MOJAVE RIVER WATERSHED

Water Quality Management Plan

For:

KISS Logistics Center

HIGHWAY 395 AND PHELAN ROAD

APN: 3064-401-03, -04, -05

Prepared for:

City of Hesperia

Prepared by:

Alliance Land Planning and Engineering, inc

2248 Faraday Ave.

Carlsbad, California, 92008

760-431-9896

Submittal Date: 6/21/22

Revision No. and Date: _____

Revision No. and Date: _____

Revision No. and Date: _____

Revision No. and Date: _____

Revision No. and Date: _____

Final Approval Date:_____

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for KISS Hesperia Venture, LLC by Alliance Land Planning and Engineering. The WQMP is intended to comply with the requirements of the City of Hesperia and the Phase II Small MS4 General Permit for the Mojave River Watershed. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Hesperia and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the city/county/town shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			3064-401-03, -04, -05

Owner's Signature			
Owner Name: Jin Kim			
Title	Senior Director		
Company	KISS Hesperia Ventuire, LLC		
Address	25 Harbor Park Drive, Port Washington, NY 11050		
Email			
Telephone #	516-625-9292		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			3064-401-03, -04, -05

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of the California State Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer:		PE Stamp Below
Title	Craig Whitteker	
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Signature		
Date		

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Section I – Introduