___4____	___45_7_	123____8	4I6L	EBRT, ROSEMONT AVE
8	46	0.0	0.0	_______8	___45_7_	123_____	8J6L	
9	47	0.0	0.0	_2_____	_____67_	123_____	2I4U/L	
10	48	0.0	0.0	_____6__	_____67_	123_____	6J4U/L	
11	49	0.0	0.0	___4____	_____67_	123_____	4I8U/L	
12	50	0.0	0.0	_______8	_____67_	123_____	8J8U/L	
13	55	0.0	0.0	____5___	___45_7_	123____8	5J1U/L	NBLT, ARROYO BLVD
14	56	0.0	0.0	1_______	___45_7_	123_____	1I1U/L	
15	57	0.0	0.0	_____7_	___45_7_	123_____	7J5U/L	
16	58	0.0	0.0	__3____	___45_7_	123_____	3I5U/L	
17	59	0.0	0.0	____5___	___45_7_	123_____	5J9U	
18	60	0.0	0.0	1_______	___45_7_	123_____	1I9U	
19	61	0.0	0.0	_____7_	___45_7_	123_____	7J9L	
20	62	0.0	0.0	__3____	___45_7_	123_____	3I9L	
21	63	0.0	0.0	____5___	___45_7_	123____8	3^2I3U	EB OFFRAMP
22	64	0.0	0.0	_____6__	___45_7_	123_____	6J3U	
23	65	0.0	0.0	___4____	___45_7_	123_____	4I7U	
24	66	0.0	0.0	_______8	___45_7_	123_____	8J7U	
25	67	0.0	0.0	_2_____	_2_____	123_____	2I12U	φ2 PED
26	68	0.0	0.0	____5___	_2_____	123_____	6I13U	φ6 PED
27	69	0.0	0.0	___4____	_2_____	123_____	4I12L	φ4 PED
28	70	0.0	0.0	_______8	_2_____	123_____	8I13L	φ8 PED
29	76	0.0	0.0	_2_____	___45_7_	123_____	2I3L	
30	77	0.0	0.0	_____6__	___45_7_	123_____	6J3L	
31	78	0.0	0.0	___4____	___45_7_	123_____	4I7L	
32	79	0.0	0.0	_______8	___45_7_	123_____	8J7L	
	54	0.0	0.0	_____	___45_7_	123_____	J11U	
	75	0.0	0.0	_____	___45_7_	123_____	J11L	

Detector Assignments

	C-1 Pin #
Flash Sense	81
External Permit - 1	0
External Permit - 2	0
Exclusive Ped Omit	0
Max. Term Inhibit	0
Max. 2	212
External Lag Phases	0
External Max. Recall	0
Stop Time	82
Manual Control Enable	53
Manual Cont. Advance	80
External Min. Recall	0

General Inputs

	C-1 Pin #
Plan 1	0
Plan 2	0
Plan 3	0
Plan 4	0
Plan 5	0
Plan 6	0
Plan 7	0
Plan 8	0
Plan 9	0
Free	0
Flash	0

Coordination Plan Inputs

	C-1 Pin #
Railroad - 1	0
Railroad - 2	0
Special Event - 1	0
Special Event - 2	0
Gate Down	0
EV - A	71
EV - B	0
EV - C	0
EV - D	0

Preempt Inputs

	C-1 Pin #
Phase Bank - 2	0
Phase Bank - 3	0
Detector Set - 2	0
Detector Set - 3	0
Overlap Vehicle Set - 2	0
Overlap Vehicle Set - 3	0

Bank & Set Inputs

	C-1 Pin #
Door Ajar	
UPS Battery	
UPS Power	
Cabinet Temperature	

Alarm Inputs

	C-1 Pin #
Alarm - 1	
Alarm - 2	
Alarm - 3	
Alarm - 4	

Detector Attributes
1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Detector Assignments
1 = Detector Set 1
2 = Detector Set 2
3 = Detector Set 3
4 =
5 =
6 = Failure - Min Recall
7 = Failure - Max Recall
8 = Report on Failure

SYSTEM DETECTORS

DIR	LANE	DESCRIPTION	C1 PIN	SLOT	DIR	LANE	DESCRIPTION	C1 PIN	SLOT
		SYS DET # 1	60	I9U			SYS DET # 5	54	J11U
		SYS DET # 2	62	I9L			SYS DET # 6	75	J11L
		SYS DET # 3	59	J9U			SYS DET # 7	47	I4U
		SYS DET # 4	61	J9L			SYS DET # 8	49	I8U

Department of Transportation - California Caltrans

NTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

	C-1 Pin #
Advance Warning - 1	0
Advance Warning - 2	0
Detector Failure	0
Flasher - Alternating 1	0
Flasher - Alternating 2	0
Fast Flasher	0
On Line	0
Exclusive - Walk	0
Exclusive - Don't Walk	0

General Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Time of Day Outputs

Serial N

	C-1 Pin #
Plan - 1	0
Plan - 2	0
Plan - 3	0
Plan - 4	0
Plan - 5	0
Plan - 6	0
Plan - 7	0
Plan - 8	0
Plan - 9	0
Free	210
Flash	

Coordination Plan Out

	Ped Phase
Ped 2-P Loadswitch	_2_____
Ped 4-P Loadswitch	___4____
Ped 6-P Loadswitch	____5___
Ped 8-P Loadswitch	_____

Ped Loadswitch Assignment

	C-1 Pin #
Dial - 2	0
Dial - 3	0
Offset - 1	0
Offset - 2	0
Offset - 3	0
Free	0
Flash	0

Seven Wire Outputs

	C-1 Pin #	
	On	Flash
Railroad - 1	0	
Railroad - 2	0	
Special Event - 1	0	
Special Event - 2	0	
Preempt Failure	0	
EV - A	0	
EV - B	0	
EV - C	0	
EV - D	0	
Any Preempt	0	

Preemption Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Event Outputs

	C-1 Pin #
Output - 1	0
Output - 2	0
Output - 3	0
Output - 4	0
Output - 5	0
Output - 6	0
Output - 7	0
Output - 8	0

Special Function Output

	Phase Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0
Walk	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0

Phase Output Redirection

	Overlap Number							
	1	2	3	4	5	6	7	8
Red	0	0	0	0	0	0	0	0
Yellow	0	0	0	0	0	0	0	0
Green	0	0	0	0	0	0	0	0

Overlap Output Redirection

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

Event	Day of Week	Season	Hour	Minute	Plan	Offset
0	1234567	12345678	5	0	1	1
1	_23456_	12345678	6	30	2	1
2	_23456_	12345678	14	0	3	1
3	1234567	12345678	22	0	E	1
4	_____					
5	_____					
6	_____					
7	_____					
8	_____					
9	_____					
10	_____					
11	_____					
12	_____					
13	_____					
14	_____					
15	_____					
16	_____					
17	_____					
18	_____					
19	_____					
20	_____					
21	_____					
22	_____					
23	_____					
24	_____					
25	_____					
26	_____					
27	_____					
28	_____					
29	_____					
30	_____					
31	_____					

Time Base Coordination Events

Event	Day of Week	Season	Hour	Minute	Funct.	Phase / Bits
0	12345678	12345678	0	0	14	_____78
1	_____		0	0	0	_____
2	_____		0	0	0	_____
3	_____		0	0	0	_____
4	_____		0	0	0	_____
5	_____		0	0	0	_____
6	_____		0	0	0	_____
7	_____		0	0	0	_____
8	_____		0	0	0	_____
9	_____		0	0	0	_____
10	_____		0	0	0	_____
11	_____		0	0	0	_____
12	_____		0	0	0	_____
13	_____		0	0	0	_____
14	_____		0	0	0	_____
15	_____		0	0	0	_____

Time of Day Function Events

TOD Functions

0 = Permitted Phases
1 = Red Lock
2 = Yellow Lock
3 = Vehicle Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Vehicle Max Recall
10 = Soft Recall
11= Max Extension 2
12 = Conditional Service
13 = Lag Free Phases
14, Bit 1 = Local Override
14, Bit 4 = Disable Det Off Monitoring
15 = TOD Outputs

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

#	Holiday Type	Day	Month	Year
0	_____	0	0	0
1	_____	0	0	0
2	_____	0	0	0
3	_____	0	0	0
4	_____	0	0	0
5	_____	0	0	0
6	_____	0	0	0
7	_____	0	0	0
8	_____	0	0	0
9	_____	0	0	0
10	_____	0	0	0
11	_____	0	0	0
12	_____	0	0	0
13	_____	0	0	0
14	_____	0	0	0
15	_____	0	0	0
16	_____	0	0	0
17	_____	0	0	0
18	_____	0	0	0
19	_____	0	0	0
20	_____	0	0	0
21	_____	0	0	0
22	_____	0	0	0
23	_____	0	0	0
24	_____	0	0	0
25	_____	0	0	0
26	_____	0	0	0
27	_____	0	0	0
28	_____	0	0	0
29	_____	0	0	0
30	_____	0	0	0
31	_____	0	0	0

Holiday Dates

Event	Holiday Type	Hour	Minute	Plan	Offset
0	_____	0	0	0	0
1	_____	0	nber: 54	0	0
2	_____	0	0	0	0
3	_____	0	0	0	0
4	_____	0	0	0	0
5	_____	0	0	0	0
6	_____	0	0	0	0
7	_____	0	0	0	0
8	_____	0	0	0	0
9	_____	0	0	0	0
10	_____	0	0	0	0
11	_____	0	0	0	0
12	_____	0	0	0	0
13	_____	0	0	0	0
14	_____	0	0	0	0
15	_____	0	0	0	0
16	_____	0	0	0	0
17	_____	0	0	0	0
18	_____	0	0	0	0
19	_____	0	0	0	0
20	_____	0	0	0	0
21	_____	0	0	0	0
22	_____	0	0	0	0
23	_____	0	0	0	0
24	_____	0	0	0	0
25	_____	0	0	0	0
26	_____	0	0	0	0
27	_____	0	0	0	0
28	_____	0	0	0	0
29	_____	0	0	0	0
30	_____	0	0	0	0
31	_____	0	0	0	0

Holiday Time Base Coordination Events

Event	Holiday Type	Hour	Minute	Funct.	Phase / Bits
0	_____	0	0	0	_____
1	_____	0	0	0	_____
2	_____	0	0	0	_____
3	_____	0	0	0	_____
4	_____	0	0	0	_____
5	_____	0	0	0	_____
6	_____	0	0	0	_____
7	_____	0	0	0	_____
8	_____	0	0	0	_____
9	_____	0	0	0	_____
10	_____	0	0	0	_____
11	_____	0	0	0	_____
12	_____	0	0	0	_____
13	_____	0	0	0	_____
14	_____	0	0	0	_____
15	_____	0	0	0	_____

Holiday Time of Day Function Events

Season #	Start Month	Start Day	End Month	End Day
1	1	1	12	31
2				
3				
4				
5				
6				
7				
8				

Season Definitions

Department of Transportation - California Caltrans

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

Red Start Time	5.0
Yellow Start Phases	____5___
First Green Phases	_2____6__
Startup Vehicle Calls	_23456__
Startup Ped Calls	_2_45___

Startup

Max ON Time	7
Max OFF Time	255
Chatter	45

Detector Check

Serial Number: 5485 McCain

	Sign 1	Sign 2
Phase Number	0	0
Time Before Yellow	0.0	0.0

Advance Warning Signs

Flash Entry Phases	_____
Flash Phases Yellow	_____
Flash Overlaps Yellow	_____
Flash Type	

Flash Setup

Exclusive Phases	_____
Protect / Permissive	_____
Disable Yellow Range	_____
Extra One	1_3_5___
Lag Phases - Free	_23_5__8

Configuration

Permitted Phases	_23456__
Restricted Phases	_____
Disable Overlap Range	_____
Extra Two	___4____

Configuration

Keyboard Beep	0
Backlight Timeout	0
Spec Evnt 1 - Ltd Serv Interval	0
Spec Evnt 2 - Ltd Serv Interval	0
Red Revert	5.0

Miscellaneous

Spring Month (Begin)	3
Spring Week (Begin)	2
Fall Month (End)	11
Fall Week (End)	1

Daylight Savings Time

Manual Plan	0
Manual Offset	0

Manual

Manual Plan
1 thru 9 = Coordination Plan 1 thru 9
14 = Free
15 = Flash

Extra One
1 =
2 =
3 = Auto Daylight Savings
4 = Solid FDW on EV
5 = Extended Status
6 = International Ped
7 =
8 =

Extra Two
1 =
2 =
3 = Disable Min Walk
4 = QuicNet Pro System
5 = Ignor P/P on EV
6 =
7 =
8 =

Address	0			
Area Number	0			
Area Address	0			
IP Port	0			
IP Address	0	0	0	0
Subnet Mask	0	0	0	0
Gateway	0	0	0	0

Ethernet Port Address

Flash Type
0 = All On-Off (12345678-0)
1 = Main-Side (1256-3478)
2 = Ping Pong (1234-5678
3 = Ring Pairs (1638-5247)

CHANNEL	TPS / PAIR	TRUNK	NETWORK	PAIRS
H95		T1		

	Serial Port Port 1	Port 2	Port 3	Port 4
Address	2			
Area Number	7			
Area Address	1			
Comm Time Out	15			
CTS Delay	15			
RTS Hold	6			
Baud Rate	1200			
Data Format	8,1			

Communications Parameters

T1 CIRCUIT ID 20FDDA510876-0
TEL PHONE ADDRESS: 2023 N Arroyo Blvd /Seg

City of Pasadena - Department of Transportation - TMC

INTERSECTION: ARROYO BOULEVARD @ 210 EB OFF/ROSEMONT AVENUE - NO. 701

Event	Day of Week	Direction (+-)	Hour	Minute	Headway
0	_____	_ _ _ _	0	0	0
1	_____	_ _ _ _	0	0	0
2	_____	_ _ _ _	0	0	0
3	_____	_ _ _ _	0	0	0
4	_____	_ _ _ _	0	0	0
5	_____	_ _ _ _	0	0	0
6	_____	_ _ _ _	0	0	0
7	_____	_ _ _ _	0	0	0
8	_____	_ _ _ _	0	0	0
9	_____	_ _ _ _	0	0	0
10	_____	_ _ _ _	0	0	0

Headway Schedule

	Phase Number							
	1	2	3	4	5	6	7	8
A	0	0	0	0	0	0	0	0
B	0	0	0	0	0	0	0	0
C	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0

Non Priority Phase Max Adjustment

Display Menu
1 = Unit Status
2 = Loop/Bus Comm
3 = TPS Comm Status
4 = Request/Headway
5 = Priority Status
6 = Ram Checksum

Direction	A	B	C	D
Delay	0	0	0	0
Early Green	0	0	0	0
Green Extension	0	0	0	0

Bus Priority Timing

	Direction
A	_____
B	_____
C	_____
D	_____

Bus Priority Phases

	Direction
A	_____
B	_____
C	_____
D	_____

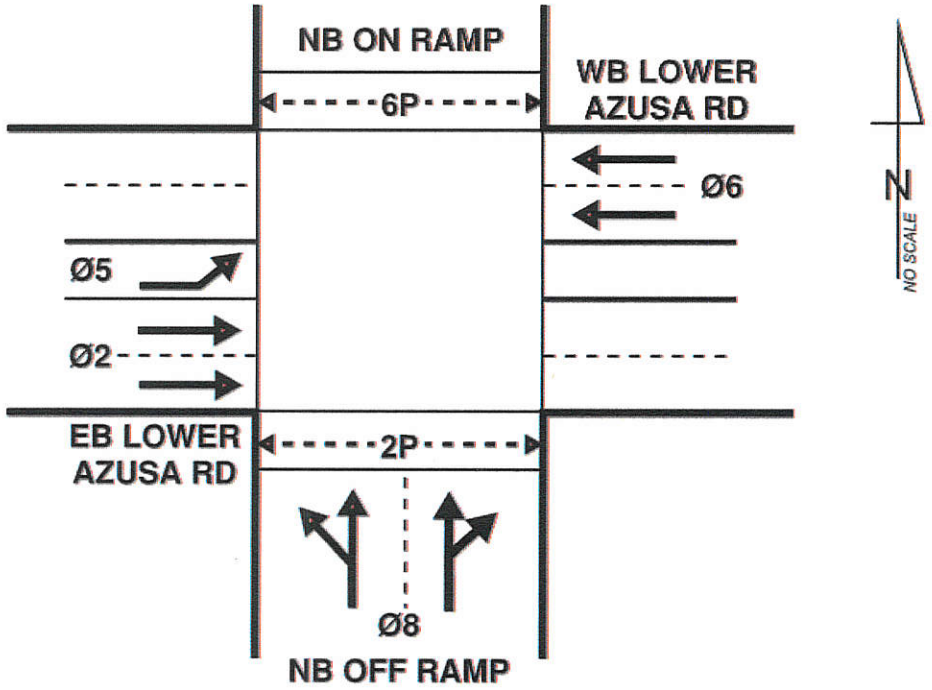
Bus Priority Phases

Location: San Gabriel River Frwy (I-605) NB @ Lower Azusa
System:
Master At: This location
District: 07
I/C:
Designed By:
Installed By:
Service Info: TSCP 2.21 Build 7A

Timing Change:	Date Start:	Date End:	Designed:	Installed:
				4/15/2019

		FLASH
PHASE	1)	[ ]
	2) EB Lower Azusa Rd	[ ]
	3)	[ ]
	4)	[ ]
	5) EBLT Lower Azusa Rd	[ ]
	6) WB Lower Azusa Rd	[ ]
	7)	[ ]
	8) NB Off Ramp	[ ]
OVERLAP	A)	[ ]
	B)	[ ]
	C)	[ ]
	D)	[ ]
	E)	[ ]
	F)	[ ]

Intersection Layout



Comments and Notes:

RAM Checksum

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Post Mile: 22.19 LA County

Printed: 4/23/2020

CONFIGURATION PHASE FLAGS

Cabinet
332
Configuration
CALTRANS

Phases (2-1-1-1)	
Permitted	. 2 . . 5 6 . 8
Restricted	. . . . .

Phase Recalls (2-1-1-2)	
Vehicle Min	. 2 . . 5 6 . 8
Vehicle Max	. . . . .
Pedestrian	. 2 . . . 6 . .
Bicycle	. . . . .

Phase Locks (2-1-1-3)	
Red	. . . . .
Yellow	. . . . .
Force/Max	. . . . .

Phase Features (2-1-1-4)	
Double Entry	. . . . .
Rest In Walk	. . . . .
Rest In Red	. . . . .
Walk 2	. . . . .
Max Green 2	. . . . .
Max Green 3	. . . . .

Startup (2-1-1-5)	
First Green Phases	. 2 . . . 6 . .
Yellow Start Phases	. . . . .
Vehicle Calls	. 2 . . 5 6 . 8
Pedestrian Calls	. 2 . . . 6 . .
Yellow Start Overlaps	. . . . .
Startup All-Red	6.0

Call To Phase (2-1-2-1)		Omit On Green	
1	. . . . .	1	. . . . .
2	. . . . .	2	. . . . .
3	. . . . .	3	. . . . .
4	. . . . .	4	. . . . .
5	. . . . .	5	. . . . .
6	. . . . .	6	. . . . .
7	. . . . .	7	. . . . .
8	. . . . .	8	. . . . .

Flashing Colors (2-1-2-2)	
Yellow Flash Phases	. . . . .
Yellow Flash Overlap	. . . . .
Flash In Red Phases	. . . . .
Flash In Red Overlap	. . . . .

Special Operation (2-1-2-3)	
Single Exit Phase	. . . . .
Driveway Signal Phases	. . . . .
Driveway Signal Overlaps	. . . . .
Leading Ped Phases	. . . . .

Protected Permissive (2-1-2-4)	
Protected Permissive	. . . . .

Pedestrian (2-1-3)	
P1	. . . . .
P2	. 2 . . . . .
P3	. . . . .
P4	. . . . .
P5	. . . . .
P6	. . . . . 6 . .
P7	. . . . .
P8	. . . . .

Overlap (2-1-4)				
Overlap	Parent	Omit	No Start	Not
A	. . . . .	. . . . .	. . . . .	. . . . .
B	. . . . .	. . . . .	. . . . .	. . . . .
C	. . . . .	. . . . .	. . . . .	. . . . .
D	. . . . .	. . . . .	. . . . .	. . . . .
E	. . . . .	. . . . .	. . . . .	. . . . .
F	. . . . .	. . . . .	. . . . .	. . . . .

PHASE TIMING

Phase (2-2)	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
--- Walk 1 ---	0	7	0	10	0	7	0	0
Flash Don't Walk	0	10	0	10	0	10	0	0
Minimum Green	10	15	10	10	12	15	10	14
Det Limit	10	0	10	10	0	0	10	0
Max Initial	10	10	10	10	10	10	10	10
Max Green 1	50	20	50	50	15	20	50	30
Max Green 2	50	20	50	50	15	20	50	30
Max Green 3	50	50	50	50	50	50	50	50
Extension	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Maximum Gap	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Gap	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Add Per Vehicle	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Reduce Gap By	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduce Every	1.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0
Yellow	5.0	4.8	5.0	5.0	3.7	4.8	5.0	4.1
All-Red	1.0	1.0	1.0	1.0	1.5	1.0	1.0	1.0

Ped/Bike (2-3)	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
--- Walk 2 ---	0	0	0	0	0	0	0	0
Delay/Early Walk	0	0	0	0	0	0	0	0
Solid Don't Walk	0	0	0	0	0	0	0	0
Bike Green	0	0	0	0	0	0	0	0
Bike All-Red	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

OVERLAP TIMING

Overlap (2-4)	A	B	C	D	E	F
Green	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	5.0	5.0	5.0	5.0	5.0	5.0
Red	0.0	0.0	0.0	0.0	0.0	0.0

Red Revert

Red Revert (2-5)	
Time	5.0
All-Red Sec/Min (2-6)	
All-Red Sec/Min:	OFF

Max 2 Extension

Max/Gap Out (2-7)	
Max Cnt	0
Gap Cnt	0

Local Plan 1...9 (7-1) TIMING DATA

COORDINATION

[Offsets] Green Factors or Press [F] to Select Force-Off

		Cycle	Multi	Lag Gap	A	B	C	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
Plan 1	Green Factor	110		.....	77				58			18	34		40
Plan 2	Green Factor	90		.....	36				45			15	24		33
Plan 3	Green Factor	110		.....	53				52			18	28		46
Plan 4	Green Factor			.....											
Plan 5	Green Factor			.....											
Plan 6	Green Factor			.....											
Plan 7	Green Factor			.....											
Plan 8	Green Factor			.....											
Plan 9	Green Factor			.....											

Master Timer Sync (7-A)	
Enable in Plans	
1-9	.....
11-19	.....
21-29	.....

Master Sub Master	
Input	
Output	

FREE PLAN PHASE FLAGS

(7-E) Free	
Lag	Omit
.2.4.6.8	.....
Veh Min	Veh Max
.2...6..	.....
Ped	Bike
.....	.....
Cond	Cond Grn
.....	10

Local Plan 1...9 (7-1) PHASE FLAGS

	Lag	Sync	Hold	Omit	Veh Min	Veh Max	Ped	Bike
Plan 1	.2...6.8	.2...6..	.....	.....	.....	.2..56.8	.2...6..	.....
Plan 2	.2...6.8	.2...6..	.....	.....	.....	.2..56.8	.2...6..	.....
Plan 3	.2...6.8	.2...6..	.....	.....	.....	.2..56.8	.2...6..	.....
Plan 4	.....	.....	.....	.....	.....	.....	.....	.....
Plan 5	.....	.....	.....	.....	.....	.....	.....	.....
Plan 6	.....	.....	.....	.....	.....	.....	.....	.....
Plan 7	.....	.....	.....	.....	.....	.....	.....	.....
Plan 8	.....	.....	.....	.....	.....	.....	.....	.....
Plan 9	.....	.....	.....	.....	.....	.....	.....	.....

MANUAL COMMANDS

Manual Plan (4-1)	
Plan	OffSet
	A

Plan: 1-9
15 or 254 = Flash
14 or 255 = Free
Offset A, B, or C

Special Function Override (4-2)			
#	Control	#	Control
1	NORMAL	3	NORMAL
2	NORMAL	4	NORMAL

Detector Reset	(4-3)
Local Manual (4-4)	OFF

Local Plan 11...19 (7-2) TIMING DATA

COORDINATION

[Offsets] Green Factors or Press [F] to Select Force-Off

		Cycle	Multi	Lag Gap	A	B	C	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
Plan 11	Green Factor			.....											
Plan 12	Green Factor			.....											
Plan 13	Green Factor			.....											
Plan 14	Green Factor			.....											
Plan 15	Green Factor			.....											
Plan 16	Green Factor			.....											
Plan 17	Green Factor			.....											
Plan 18	Green Factor			.....											
Plan 19	Green Factor			.....											

Local Plan 11...19 (7-2) PHASE FLAGS

	Lag	Sync	Hold	Omit	Veh Min	Veh Max	Ped	Bike
Plan 11	.....	.....	.....	.....	.....	.....	.....	.....
Plan 12	.....	.....	.....	.....	.....	.....	.....	.....
Plan 13	.....	.....	.....	.....	.....	.....	.....	.....
Plan 14	.....	.....	.....	.....	.....	.....	.....	.....
Plan 15	.....	.....	.....	.....	.....	.....	.....	.....
Plan 16	.....	.....	.....	.....	.....	.....	.....	.....
Plan 17	.....	.....	.....	.....	.....	.....	.....	.....
Plan 18	.....	.....	.....	.....	.....	.....	.....	.....
Plan 19	.....	.....	.....	.....	.....	.....	.....	.....

Local Plan 21...29 (7-3) TIMING DATA

COORDINATION

[Offsets] Green Factors or Press [F] to Select Force-Off

		Cycle	Multi	Lag Gap	A	B	C	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
Plan 21	Green Factor			.....											
Plan 22	Green Factor			.....											
Plan 23	Green Factor			.....											
Plan 24	Green Factor			.....											
Plan 25	Green Factor			.....											
Plan 26	Green Factor			.....											
Plan 27	Green Factor			.....											
Plan 28	Green Factor			.....											
Plan 29	Green Factor			.....											

Local Plan 21...29 (7-3) PHASE FLAGS

	Lag	Sync	Hold	Omit	Veh Min	Veh Max	Ped	Bike
Plan 21	.....	.....	.....	.....	.....	.....	.....	.....
Plan 22	.....	.....	.....	.....	.....	.....	.....	.....
Plan 23	.....	.....	.....	.....	.....	.....	.....	.....
Plan 24	.....	.....	.....	.....	.....	.....	.....	.....
Plan 25	.....	.....	.....	.....	.....	.....	.....	.....
Plan 26	.....	.....	.....	.....	.....	.....	.....	.....
Plan 27	.....	.....	.....	.....	.....	.....	.....	.....
Plan 28	.....	.....	.....	.....	.....	.....	.....	.....
Plan 29	.....	.....	.....	.....	.....	.....	.....	.....

DETECTORS

Detector Attributes (5-1)

Det	Type	Phases	Lock	Slot
1	COUNT+CALL+EXTEND	1.....	NO	I1U
2	COUNT+CALL+EXTEND	1.....	NO	I1L
3	COUNT+CALL+EXTEND	.2.....	NO	I2U
4	COUNT+CALL+EXTEND	.2.....	NO	I2L
5	COUNT+CALL+EXTEND	.2.....	NO	I3U
6	CALL+EXTEND	.2.....	NO	I3L
7	LIMITED	.2.....	NO	I4U
8	COUNT+CALL+EXTEND	.2.....	NO	I4L
9	COUNT+CALL+EXTEND	..3....	NO	I5U
10	COUNT+CALL+EXTEND	..3....	NO	I5L
11	COUNT+CALL+EXTEND	...4...	NO	I6U
12	COUNT+CALL+EXTEND	...4...	NO	I6L
13	COUNT+CALL+EXTEND	...4...	NO	I7U
14	CALL+EXTEND	...4...	NO	I7L
15	LIMITED	...4...	NO	I8U
16	COUNT+CALL+EXTEND	...4...	NO	I8L
17	COUNT+CALL+EXTEND	1.....	NO	I9U
18	COUNT+CALL+EXTEND	..3....	NO	I9L
19	COUNT+CALL+EXTEND	.2.....	NO	I10U
20	COUNT+CALL+EXTEND	...4...	NO	I10L
21	COUNT+CALL+EXTEND	....5...	NO	J1U
22	COUNT+CALL+EXTEND	....5...	NO	J1L
23	COUNT+CALL+EXTEND	.....6..	NO	J2U
24	COUNT+CALL+EXTEND	.....6..	NO	J2L
25	COUNT+CALL+EXTEND	.....6..	NO	J3U
26	CALL+EXTEND	.....6..	NO	J3L
27	LIMITED	.....6..	NO	J4U
28	COUNT+CALL+EXTEND	.....6..	NO	J4L
29	COUNT+CALL+EXTEND	......7.	NO	J5U
30	COUNT+CALL+EXTEND	......7.	NO	J5L
31	COUNT+CALL+EXTEND	8	NO	J6U
32	COUNT+CALL+EXTEND	8	NO	J6L
33	COUNT+CALL+EXTEND	8	NO	J7U
34	CALL+EXTEND	8	NO	J7L
35	LIMITED	8	NO	J8U
36	COUNT+CALL+EXTEND	8	NO	J8L
37	COUNT+CALL+EXTEND	....5...	NO	J9U
38	COUNT+CALL+EXTEND	......7.	NO	J9L
39	COUNT+CALL+EXTEND	.....6..	NO	J10U
40	COUNT+CALL+EXTEND	8	NO	J10L
41	PEDESTRIAN	.2.....	NO	I12U
42	PEDESTRIAN	...4...	NO	I12L
43	PEDESTRIAN	.....6..	NO	I13U
44	PEDESTRIAN	8	NO	I13L

Detector Configuration (5-2)

Det	Delay	Extend	Recall	Port
1			10	3.2
2			10	7.2
3			10	1.1
4			10	1.5
5			10	4.5
6			10	6.2
7			10	2.1
8			10	7.4
9			10	3.4
10			10	7.6
11			10	1.3
12			10	1.7
13			10	4.7
14			10	6.4
15			10	2.3
16			10	7.8
17			10	3.6
18			10	3.8
19			10	4.1
20			10	4.2
21			10	3.1
22			10	7.1
23			10	1.2
24			10	1.6
25			10	4.6
26			10	6.3
27			10	2.2
28			10	7.3
29			10	3.3
30			10	7.5
31			10	1.4
32			10	1.8
33			10	4.8
34			10	6.5
35			10	2.4
36			10	7.7
37			10	3.5
38			10	3.7
39			10	4.3
40			10	4.4
41			10	5.1
42			10	5.3
43			10	5.2
44			10	5.4

Failure Times(5-3)	Minutes
Maximum On Time	
Fail Reset Time	

Failure Override (5-4)

Detectors 1-8	.....
Detectors 9-16	.....
Detectors17-24	.....
Detectors 25-32	.....
Detectors 33-40	.....
Detectors 41-44	.....

System Detector Assignment (5-5)

Sys Det	1	2	3	4	5	6	7	8
Det Nu								
Sys Det	9	10	11	12	13	14	15	16
Det Nu								

CIC Operation (5-6-1)

Enable in Plans	.....

CIC Values (5-6-2)	Volume	Occupancy	Demand
Smoothing	0.66	0.66	0.66
Multiplier	4.0	0.33	
Exponent	0.50	1.00	

Detector-to-Phase Assignment (5-6-3)

Sys Det	1	2	3	4	5	6	7	8
Phase								
Sys Det	9	10	11	12	13	14	15	16
Phase								

Input File Port-Bit Assignments

332 Cabinet - For Reference Only

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
I-	3.2	1.1	4.5	2.1	3.4	1.3	4.7	2.3	3.6	4.1	6.6	5.1	5.2	6.7
	7.2	1.5	6.2	7.4	7.6	1.7	6.4	7.8	3.8	4.2	2.7	5.3	5.4	6.8
J-	3.1	1.2	4.6	2.2	3.3	1.4	4.8	2.4	3.5	4.3	2.8	5.5	5.6	2.5
	7.1	1.6	6.3	7.3	7.5	1.8	6.5	7.7	3.7	4.4	6.1	5.7	5.8	2.6

TOD SCHEDULE

Table 1 (8-2-1)		
Time	Plan	OS
0600	1	A
0930	2	A
1500	3	A
1800	2	A
2100	255	A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 2 (8-2-2)		
Time	Plan	OS
0900	2	A
2100	255	A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 3 (8-2-3)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 4 (8-2-4)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 5 (8-2-5)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 6 (8-2-6)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

WEEKDAY ASSIGNMENT

Weekday Table Assignments (8-2-7)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	1	1	1	1	2	2

HOLIDAY TABLES

Floating Holiday Table (8-2-8)

#	Mnth	Week	DOW	Table
1			.....	
2			.....	
3			.....	
4			.....	
5			.....	
6			.....	
7			.....	
8			.....	
9			.....	
10			.....	
11			.....	
12			.....	
13			.....	
14			.....	
15			.....	
16			.....	

Fixed Holiday Table (8-2-9)

#	Mnth	Day	DOW	Table
1			.....	
2			.....	
3			.....	
4			.....	
5			.....	
6			.....	
7			.....	
8			.....	
9			.....	
10			.....	
11			.....	
12			.....	
13			.....	
14			.....	
15			.....	
16			.....	

Solar Clock Data (8-4)

North Latitude	34
West Longitude	118
Local Time Zone	8

Sabbatical Clock (8-5)

Hebrew	Ped Recall
Sabbath	.....
Holiday	.....

Daylight Saving (8-6)

Enabled	YES

TOD FUNCTIONS

TOD Functions (8-3)

#	Start	End	DOW	Action	Phases
1			.....		.....
2			.....		.....
3			.....		.....
4			.....		.....
5			.....		.....
6			.....		.....
7			.....		.....
8			.....		.....
9			.....		.....
10			.....		.....
11			.....		.....
12			.....		.....
13			.....		.....
14			.....		.....
15			.....		.....
16			.....		.....

Action Codes:
0. None
1. Permitted
2. Restricted
4. Veh Min Recall
5. Veh Max Recall
6. Ped Recall
7. Bike Recall
8. Red Lock
9. Yellow Lock
10. Force/Max Lock
11.Double Entry
12. Y-Coord C
13. Y-Coord D
14. Free
15. Flashing
16. Walk 2
17. Max Green 2
18. Max Green 3
19. Rest in Walk
20. Rest in Red
21. Free Lag Phases
22. Special Functions
23. Truck Preempt
24. Conditional Service
25. Conditional Service
26. Leading Ped
27. Traffic Actuated Max 2
41. Protected Permissive
42. Protected Permissive

Action Code = Phases added to normal setting
100+Action Code = Phases removed
200+Action Code = Phases replaced

COMMUNICATIONS

C2 (6-1-1)	
Address	
Protocol	MASTER
Access Level	0
Baud	9600
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	20
RTS Off Time	20
Handshaking	NORMAL

C20 (6-1-2)	
Address	
Protocol	AB3418
Access Level	0
Baud	1200
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	20
RTS Off Time	20
Handshaking	NORMAL

C21 (6-1-3)	
Address	
Protocol	UTB
Access Level	0
Baud	1200
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	20
RTS Off Time	20
Handshaking	NORMAL

Access Levels:

0-Full Access
1-Status Only
2-Status, Set Pattern, Time
3-Status, Set Pattern, Time, Manual Plan
4-Reserved
5-Full Access with No Set Pattern
6-Full Access with No Set Time
7-Full Access with No Set Pattern, Manual Plan
8-Full Access with No Set Time, Pattern, Manual Plan

SOFT LOGIC

Soft Logic (6-2)

#	Data	OP	Data	OP	Data	OP	Data
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

*Refer to User's Manual for Data and OP Codes

CALLBACK NUMBERS

Callback Numbers (6-3...3)	
Line Out	
Local Toll	
Long Distance	
Delay	10
Area Code	
Phone Number	

Line Out	
Local Toll	
Long Distance	
Delay	10
Area Code	
Phone Number	

Line Out	
Local Toll	
Long Distance	
Delay	10
Area Code	
Phone Number	

NETWORK

Network (6-4)	
Address	
Protocol	AB3418
Port	27000
Type	STATIC
Central Access	0
Field Access	0

IP Address	0	.	0	.	0	.	0
Netmask	255	.	255	.	255	.	0
Broadcast	0	.	0	.	0	.	255
Gateway	0	.	0	.	0	.	254

RAILROAD PREEMPTION

RR 1

(3-1-1)	Timing	Phase Flags (3-1-2)			Pedestrian Flags (3-1-3)			Overlap Flags (3-1-4)		
		Grn Hold	Yel Flash	Red Flash	Walk	Flash DW	Solid DW	Grn Hold	Yel Flash	Red Flash
Delay										
Clear 1	10	.2..5...	.....	.....	.....	.....	.2.4.6.8	.....	.....	.....
Clear 2		.....	.....	.....	.....	.....	.....	.....	.....	.....
Clear 3		.....	.....	.....	.....	.....	.....	.....	.....	.....
Hold		.....	.....	12345678	.....	.....	.....	.....	.....	ABCDEF
Exit										
Min Grn										
Ped Clr										

Exit Parameters (3-1-5)			
Phase Green	Overlap Green	Vehicle Call	Ped Call
.....	.....	12345678	.2.4.6.8

Configuration (3-1-6)			
Primary Port	Secondary Port	Latching	Power-Up
2.5	0.0	YES	FLASHING

RR 2

(3-2-1)	Timing	Phase Flags (3-2-2)			Pedestrian Flags (3-2-3)			Overlap Flags (3-2-4)		
		Grn Hold	Yel Flash	Red Flash	Walk	Flash DW	Solid DW	Grn Hold	Yel Flash	Red Flash
Delay										
Clear 1	10	...4..7.	.....	.....	.....	.....	.2.4.6.8	.....	.....	.....
Clear 2		.....	.....	.....	.....	.....	.....	.....	.....	.....
Clear 3		.....	.....	.....	.....	.....	.....	.....	.....	.....
Hold		123..6..	.....	.....	.2...6..	.....	...4...8	.....	.....	.....
Exit										
Min Grn										
Ped Clr										

Exit Parameters (3-2-5)			
Phase Green	Overlap Green	Vehicle Call	Ped Call
.....	.....	...4..7.	.....

Configuration (3-2-6)			
Primary Port	Secondary Port	Latching	Power-up
2.6	0.0	YES	DARK

EMERGENCY VEHICLE PREEMPTION

EVA (3-A)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	.2..5...	.....

Port	Latching	Phase Termination
5.5	NO	ADVANCE

EVB (3-B)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	...4..7.	.....

Port	Latching	Phase Termination
5.6	NO	ADVANCE

EVC (3-C)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	1....6..	.....

Port	Latching	Phase Termination
5.7	NO	ADVANCE

EVD (3-D)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	..3....8	.....

Port	Latching	Phase Termination
5.8	NO	ADVANCE

INPUTS

		7 Wire I/C (2-1-5-1)			
		Input	Port	Input	Port
Enable	NO	R1	3.8	Free	3.6
Max ON		R2	3.5	D2	2.8
Max OFF		R3	3.7	D3	6.1

Manual Control (2-1-5-2)	
Input	Port
Manual Advance	
Advance Enable	

Cabinet Status (2-1-5-3)	
Input	Port
Flash Bus	
Door Ajar	
Flash Sense	6.7
Stop Time	6.8

Special Function (2-1-5-4)	
Input	Port
1	
2	
3	
4	

Battery Backup (2-1-5-5)	
Port	Operation
	NORMAL

Y-Coordination (2-1-5-6)	
Port C	Port D
6.1	2.8

OUTPUTS

Loadswitch Assignments (2-1-6)							+
A	1	2	22	3	4	24	9
B	5	6	26	7	8	28	10
X	13	14	0	11	12	0	0

Loadswitch Codes:

0 Unused (no output)
1-8 Vehicle 1-8
9-14 Overlap A-F
21-28 Ped 1-8
41-47 Special Functions
41 Protected Permissive Flashing Phase 1
43 Protected Permissive Flashing Phase 3
45 Protected Permissive Flashing Phase 5
47 Protected Permissive Flashing Phase 7
51-57 Special Functions
71-72 Seven Wire I/C

+ middle output of loadswitches 3 and 6
Channel 9 and 10

TRANSIT PRIORITY

Local Plans (3-E) 1...9 11...19		Early Green	Green Extend	Inhibit Cycles	Phase 1 Minimum	Phase 2 Minimum	Phase 3 Minimum	Phase 4 Minimum	Phase 5 Minimum	Phase 6 Minimum	Phase 7 Minimum	Phase 8 Minimum
Plan 1	Green Factor											
Plan 2	Green Factor											
Plan 3	Green Factor											
Plan 4	Green Factor											
Plan 5	Green Factor											
Plan 6	Green Factor											
Plan 7	Green Factor											
Plan 8	Green Factor											
Plan 9	Green Factor											
Plan 11	Green Factor											
Plan 12	Green Factor											
Plan 13	Green Factor											
Plan 14	Green Factor											
Plan 15	Green Factor											
Plan 16	Green Factor											
Plan 17	Green Factor											
Plan 18	Green Factor											
Plan 19	Green Factor											

Transit Priority Configuration (3-E-A)				Indicator Output	
Enable in Plans		Input	Type	Stop	Go
Plan 1-9	.....	0.0	OPT	0	0
Plan 11-19	.....	0.0	OPT	0	0

Queue Jump (3-E-B)	
Grn Hold	Hold Phase
	.....
	.....

Free Plans (3-E-E)	
Max Grn Hold	Hold Phase
	.....

Access Utilities (9-5)	
Password	***
Timeout	30

YELLOW YIELD COORDINATION

Y-Coord Plans (7-C,D)	Long Grn	No Grn	Offset	Perm	Force-Offs -1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	Coord	Lag	Min Recall	Restricted
Plan C													.2...6..	.2.4.6.8	.....	.....
Plan D													.2...6..	.2.4.6.8	.....	.....

TRUCK PRIORITY

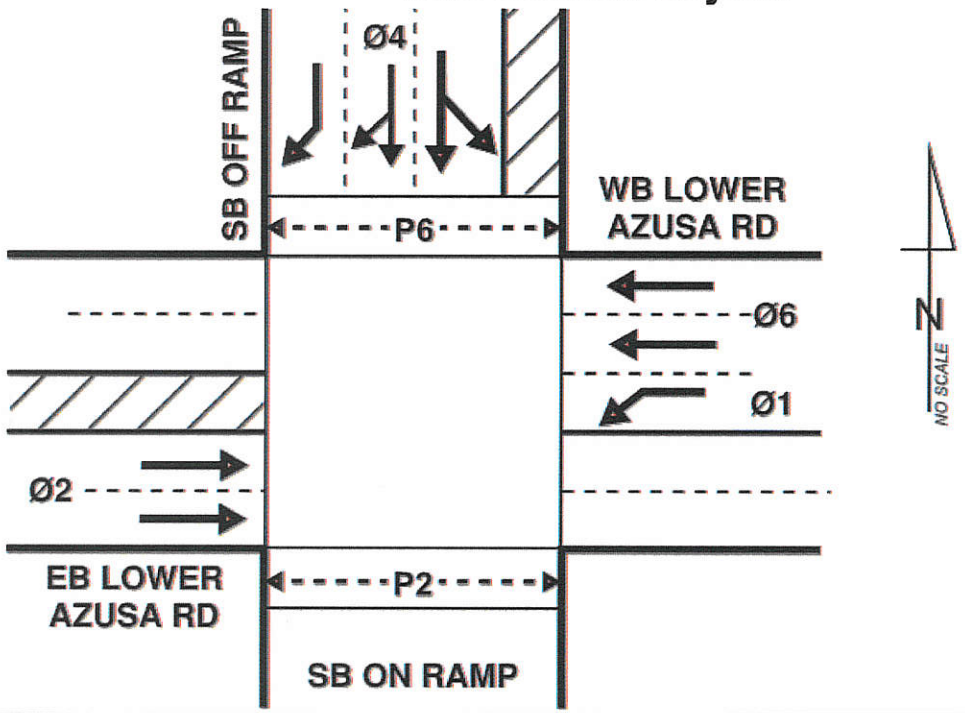
Truck Priority (3-F)	Passage	CarryOver	Clearance	Next Priority	Phase Green	Det 2 Port	Det 3 Port	Det 4 Port	Sign Output	Slave Input	Slave Output
					.....	0.0	0.0	0.0	0	0.0	0

Location: San Gabriel River Frwy (I-605) SB @ Lower Azusa
System:
Master At: NB Off Ramp Signal
District: 07
I/C:
Designed By:
Installed By:
Service Info: TSCP 2.21 Build 7A

Timing Change:	Date Start:	Date End:	Designed:	Installed:
	1/31/2017			4/15/2019

		FLASH
PHASE	1) WBLT	[ ]
	2) EB Lower Azusa Rd	[ ]
	3)	[ ]
	4) SB Off Ramp	[ ]
	5)	[ ]
	6) WB Lower Azusa Rd	[ ]
	7)	[ ]
	8)	[ ]
OVERLAP	A)	[ ]
	B)	[ ]
	C)	[ ]
	D)	[ ]
	E)	[ ]
	F)	[ ]

Intersection Layout



Comments and Notes:
Replaced 170 controller with 2070 controller equipped with GPS

RAM Checksum

Page 2: 3D53	Page 8: ECEF
Page 3: 75D6	Page 9: D2FD
Page 4: CEE6	Page 10: F4E1
Page 5: 191A	Page 11: C3CB
Page 6: 191A	Page 12: B437
Page 7: 0290	Page 13: 86F7

Post Mile: 22.18

Printed: 4/23/2020

CONFIGURATION PHASE FLAGS

Cabinet
332
Configuration
CALTRANS

Phases (2-1-1-1)	
Permitted	1 2 . 4 . 6 . .
Restricted	. . . . .

Phase Features (2-1-1-4)	
Double Entry	. . . . .
Rest In Walk	. . . . .
Rest In Red	. . . . .
Walk 2	. . . . .
Max Green 2	. . . . .
Max Green 3	. . . . .

Startup (2-1-1-5)	
First Green Phases	. 2 . . . 6 . .
Yellow Start Phases	. . . . .
Vehicle Calls	. 2 . . . 6 . .
Pedestrian Calls	. 2 . . . 6 . .
Yellow Start Overlaps	. . . . .
Startup All-Red	6.0

Phase Recalls (2-1-1-2)	
Vehicle Min	. 2 . . . 6 . .
Vehicle Max	. . . . .
Pedestrian	. . . . .
Bicycle	. . . . .

Phase Locks (2-1-1-3)	
Red	1 . . 4 . . . .
Yellow	. 2 . . . 6 . .
Force/Max	. . . . .

Call To Phase (2-1-2-1)		Omit On Green	
1	. . . . .	1	. . . . .
2	. . . . .	2	. . . . .
3	. . . . .	3	. . . . .
4	. . . . .	4	. . . . .
5	. . . . .	5	. . . . .
6	. . . . .	6	. . . . .
7	. . . . .	7	. . . . .
8	. . . . .	8	. . . . .

Flashing Colors (2-1-2-2)	
Yellow Flash Phases	. . . . .
Yellow Flash Overlap	. . . . .
Flash In Red Phases	. . . . .
Flash In Red Overlap	. . . . .

Special Operation (2-1-2-3)	
Single Exit Phase	. . . . .
Driveway Signal Phases	. . . . .
Driveway Signal Overlaps	. . . . .
Leading Ped Phases	. . . . .

Protected Permissive (2-1-2-4)	
Protected Permissive	. . . . .

Pedestrian (2-1-3)	
P1	. . . . .
P2	. 2 . . . . .
P3	. . . . .
P4	. . . . .
P5	. . . . .
P6	. . . . . 6 . .
P7	. . . . .
P8	. . . . .

Overlap (2-1-4)				
Overlap	Parent	Omit	No Start	Not
A	. . . . .	. . . . .	. . . . .	. . . . .
B	. . . . .	. . . . .	. . . . .	. . . . .
C	. . . . .	. . . . .	. . . . .	. . . . .
D	. . . . .	. . . . .	. . . . .	. . . . .
E	. . . . .	. . . . .	. . . . .	. . . . .
F	. . . . .	. . . . .	. . . . .	. . . . .

PHASE TIMING

Phase (2-2)	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
--- Walk 1 ---	0	7	0	0	0	7	0	10
Flash Don't Walk	0	10	0	0	0	10	0	10
Minimum Green	10	10	10	10	10	10	10	10
Det Limit	0	0	10	0	10	0	10	10
Max Initial	10	10	10	10	10	10	10	10
Max Green 1	25	30	50	25	50	30	50	50
Max Green 2	25	30	50	25	50	30	50	50
Max Green 3	50	50	50	50	50	50	50	50
Extension	5.0	2.5	5.0	3.0	5.0	2.5	5.0	5.0
Maximum Gap	5.0	2.5	5.0	3.0	5.0	2.5	5.0	5.0
Minimum Gap	5.0	2.5	5.0	3.0	5.0	2.5	5.0	5.0
Add Per Vehicle	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0
Reduce Gap By	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Reduce Every	0.0	0.0	1.0	0.0	1.0	0.0	1.0	1.0
Yellow	3.7	4.8	5.0	4.1	5.0	4.8	5.0	5.0
All-Red	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Ped/Bike (2-3)	**-1-**	**-2-**	**-3-**	**-4-**	**-5-**	**-6-**	**-7-**	**-8-**
--- Walk 2 ---	0	0	0	0	0	0	0	0
Delay/Early Walk	0	0	0	0	0	0	0	0
Solid Don't Walk	0	0	0	0	0	0	0	0
Bike Green	0	0	0	0	0	0	0	0
Bike All-Red	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

OVERLAP TIMING

Overlap (2-4)	A	B	C	D	E	F
Green	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	5.0	5.0	5.0	5.0	5.0	5.0
Red	0.0	0.0	0.0	0.0	0.0	0.0

Red Revert

Red Revert (2-5)	
Time	5.0
All-Red Sec/Min (2-6)	
All-Red Sec/Min:	OFF

Max 2 Extension

Max/Gap Out (2-7)	
Max Cnt	0
Gap Cnt	0

Local Plan 1...9 (7-1) TIMING DATA

COORDINATION

[Offsets] Green Factors or Press [F] to Select Force-Off

		Cycle	Multi	Lag Gap	A	B	C	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
Plan 1	Green Factor	110		.....	9			37	39		16		82		
Plan 2	Green Factor	90		.....	60			32	25		15		63		
Plan 3	Green Factor	110		.....	95			31	45		16		82		
Plan 4	Green Factor			.....											
Plan 5	Green Factor			.....											
Plan 6	Green Factor			.....											
Plan 7	Green Factor			.....											
Plan 8	Green Factor			.....											
Plan 9	Green Factor			.....											

Master Timer Sync (7-A)	
Enable in Plans	
1-9	.....
11-19	.....
21-29	.....

Master Sub Master	
Input	
Output	

FREE PLAN PHASE FLAGS

(7-E) Free	
Lag	Omit
.2.4.6.8	.....
Veh Min	Veh Max
.2...6..	.....
Ped	Bike
.....	.....
Cond	Cond Grn
.....	10

Local Plan 1...9 (7-1) PHASE FLAGS

	Lag	Sync	Hold	Omit	Veh Min	Veh Max	Ped	Bike
Plan 1	.2.4.6..	.2...6..	.....	.....	.....	1.....	.....	.....
Plan 2	.2.4.6..	.2...6..	.....	.....	.....	1.....	.....	.....
Plan 3	.2.4.6..	.2...6..	.....	.....	1.....	.....	.....	.....
Plan 4	.....	.....	.....	.....	.....	.....	.....	.....
Plan 5	.....	.....	.....	.....	.....	.....	.....	.....
Plan 6	.....	.....	.....	.....	.....	.....	.....	.....
Plan 7	.....	.....	.....	.....	.....	.....	.....	.....
Plan 8	.....	.....	.....	.....	.....	.....	.....	.....
Plan 9	.....	.....	.....	.....	.....	.....	.....	.....

MANUAL COMMANDS

Manual Plan (4-1)	
Plan	OffSet
	A

Plan: 1-9
15 or 254 = Flash
14 or 255 = Free
Offset A, B, or C

Special Function Override (4-2)			
#	Control	#	Control
1	NORMAL	3	NORMAL
2	NORMAL	4	NORMAL

Detector Reset	(4-3)
Local Manual (4-4)	OFF

Local Plan 11...19 (7-2) TIMING DATA

COORDINATION

[Offsets] Green Factors or Press [F] to Select Force-Off

		Cycle	Multi	Lag Gap	A	B	C	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
Plan 11	Green Factor			.....											
Plan 12	Green Factor			.....											
Plan 13	Green Factor			.....											
Plan 14	Green Factor			.....											
Plan 15	Green Factor			.....											
Plan 16	Green Factor			.....											
Plan 17	Green Factor			.....											
Plan 18	Green Factor			.....											
Plan 19	Green Factor			.....											

Local Plan 11...19 (7-2) PHASE FLAGS

	Lag	Sync	Hold	Omit	Veh Min	Veh Max	Ped	Bike
Plan 11	.....	.....	.....	.....	.....	.....	.....	.....
Plan 12	.....	.....	.....	.....	.....	.....	.....	.....
Plan 13	.....	.....	.....	.....	.....	.....	.....	.....
Plan 14	.....	.....	.....	.....	.....	.....	.....	.....
Plan 15	.....	.....	.....	.....	.....	.....	.....	.....
Plan 16	.....	.....	.....	.....	.....	.....	.....	.....
Plan 17	.....	.....	.....	.....	.....	.....	.....	.....
Plan 18	.....	.....	.....	.....	.....	.....	.....	.....
Plan 19	.....	.....	.....	.....	.....	.....	.....	.....

Local Plan 21...29 (7-3) TIMING DATA

COORDINATION

[Offsets] Green Factors or Press [F] to Select Force-Off

		Cycle	Multi	Lag Gap	A	B	C	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
Plan 21	Green Factor			.....											
Plan 22	Green Factor			.....											
Plan 23	Green Factor			.....											
Plan 24	Green Factor			.....											
Plan 25	Green Factor			.....											
Plan 26	Green Factor			.....											
Plan 27	Green Factor			.....											
Plan 28	Green Factor			.....											
Plan 29	Green Factor			.....											

Local Plan 21...29 (7-3) PHASE FLAGS

	Lag	Sync	Hold	Omit	Veh Min	Veh Max	Ped	Bike
Plan 21	.....	.....	.....	.....	.....	.....	.....	.....
Plan 22	.....	.....	.....	.....	.....	.....	.....	.....
Plan 23	.....	.....	.....	.....	.....	.....	.....	.....
Plan 24	.....	.....	.....	.....	.....	.....	.....	.....
Plan 25	.....	.....	.....	.....	.....	.....	.....	.....
Plan 26	.....	.....	.....	.....	.....	.....	.....	.....
Plan 27	.....	.....	.....	.....	.....	.....	.....	.....
Plan 28	.....	.....	.....	.....	.....	.....	.....	.....
Plan 29	.....	.....	.....	.....	.....	.....	.....	.....

DETECTORS

Detector Attributes (5-1) / Slot / Detector Configuration (5-2)

Det	Type	Phases	Lock	Slot	Det	Delay	Extend	Recall	Port
1	COUNT+CALL+EXTEND	1.....	NO	I1U	1			10	3.2
2	COUNT+CALL+EXTEND	1.....	NO	I1L	2			10	7.2
3	COUNT+CALL+EXTEND	.2.....	NO	I2U	3			10	1.1
4	COUNT+CALL+EXTEND	.2.....	NO	I2L	4			10	1.5
5	COUNT+CALL+EXTEND	.2.....	NO	I3U	5			10	4.5
6	CALL+EXTEND	.2.....	NO	I3L	6			10	6.2
7	LIMITED	.2.....	NO	I4U	7			10	2.1
8	COUNT+CALL+EXTEND	.2.....	NO	I4L	8			10	7.4
9	COUNT+CALL+EXTEND	..3....	NO	I5U	9			10	3.4
10	COUNT+CALL+EXTEND	..3....	NO	I5L	10			10	7.6
11	COUNT+CALL+EXTEND	...4...	NO	I6U	11			10	1.3
12	COUNT+CALL+EXTEND	...4...	NO	I6L	12			10	1.7
13	COUNT+CALL+EXTEND	...4...	NO	I7U	13	10		10	4.7
14	CALL+EXTEND	...4...	NO	I7L	14			10	6.4
15	LIMITED	...4...	NO	I8U	15			10	2.3
16	COUNT+CALL+EXTEND	...4...	NO	I8L	16			10	7.8
17	COUNT+CALL+EXTEND	1.....	NO	I9U	17			10	3.6
18	COUNT+CALL+EXTEND	..3....	NO	I9L	18			10	3.8
19	COUNT+CALL+EXTEND	.2.....	NO	I10U	19			10	4.1
20	COUNT+CALL+EXTEND	...4...	NO	I10L	20			10	4.2
21	COUNT+CALL+EXTEND	....5...	NO	J1U	21			10	3.1
22	COUNT+CALL+EXTEND	....5...	NO	J1L	22			10	7.1
23	COUNT+CALL+EXTEND	.....6..	NO	J2U	23			10	1.2
24	COUNT+CALL+EXTEND	.....6..	NO	J2L	24			10	1.6
25	COUNT+CALL+EXTEND	.....6..	NO	J3U	25			10	4.6
26	CALL+EXTEND	.....6..	NO	J3L	26			10	6.3
27	LIMITED	.....6..	NO	J4U	27			10	2.2
28	COUNT+CALL+EXTEND	.....6..	NO	J4L	28			10	7.3
29	COUNT+CALL+EXTEND	......7.	NO	J5U	29			10	3.3
30	COUNT+CALL+EXTEND	......7.	NO	J5L	30			10	7.5
31	COUNT+CALL+EXTEND	8	NO	J6U	31			10	1.4
32	COUNT+CALL+EXTEND	8	NO	J6L	32			10	1.8
33	COUNT+CALL+EXTEND	8	NO	J7U	33			10	4.8
34	CALL+EXTEND	8	NO	J7L	34			10	6.5
35	LIMITED	8	NO	J8U	35			10	2.4
36	COUNT+CALL+EXTEND	8	NO	J8L	36			10	7.7
37	COUNT+CALL+EXTEND	....5...	NO	J9U	37			10	3.5
38	COUNT+CALL+EXTEND	......7.	NO	J9L	38			10	3.7
39	COUNT+CALL+EXTEND	.....6..	NO	J10U	39			10	4.3
40	COUNT+CALL+EXTEND	8	NO	J10L	40			10	4.4
41	PEDESTRIAN	.2.....	NO	I12U	41			10	5.1
42	PEDESTRIAN	...4...	NO	I12L	42			10	5.3
43	PEDESTRIAN	.....6..	NO	I13U	43			10	5.2
44	PEDESTRIAN	8	NO	I13L	44			10	5.4

Failure Times(5-3)

Failure Times(5-3)	Minutes
Maximum On Time	
Fail Reset Time	

Failure Override (5-4)

Detectors 1-8	.....
Detectors 9-16	.....
Detectors17-24	.....
Detectors 25-32	.....
Detectors 33-40	.....
Detectors 41-44	.....

System Detector Assignment (5-5)

Sys Det	1	2	3	4	5	6	7	8
Det Nu								
Sys Det	9	10	11	12	13	14	15	16
Det Nu								

CIC Operation (5-6-1)

Enable in Plans	.....

CIC Values (5-6-2)

CIC Values (5-6-2)	Volume	Occupancy	Demand
Smoothing	0.66	0.66	0.66
Multiplier	4.0	0.33	
Exponent	0.50	1.00	

Detector-to-Phase Assignment (5-6-3)

Sys Det	1	2	3	4	5	6	7	8
Phase								
Sys Det	9	10	11	12	13	14	15	16
Phase								

Input File Port-Bit Assignments

332 Cabinet - For Reference Only

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
I-	3.2	1.1	4.5	2.1	3.4	1.3	4.7	2.3	3.6	4.1	6.6	5.1	5.2	6.7
	7.2	1.5	6.2	7.4	7.6	1.7	6.4	7.8	3.8	4.2	2.7	5.3	5.4	6.8
J-	3.1	1.2	4.6	2.2	3.3	1.4	4.8	2.4	3.5	4.3	2.8	5.5	5.6	2.5
	7.1	1.6	6.3	7.3	7.5	1.8	6.5	7.7	3.7	4.4	6.1	5.7	5.8	2.6

TOD SCHEDULE

Table 1 (8-2-1)		
Time	Plan	OS
0600	1	A
0930	2	A
1500	3	A
1900	2	A
2100	255	A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 2 (8-2-2)		
Time	Plan	OS
0900	2	A
2100	255	A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 3 (8-2-3)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 4 (8-2-4)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 5 (8-2-5)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

Table 6 (8-2-6)		
Time	Plan	OS
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A
		A

WEEKDAY ASSIGNMENT

Weekday Table Assignments (8-2-7)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	1	1	1	1	2	2

HOLIDAY TABLES

Floating Holiday Table (8-2-8)

#	Mnth	Week	DOW	Table
1			.....	
2			.....	
3			.....	
4			.....	
5			.....	
6			.....	
7			.....	
8			.....	
9			.....	
10			.....	
11			.....	
12			.....	
13			.....	
14			.....	
15			.....	
16			.....	

Fixed Holiday Table (8-2-9)

#	Mnth	Day	DOW	Table
1			.....	
2			.....	
3			.....	
4			.....	
5			.....	
6			.....	
7			.....	
8			.....	
9			.....	
10			.....	
11			.....	
12			.....	
13			.....	
14			.....	
15			.....	
16			.....	

Solar Clock Data (8-4)

North Latitude	34
West Longitude	118
Local Time Zone	8

Sabbatical Clock (8-5)

Hebrew	Ped Recall
Sabbath	.....
Holiday	.....

Daylight Saving (8-6)

Enabled	YES

TOD FUNCTIONS

TOD Functions (8-3)

#	Start	End	DOW	Action	Phases
1			.....		.....
2			.....		.....
3			.....		.....
4			.....		.....
5			.....		.....
6			.....		.....
7			.....		.....
8			.....		.....
9			.....		.....
10			.....		.....
11			.....		.....
12			.....		.....
13			.....		.....
14			.....		.....
15			.....		.....
16			.....		.....

Action Codes:
0. None
1. Permitted
2. Restricted
4. Veh Min Recall
5. Veh Max Recall
6. Ped Recall
7. Bike Recall
8. Red Lock
9. Yellow Lock
10. Force/Max Lock
11.Double Entry
12. Y-Coord C
13. Y-Coord D
14. Free
15. Flashing
16. Walk 2
17. Max Green 2
18. Max Green 3
19. Rest in Walk
20. Rest in Red
21. Free Lag Phases
22. Special Functions
23. Truck Preempt
24. Conditional Service
25. Conditional Service
26. Leading Ped
27. Traffic Actuated Max 2
41. Protected Permissive
42. Protected Permissive

Action Code = Phases added to normal setting
100+Action Code = Phases removed
200+Action Code = Phases replaced

COMMUNICATIONS

C2 (6-1-1)	
Address	
Protocol	AB3418
Access Level	0
Baud	9600
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	20
RTS Off Time	20
Handshaking	NORMAL

C20 (6-1-2)	
Address	
Protocol	AB3418
Access Level	0
Baud	1200
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	20
RTS Off Time	20
Handshaking	NORMAL

C21 (6-1-3)	
Address	
Protocol	UTB
Access Level	0
Baud	1200
Parity	NONE
Data Bits	8
Stop Bits	1
RTS On Time	20
RTS Off Time	20
Handshaking	NORMAL

Access Levels:

0-Full Access
1-Status Only
2-Status, Set Pattern, Time
3-Status, Set Pattern, Time, Manual Plan
4-Reserved
5-Full Access with No Set Pattern
6-Full Access with No Set Time
7-Full Access with No Set Pattern, Manual Plan
8-Full Access with No Set Time, Pattern, Manual Plan

SOFT LOGIC

Soft Logic (6-2)

#	Data	OP	Data	OP	Data	OP	Data
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

*Refer to User's Manual for Data and OP Codes

CALLBACK NUMBERS

Callback Numbers (6-3...3)	
Line Out	
Local Toll	
Long Distance	
Delay	10
Area Code	
Phone Number	

Line Out	
Local Toll	
Long Distance	
Delay	10
Area Code	
Phone Number	

Line Out	
Local Toll	
Long Distance	
Delay	10
Area Code	
Phone Number	

NETWORK

Network (6-4)	
Address	
Protocol	AB3418
Port	27000
Type	STATIC
Central Access	0
Field Access	0

IP Address	0	.	0	.	0	.	0
Netmask	255	.	255	.	255	.	0
Broadcast	0	.	0	.	0	.	255
Gateway	0	.	0	.	0	.	254

RAILROAD PREEMPTION

RR 1

(3-1-1)	Timing	Phase Flags (3-1-2)			Pedestrian Flags (3-1-3)			Overlap Flags (3-1-4)		
Delay		Grn Hold	Yel Flash	Red Flash	Walk	Flash DW	Solid DW	Grn Hold	Yel Flash	Red Flash
Clear 1	10	.2..5...	.....	.....	.....	.....	.2.4.6.8	.....	.....	.....
Clear 2		.....	.....	.....	.....	.....	.....	.....	.....	.....
Clear 3		.....	.....	.....	.....	.....	.....	.....	.....	.....
Hold		.....	.....	12345678	.....	.....	.....	.....	.....	ABCDEF
Exit										
Min Grn										
Ped Clr										

Exit Parameters (3-1-5)

Phase Green	Overlap Green	Vehicle Call	Ped Call
.....	.....	12345678	.2.4.6.8

Configuration (3-1-6)

Primary Port	Secondary Port	Latching	Power-Up
2.5	0.0	YES	FLASHING

RR 2

(3-2-1)	Timing	Phase Flags (3-2-2)			Pedestrian Flags (3-2-3)			Overlap Flags (3-2-4)		
Delay		Grn Hold	Yel Flash	Red Flash	Walk	Flash DW	Solid DW	Grn Hold	Yel Flash	Red Flash
Clear 1	10	...4..7.	.....	.....	.....	.....	.2.4.6.8	.....	.....	.....
Clear 2		.....	.....	.....	.....	.....	.....	.....	.....	.....
Clear 3		.....	.....	.....	.....	.....	.....	.....	.....	.....
Hold		123..6..	.....	.....	.2...6..	.....	...4...8	.....	.....	.....
Exit										
Min Grn										
Ped Clr										

Exit Parameters (3-2-5)

Phase Green	Overlap Green	Vehicle Call	Ped Call
.....	.....	...4..7.	.....

Configuration (3-2-6)

Primary Port	Secondary Port	Latching	Power-up
2.6	0.0	YES	DARK

EMERGENCY VEHICLE PREEMPTION

EVA (3-A)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	.2..5...	.....

Port	Latching	Phase Termination
5.5	NO	ADVANCE

EVB (3-B)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	...4..7.	.....

Port	Latching	Phase Termination
5.6	NO	ADVANCE

EVC (3-C)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	1....6..	.....

Port	Latching	Phase Termination
5.7	NO	ADVANCE

EVD (3-D)

Preempt Timers			Phase Green	Overlap Green
Delay	Clear	Max		
	30	30	..3....8	.....

Port	Latching	Phase Termination
5.8	NO	ADVANCE

INPUTS

		7 Wire I/C (2-1-5-1)			
		Input	Port	Input	Port
Enable	NO	R1	3.8	Free	3.6
Max ON		R2	3.5	D2	2.8
Max OFF		R3	3.7	D3	6.1

Manual Control (2-1-5-2)	
Input	Port
Manual Advance	
Advance Enable	

Cabinet Status (2-1-5-3)	
Input	Port
Flash Bus	
Door Ajar	
Flash Sense	6.7
Stop Time	6.8

Special Function (2-1-5-4)	
Input	Port
1	
2	
3	
4	

Battery Backup (2-1-5-5)	
Port	Operation
	NORMAL

Y-Coordination (2-1-5-6)	
Port C	Port D
6.1	2.8

OUTPUTS

Loadswitch Assignments (2-1-6)							+
A	1	2	22	3	4	24	9
B	5	6	26	7	8	28	10
X	13	14	0	11	12	0	0

Loadswitch Codes:

0 Unused (no output)
1-8 Vehicle 1-8
9-14 Overlap A-F
21-28 Ped 1-8
41-47 Special Functions
41 Protected Permissive Flashing Phase 1
43 Protected Permissive Flashing Phase 3
45 Protected Permissive Flashing Phase 5
47 Protected Permissive Flashing Phase 7
51-57 Special Functions
71-72 Seven Wire I/C

+ middle output of loadswitches 3 and 6 Channel 9 and 10

TRANSIT PRIORITY

Local Plans (3-E) 1...9 11...19		Early Green	Green Extend	Inhibit Cycles	Phase 1 Minimum	Phase 2 Minimum	Phase 3 Minimum	Phase 4 Minimum	Phase 5 Minimum	Phase 6 Minimum	Phase 7 Minimum	Phase 8 Minimum
Plan 1	Green Factor											
Plan 2	Green Factor											
Plan 3	Green Factor											
Plan 4	Green Factor											
Plan 5	Green Factor											
Plan 6	Green Factor											
Plan 7	Green Factor											
Plan 8	Green Factor											
Plan 9	Green Factor											
Plan 11	Green Factor											
Plan 12	Green Factor											
Plan 13	Green Factor											
Plan 14	Green Factor											
Plan 15	Green Factor											
Plan 16	Green Factor											
Plan 17	Green Factor											
Plan 18	Green Factor											
Plan 19	Green Factor											

Transit Priority Configuration (3-E-A)				Indicator Output	
Enable in Plans		Input	Type	Stop	Go
Plan 1-9	.....	0.0	OPT	0	0
Plan 11-19	.....	0.0	OPT	0	0

Queue Jump (3-E-B)	
Grn Hold	Hold Phase
	.....
	.....

Free Plans (3-E-E)	
Max Grn Hold	Hold Phase
	.....

Access Utilities (9-5)	
Password	***
Timeout	30

YELLOW YIELD COORDINATION

					Force-Offs											
Y-Coord Plans (7-C,D)	Long Grn	No Grn	Offset	Perm	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	Coord	Lag	Min Recall	Restricted
Plan C													.2...6..	.2.4.6.8	.....	.....
Plan D													.2...6..	.2.4.6.8	.....	.....

TRUCK PRIORITY

Truck Priority (3-F)	Passage	CarryOver	Clearance	Next Priority	Phase Green	Det 2 Port	Det 3 Port	Det 4 Port	Sign Output	Slave Input	Slave Output
					.....	0.0	0.0	0.0	0	0.0	0

- ***Queuing Analysis - SimTraffic Worksheets***

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	339	272	84	167	190	301	313
Average Queue (ft)	215	159	27	64	105	205	240
95th Queue (ft)	299	267	63	129	167	364	356
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)					0	14	22
Queuing Penalty (veh)					0	0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)				0			
Queuing Penalty (veh)				0			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	252	360	45	51	203	264	163
Average Queue (ft)	120	197	24	26	117	155	76
95th Queue (ft)	246	298	34	39	182	226	133
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			58	33		0	
Queuing Penalty (veh)			0	0		1	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					0	2	
Queuing Penalty (veh)					0	5	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	449	467	134	239	297	282	240	299	216
Average Queue (ft)	327	427	91	194	138	127	141	165	99
95th Queue (ft)	602	496	181	264	314	240	223	246	220
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	54	57		3	3	0		0	
Queuing Penalty (veh)	0	0		0	26	3		0	
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		96	16	3	3			3	0
Queuing Penalty (veh)		423	38	14	19			5	0

Intersection: 4: I-605 NB Ramps/I-605 NB Ramps-Rivergrade Road & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	R	LT	TR
Maximum Queue (ft)	197	87	77	628	516	150	730	667
Average Queue (ft)	48	16	11	383	296	32	433	360
95th Queue (ft)	134	72	57	585	489	132	667	594
Link Distance (ft)		239	239	627	627		801	801
Upstream Blk Time (%)	0			1			0	0
Queuing Penalty (veh)	0			0			0	0
Storage Bay Dist (ft)	250					125		
Storage Blk Time (%)	0				19	0		
Queuing Penalty (veh)	0				33	1		

Zone Summary

Zone wide Queuing Penalty: 567

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	253	190	131	169	181	290	305
Average Queue (ft)	144	62	54	75	116	120	158
95th Queue (ft)	225	172	104	143	171	245	285
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)						2	4
Queuing Penalty (veh)						0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)			0	0			
Queuing Penalty (veh)			2	1			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	330	377	53	49	215	237	135
Average Queue (ft)	140	211	26	25	117	152	63
95th Queue (ft)	277	318	39	38	192	221	112
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			64	38		0	
Queuing Penalty (veh)			0	0		1	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					0	1	
Queuing Penalty (veh)					0	3	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	467	483	175	190	139	149	416	410	225
Average Queue (ft)	414	443	143	108	60	87	316	269	159
95th Queue (ft)	528	515	215	175	114	132	449	406	279
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	31	78					8	3	
Queuing Penalty (veh)	0	0					0	0	
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		93	20					29	1
Queuing Penalty (veh)		553	95					44	4

Intersection: 4: I-605 NB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	R	LT	TR
Maximum Queue (ft)	174	190	166	272	241	30	847	850
Average Queue (ft)	73	88	67	146	80	1	797	802
95th Queue (ft)	163	189	152	234	185	22	946	921
Link Distance (ft)		239	239	627	627		801	801
Upstream Blk Time (%)	0	0	0				59	65
Queuing Penalty (veh)	0	1	0				0	0
Storage Bay Dist (ft)	250					125		
Storage Blk Time (%)	0	0			0			
Queuing Penalty (veh)	1	1			1			

Zone Summary

Zone wide Queuing Penalty: 705

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	347	327	75	170	186	310	320
Average Queue (ft)	217	159	24	72	112	210	253
95th Queue (ft)	313	286	53	132	168	373	363
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)						19	29
Queuing Penalty (veh)						0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)				0			
Queuing Penalty (veh)				0			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	276	332	37	36	220	246	132
Average Queue (ft)	135	208	23	23	113	148	72
95th Queue (ft)	267	312	31	34	188	218	126
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			56	30		0	
Queuing Penalty (veh)			0	0		1	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					0	1	
Queuing Penalty (veh)					0	3	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	451	447	163	238	290	246	261	292	222
Average Queue (ft)	247	414	145	191	124	113	149	167	102
95th Queue (ft)	596	523	205	267	301	208	234	266	226
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	31	68		3	3	0			
Queuing Penalty (veh)	0	0		0	27	2			
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		61	44	3	3			5	0
Queuing Penalty (veh)		272	108	15	20			9	0

Intersection: 4: I-605 NB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	R	LT	TR
Maximum Queue (ft)	179	139	91	627	558	150	587	557
Average Queue (ft)	65	32	24	411	320	41	405	341
95th Queue (ft)	167	114	89	647	556	150	608	550
Link Distance (ft)		239	239	627	627		801	801
Upstream Blk Time (%)	0	0		4	0		0	0
Queuing Penalty (veh)	0	0		0	0		0	0
Storage Bay Dist (ft)	250					125		
Storage Blk Time (%)	0	0			23	0		
Queuing Penalty (veh)	0	0			42	1		

Zone Summary

Zone wide Queuing Penalty: 499

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	248	210	139	195	202	286	303
Average Queue (ft)	144	66	58	84	118	123	165
95th Queue (ft)	217	171	112	154	179	240	288
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)						2	3
Queuing Penalty (veh)						0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)			1	0			
Queuing Penalty (veh)			5	0			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	314	359	43	36	218	263	124
Average Queue (ft)	142	212	25	25	118	156	61
95th Queue (ft)	268	319	33	32	197	228	108
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			67	42		0	
Queuing Penalty (veh)			0	0		1	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					0	2	
Queuing Penalty (veh)					0	5	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	471	491	175	192	136	147	408	399	225
Average Queue (ft)	403	455	129	107	56	83	311	261	166
95th Queue (ft)	560	476	217	175	108	128	422	371	261
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	27	94			0		4	0	
Queuing Penalty (veh)	0	0			0		0	0	
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		83	22		0			22	1
Queuing Penalty (veh)		501	103		0			33	3

Intersection: 4: I-605 NB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	LT	TR
Maximum Queue (ft)	188	194	167	262	188	851	845
Average Queue (ft)	72	72	58	151	81	814	814
95th Queue (ft)	171	195	164	238	173	896	890
Link Distance (ft)		239	239	627	627	801	801
Upstream Blk Time (%)	0	0	0			62	71
Queuing Penalty (veh)	0	0	0			0	0
Storage Bay Dist (ft)	250						
Storage Blk Time (%)	0	0			1		
Queuing Penalty (veh)	0	0			1		

Zone Summary

Zone wide Queuing Penalty: 653

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	388	341	105	171	208	328	332
Average Queue (ft)	251	202	28	95	136	298	300
95th Queue (ft)	343	304	65	162	192	315	320
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)						50	69
Queuing Penalty (veh)						0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)				1			
Queuing Penalty (veh)				0			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	331	401	42	49	224	275	129
Average Queue (ft)	184	251	23	25	135	166	67
95th Queue (ft)	307	360	34	40	220	247	112
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			59	33		1	
Queuing Penalty (veh)			0	0		2	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					0	3	
Queuing Penalty (veh)					1	9	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	455	464	149	239	294	264	368	347	225
Average Queue (ft)	293	400	100	200	144	125	226	206	130
95th Queue (ft)	594	554	206	257	323	237	343	313	255
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	40	61		3	5	0	0	0	
Queuing Penalty (veh)	0	0		0	39	2	0	0	
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		74	28	3	5			10	1
Queuing Penalty (veh)		328	69	16	29			19	1

Intersection: 4: I-605 NB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	R	LT	TR
Maximum Queue (ft)	193	195	138	665	648	150	682	658
Average Queue (ft)	97	56	38	515	448	77	496	428
95th Queue (ft)	223	191	133	766	728	198	811	774
Link Distance (ft)		239	239	627	627		801	801
Upstream Blk Time (%)	1	1	0	25	8		8	6
Queuing Penalty (veh)	0	4	0	0	0		0	0
Storage Bay Dist (ft)	250					125		
Storage Blk Time (%)	1	1			38	0		
Queuing Penalty (veh)	2	3			101	2		

Zone Summary

Zone wide Queuing Penalty: 629

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	292	243	149	220	226	324	323
Average Queue (ft)	182	112	67	108	137	257	275
95th Queue (ft)	268	236	135	189	204	374	363
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)				0		29	43
Queuing Penalty (veh)				0		0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)			4	1			
Queuing Penalty (veh)			17	2			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	357	403	44	46	224	289	133
Average Queue (ft)	200	263	26	26	152	183	60
95th Queue (ft)	326	382	35	35	239	271	111
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			66	43		1	
Queuing Penalty (veh)			0	0		4	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					0	6	
Queuing Penalty (veh)					1	17	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	473	485	175	203	160	130	433	429	225
Average Queue (ft)	365	453	119	103	68	80	393	365	205
95th Queue (ft)	618	480	214	181	124	121	451	465	264
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	48	93			0		38	23	
Queuing Penalty (veh)	0	0			0		0	0	
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		93	19		0			53	2
Queuing Penalty (veh)		565	90		0			80	8

Intersection: 4: I-605 NB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	R	LT	TR
Maximum Queue (ft)	195	178	137	295	234	30	846	858
Average Queue (ft)	72	66	48	152	80	1	805	812
95th Queue (ft)	157	172	133	254	189	21	926	915
Link Distance (ft)		239	239	627	627		801	801
Upstream Blk Time (%)	0	0					60	69
Queuing Penalty (veh)	0	0					0	0
Storage Bay Dist (ft)	250					125		
Storage Blk Time (%)	0	0			1			
Queuing Penalty (veh)	0	0			2			

Zone Summary

Zone wide Queuing Penalty: 787

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	402	374	98	147	187	315	319
Average Queue (ft)	271	222	27	70	108	243	250
95th Queue (ft)	373	328	63	123	165	362	359
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)						19	25
Queuing Penalty (veh)						0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)				0			
Queuing Penalty (veh)				0			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	271	341	43	49	225	291	126
Average Queue (ft)	131	204	23	25	172	207	67
95th Queue (ft)	249	295	31	39	256	294	114
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			56	33		2	
Queuing Penalty (veh)			0	0		8	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					1	10	
Queuing Penalty (veh)					3	31	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	446	490	175	239	288	243	240	293	222
Average Queue (ft)	287	432	115	198	135	117	147	174	103
95th Queue (ft)	545	543	217	259	315	224	234	268	230
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	6	81		4	5	0			
Queuing Penalty (veh)	0	0		0	42	2			
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		85	9	4	5			5	0
Queuing Penalty (veh)		378	22	19	31			9	0

Intersection: 4: I-605 NB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	R	LT	TR
Maximum Queue (ft)	220	229	173	669	648	150	777	679
Average Queue (ft)	95	59	44	523	439	54	525	464
95th Queue (ft)	214	158	122	771	694	170	829	782
Link Distance (ft)		239	239	627	627		801	801
Upstream Blk Time (%)	0	0	0	19	4		8	5
Queuing Penalty (veh)	0	1	0	0	0		0	0
Storage Bay Dist (ft)	250					125		
Storage Blk Time (%)	0	0			40	0		
Queuing Penalty (veh)	0	1			71	1		

Zone Summary

Zone wide Queuing Penalty: 621

Intersection: 1: Windsor Ave & I-210 WB Ramps

Movement	WB	WB	NB	NB	NB	SB	SB
Directions Served	LTR	R	L	T	T	T	TR
Maximum Queue (ft)	361	312	135	212	229	297	306
Average Queue (ft)	209	148	68	90	122	175	179
95th Queue (ft)	310	278	133	173	189	299	318
Link Distance (ft)	690			263	263	278	278
Upstream Blk Time (%)				0	0	5	6
Queuing Penalty (veh)				1	0	0	0
Storage Bay Dist (ft)		650	125				
Storage Blk Time (%)			6	1			
Queuing Penalty (veh)			25	1			

Intersection: 2: Arroyo Blvd & I-210 EB Ramps

Movement	EB	EB	NB	NB	SB	SB	SB
Directions Served	L	LTR	T	TR	L	L	T
Maximum Queue (ft)	304	362	53	33	225	290	131
Average Queue (ft)	148	211	25	25	174	213	61
95th Queue (ft)	269	325	37	32	247	287	106
Link Distance (ft)		680				263	263
Upstream Blk Time (%)			62	38		2	
Queuing Penalty (veh)			0	0		7	
Storage Bay Dist (ft)	600				200		
Storage Blk Time (%)					1	10	
Queuing Penalty (veh)					2	33	

Intersection: 3: I-605 SB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB
Directions Served	T	T	R	L	T	T	LT	TR	R
Maximum Queue (ft)	472	492	175	191	154	157	408	401	225
Average Queue (ft)	396	454	138	109	58	89	294	252	150
95th Queue (ft)	602	482	216	183	118	137	411	375	272
Link Distance (ft)	445	445			239	239	392	392	
Upstream Blk Time (%)	35	93			0		3	1	
Queuing Penalty (veh)	0	0			0		0	0	
Storage Bay Dist (ft)			150	250					200
Storage Blk Time (%)		82	28		0			19	1
Queuing Penalty (veh)		496	131		0			29	3

Intersection: 4: I-605 NB Ramps & Lower Azusa Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	T	R	LT	TR
Maximum Queue (ft)	179	181	164	255	216	28	855	853
Average Queue (ft)	79	91	70	156	85	1	803	806
95th Queue (ft)	167	187	160	243	190	20	920	917
Link Distance (ft)		239	239	627	627		801	801
Upstream Blk Time (%)		0	0				59	67
Queuing Penalty (veh)		0	0				0	0
Storage Bay Dist (ft)	250					125		
Storage Blk Time (%)		0			1	0		
Queuing Penalty (veh)		0			1	0		

Zone Summary

Zone wide Queuing Penalty: 730

Appendix I-1

Native American Heritage Commission Sacred Lands File Results for the Arroyo Seco Canyon Project Areas 2 and 3, October 2019

Linda Kry

From: Adriane Dorrler
Sent: Monday, September 16, 2019 3:32 PM
To: nahc@nahc.ca.gov
Cc: Linda Kry
Subject: Request for a Sacred Lands File Search_Dudek (#11884)
Attachments: 11884_NAHC SLF_Request_PDF.pdf; Fig_records_search.pdf

Dear NAHC,

Please find attached the NAHC Sacred Lands File Search request and project location map for the proposed Arroyo Seco Canyon Project (Dudek #11884). Dudek is requesting a NAHC search for any sacred sites, tribal cultural resources, or other places of Native American community value that may fall within a one-mile radius of the proposed Project site.

Please let me know if you have any questions regarding this project. You can email the results to me at adorrler@dudek.com.

Thank you in advance,

Adriane Gusick
Associate Archaeologist

DUDEK
mobile: (760) 840-7556
www.dudek.com / www.facebook.com/dudeknews

Sacred Lands File & Native American Contacts List Request

NATIVE AMERICAN HERITAGE COMMISSION
1550 Harbor Blvd, Suite 100
West Sacramento, CA 95501
(916) 373-3710
(916) 373-5471 – Fax
nahc@nahc.ca.gov

Information Below is Required for a Sacred Lands File Search

Project: Arroyo Seco Canyon Project (Dudek #11884)
County: Los Angeles

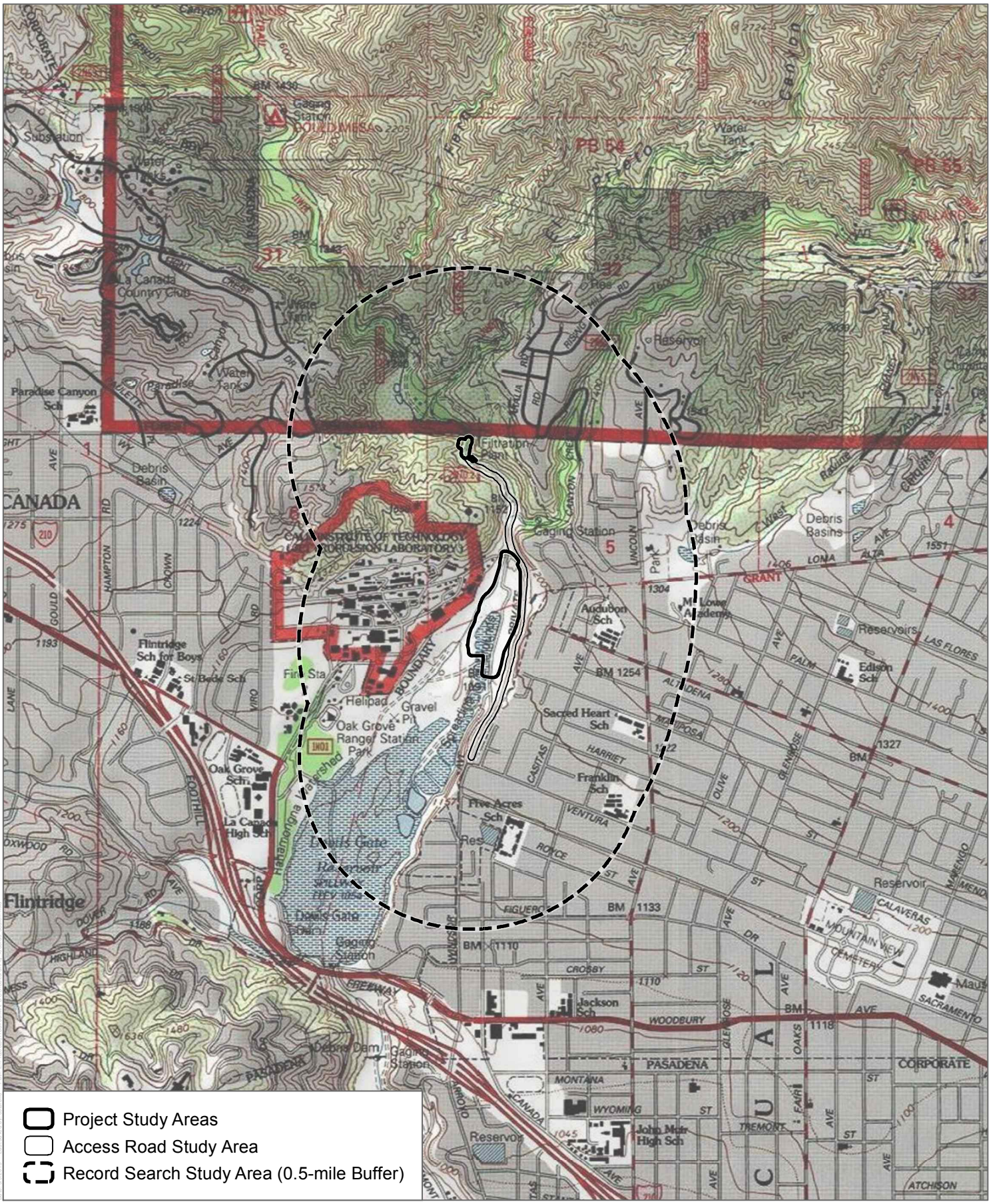
USGS Quadrangle
Name: Pasadena
Township: 1N Range: 12W Section(s): 5

Company/Firm/Agency:
Dudek
Contact Person: Adriane Gusick
Street Address: 38 N Marengo Avenue
City: Pasadena Zip: 91101
Phone: (760) 840-7556 Extension:
Fax: (760) 632-0164
Email: adorrler@dudek.com

Project Description:
The City of Pasadena (City) owns the right to divert up to 25 cubic feet per second of surface water from the Arroyo Seco into their spreading basins for pumping credits in the Raymond Basin. In the two storm seasons following the 2009 Station Fire, excessive amounts of sediment washed down from the watershed. The debris flows damaged City structures, greatly reducing the City's capacity to divert water for spreading. As a result, the City of Pasadena Department of Water and Power proposes to repair and replace damaged facilities in the Upper Arroyo Seco Canyon as a part of the proposed Project. The improvements would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this important local water resource.

The proposed Project consists of three primary areas, including Area 1, Headworks Removal; Area 2, Diversion and Intake Replacement; and Area 3, Spreading Basin Improvements. These areas are connected by the Gabrielino Trail/Access Road. The proposed Project would involve construction activity and facility improvements in all three areas, as well as along portions of the Gabrielino Trail/Access Road. Additionally, portions of the 30-inch hume line, which is a pipeline that conveys water from the diversion weir to the spreading basins, may also be improved/replaced.

☑ Project Location Map is attached



SOURCE: USGS Topo 7.5 Minute Series Pasadena Quadrangle
Township 1N / Range 12W / Section 05

DUDEK

0 1,000 2,000 Feet
0 285 570 Meters
1:24,000

Records Search Map

Arroyo Seco Canyon Project

NATIVE AMERICAN HERITAGE COMMISSION
Cultural and Environmental Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone: (916) 373-3710
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

October 7, 2019

Adriane Gusick
Dudek

VIA Email to: adorrler@dudek.com

RE: Arroyo Seco Canyon Project, Los Angeles County

Dear Ms. Gusick:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were positive. Please contact the Gabrieleno Band of Mission Indians - Kizh Nation on the attached list for more information. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify the NAHC. With your assistance, we can assure that our lists contain current information. If you have any questions or need additional information, please contact me at my email address: steven.quinn@nahc.ca.gov.

Sincerely,

Steven Quinn
Associate Governmental Program Analyst

Attachment

PASADENA WATER AND POWER

November 7, 2019

Andrew Salas, Chairman
Gabrieleño Band of Mission Indians – Kizh Nation
PO Box 393
Covina, CA 91723
Email: admin@gabrielenoindians.org and gabrielenoindians@yahoo.com

Subject: Formal Notification of a Proposed Project Pursuant to AB 52 and Sections 21080.3.1 and 21080.3.2 of the California Environmental Quality Act (CEQA)

Project: Arroyo Seco Canyon Project Areas 2 and 3, City of Pasadena, California

Dear Mr. Salas:

Pursuant to Assembly Bill (AB) 52 and Section 21080.3.1 of the California Environmental Quality Act (CEQA), and in response to your associated request, the City of Pasadena is hereby providing formal notification of the proposed Arroyo Seco Canyon Project Areas 2 and 3. Enclosed please find a brief description of the proposed project and its location.

If you wish to begin consultation on this project pursuant to AB 52 and Sections 21080.3.1 and 21080.3.2 of CEQA, please request such consultation as soon as possible, but no later than 30 days from the date of this letter. The City of Pasadena's (lead agency's) contact person for this project is:

Elisa Ventura, P.E.
City of Pasadena Department of Water and Power
150 South Los Robles Avenue, Suite 200
Pasadena, California 91101
(626) 744-4465 eventura@cityofpasadena.net

Your comments and concerns are important to the City and we welcome the opportunity to consult with the Gabrieleño Band of Mission Indians – Kizh Nation, upon your request. If you have any questions regarding the project, please do not hesitate to contact Elisa Ventura at the contact information noted above.

Sincerely,

E. Ventura

Elisa Ventura, P.E.

Enclosure: Description of the Proposed Project and Location

DESCRIPTION OF THE PROPOSED PROJECT AND LOCATION

PROJECT NAME: Arroyo Seco Canyon Project Areas 2 and 3

PROJECT LOCATION AND SETTING: As shown in the attached Figure 1, Local Vicinity and Regional Location, the proposed Project site is located within the Arroyo Seco Canyon adjacent to North Arroyo Boulevard and the Gabrielino Trail, located in Township 1 North, Range 12 West on the Pasadena, California 7.5′ USGS quadrangle map. The proposed Project is located at 3420 to 3500 North Arroyo Boulevard, City of Pasadena (City). The proposed Project site includes portions of Assessor Parcel Numbers 5830-001-906 and 5823-015-902. The proposed Project consists of two primary areas, including Area 2, Diversion and Intake Replacement and Area 3, Spreading Basin Improvements. These areas are connected by the Gabrielino Trail/Access Road, which serves as a recreational trail and the access road for City and United States Forest Service vehicles heading into the Arroyo Seco Canyon.

The proposed Project site is bound by residential uses in Pasadena and the community of Altadena to the east and south; open spaces in the Angeles National Forest (ANF) to the north; Devil's Gate Dam and Reservoir to the southwest; and the Arroyo Seco stream corridor, Oak Grove Park, and other recreational areas, the NASA-Jet Propulsion Laboratory (JPL) campus, and residential areas in the City of La Cañada Flintridge on the west.

ZONING: Open Space

GENERAL PLAN DESIGNATION: Open Space

PROJECT SUMMARY: The City owns the right to divert up to 25 cubic feet per second (cfs) of surface water from the Arroyo Seco for direct use or for spreading into its basins for water pumping credits in the Raymond Basin. The City receives between 60 to 80% groundwater pumping credit for the amount of water recharged into the groundwater basin. The City of Pasadena Department of Water and Power (PWP) proposes to repair and replace damaged facilities in the Upper Arroyo Seco Canyon, which would allow for increased utilization of the City's surface water rights from the Arroyo Seco and maximize the beneficial use of this important local water resource. The overall Project objectives to increase the beneficial use of the surface water rights held by the City and to improve biological functions within the Arroyo Seco.

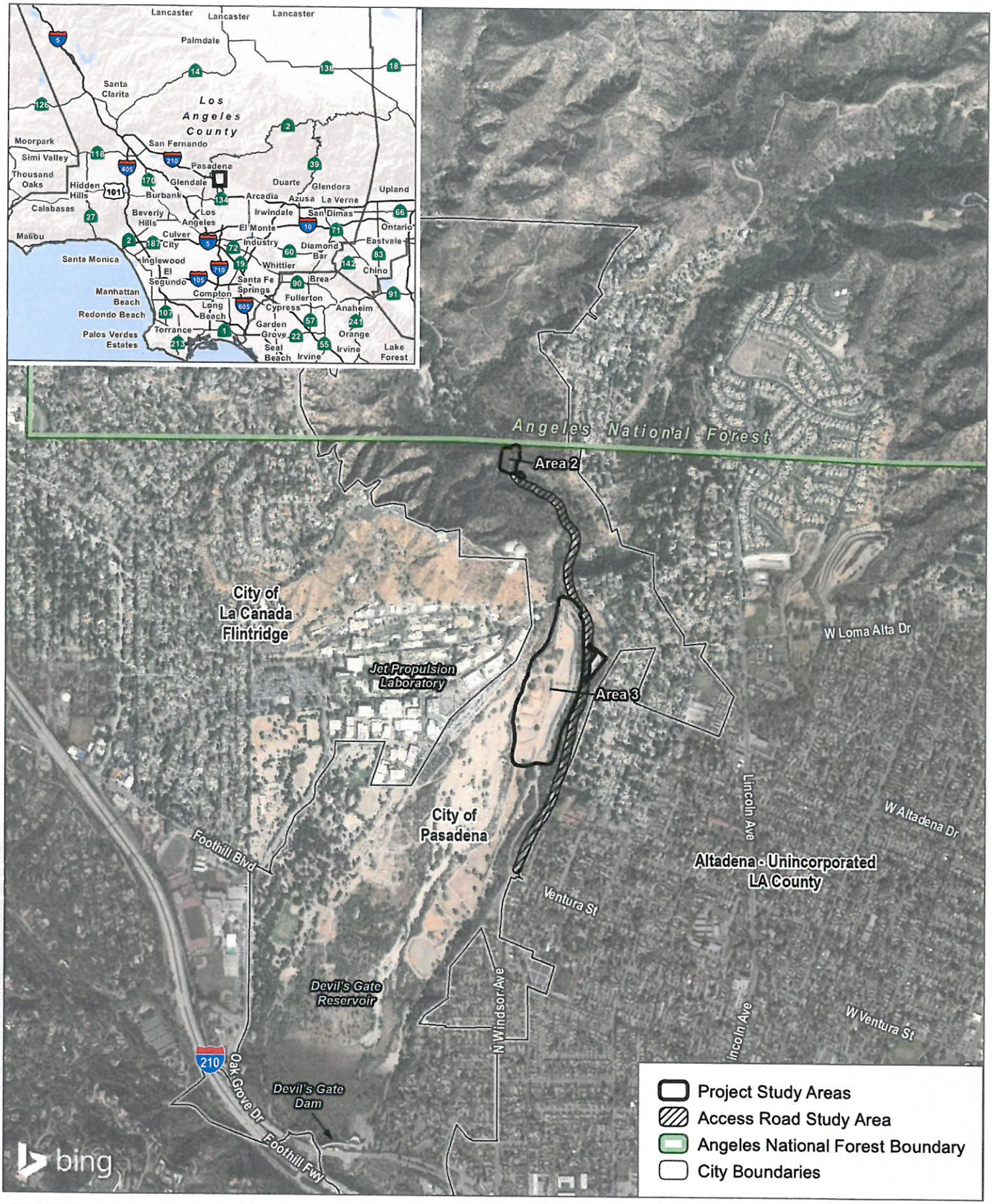
The Project involves a requested modification to Conditional Use Permit #6222 in order to construct and operate proposed water infrastructure improvements in Areas 2 and 3. A description of the proposed Project is included in the Initial Study, and a brief summary of proposed Project components is provided below.

Area 2: Diversion and Intake Replacement- Improvements in Area 2 include the removal of the existing diversion/weir structure and the intake structure, which would be replaced with a new

diversion/weir structure that could be operated to divert up to 25 cfs of creek flows through the new intake structure and into the existing conveyance system (a combination of tunnels and pipelines). The new intake would include a fish screening feature to prevent future fish populations from passing into the intake and conveyance system. A roughened channel would be constructed directly downstream of the new weir to allow for future fish passage upstream during moderate flow periods. Other improvements include a new service building to house the electrical and hydraulic controls for the diversion structure and new engineered streambed material along the eastern creek slope to prevent erosion adjacent to the Gabrielino Trail/Access Road. (See Figure 2)

Area 3: Spreading Basin Improvements- Improvements in Area 3 include the reconfiguration and expansion of the spreading basins in order to accommodate the increased flows for infiltration into the Raymond Basin. Various facilities would be demolished, including inlet/outlet structures, pipes and valves, fencing, and other small appurtenant structures, to allow for the reconstructed basins. Creek flows from the existing conveyance system would outlet to the new sedimentation basin or to new spreading Basin E located at the site of the existing Pasadena Pond 1. Basin F would be adjacent to mature trees to be preserved and would be located at the site of the existing Pasadena Pond 2. Basins G, H, and I would be located at the site of the existing Basins 1 and 2 and a portion of the City's open area (i.e. former JPL East Parking Lot). New Basin J would be located between existing Basins 3 and 4, and Explorer Road. (See Figure 3)

During construction activities, the existing Gabrielino Trail/Access Road would provide for vehicular access to and from Areas 2 and 3, and Explorer Road would provide for vehicular access to and from Area 3. The former Travelling Screen and Chlorine Building adjacent to Area 2 and the Behner Water Treatment Plant adjacent to Area 3 would be used for temporary construction materials and equipment staging. No new habitable structures would be constructed, and no new employees would be generated by the proposed Project.



SOURCE: Bing 2019, Open Street Map 2019

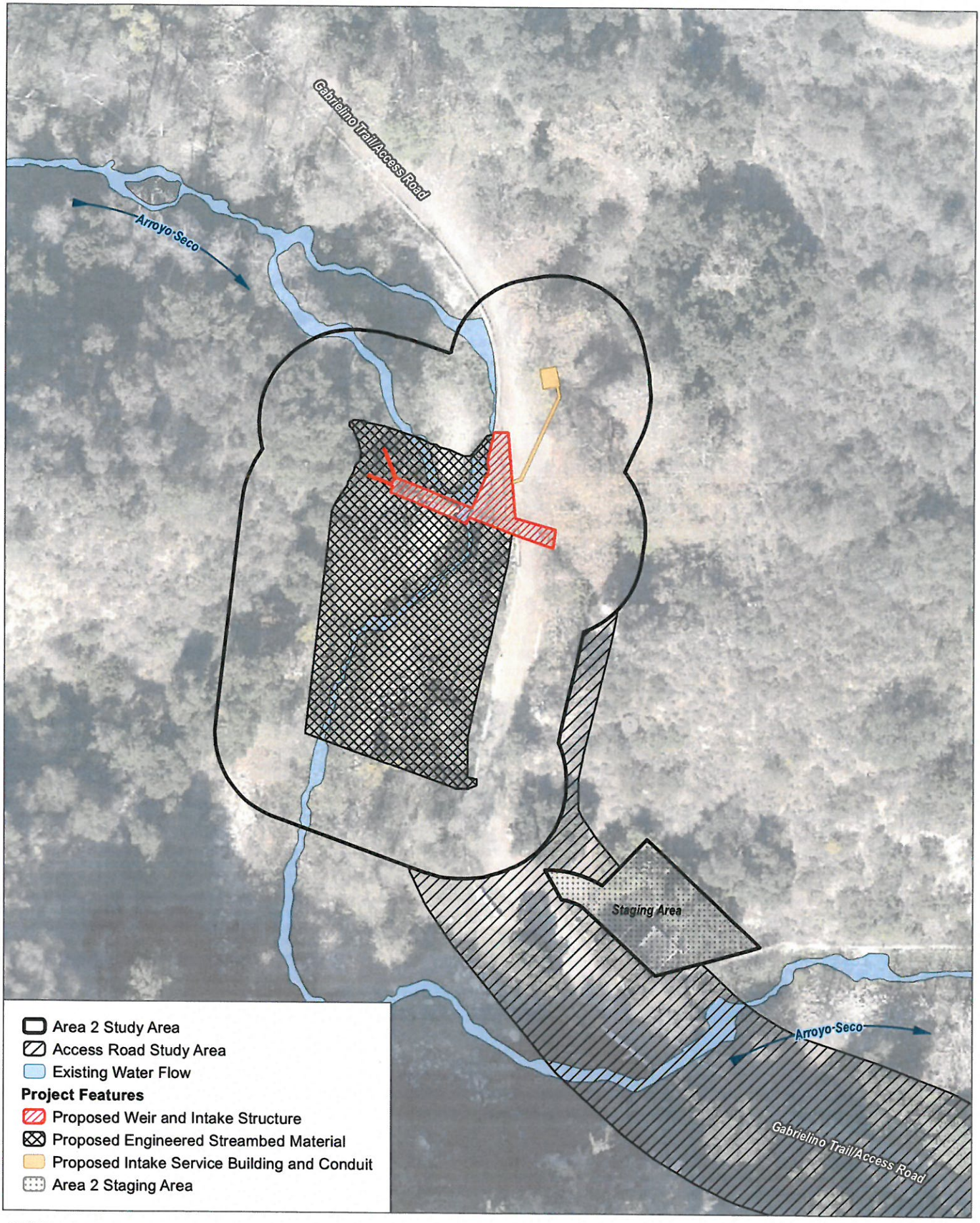
DUDEK

0 700 1,400 Feet

FIGURE 1

Local Vicinity and Regional Location

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: LARIAC Aerials 2014

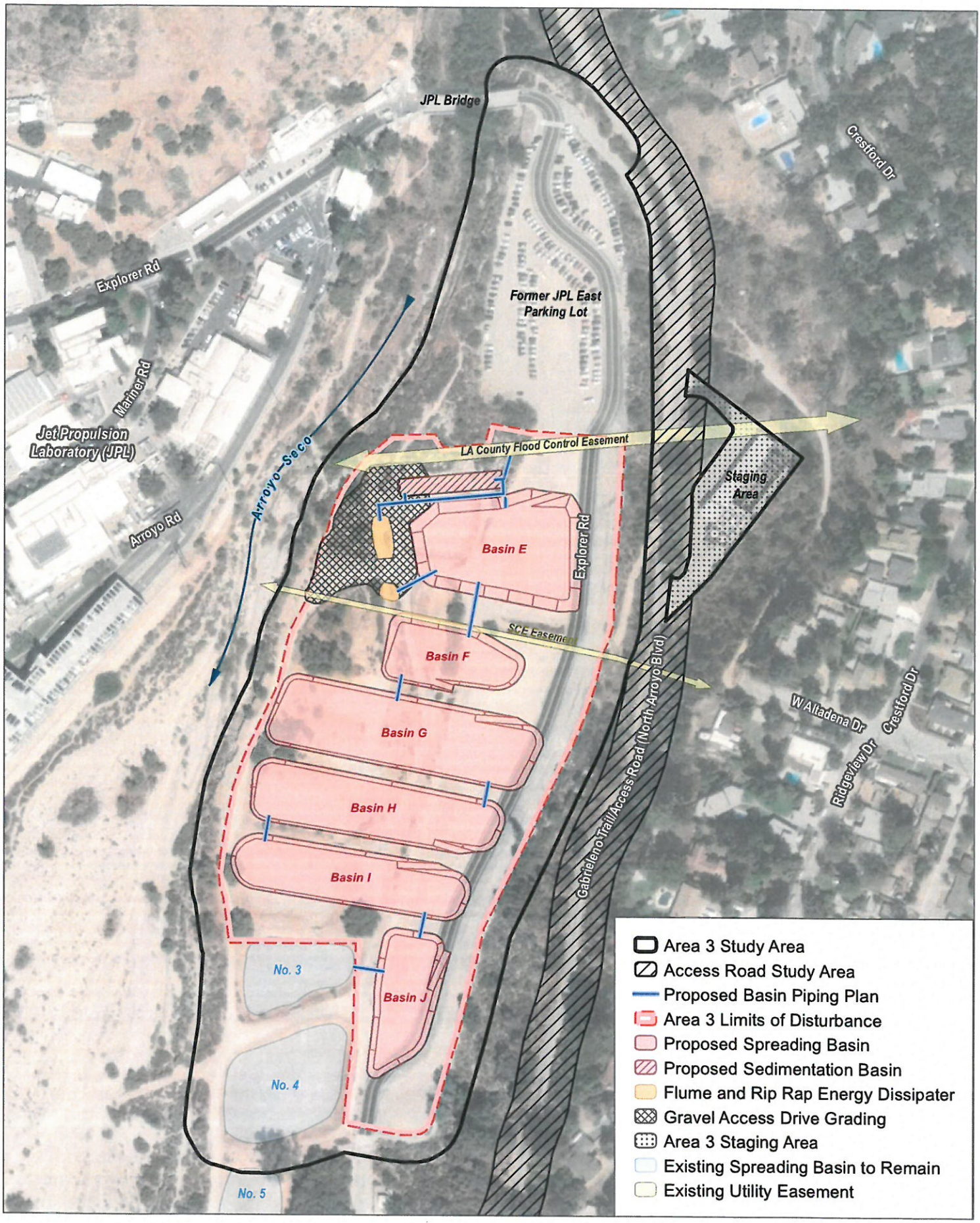
DUDEK

0 35 70 Feet

FIGURE 2

Area 2 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3



SOURCE: Esri, Digital Globe 2019

DUDEK

0 112.5 225 Feet

FIGURE 3

Area 3 Conceptual Design Overview

Arroyo Seco Canyon Project Areas 2 and 3

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YOUR OPINION COUNTS

Appendix I-2

CONFIDENTIAL APPENDIX: AB 52
Communication Documentation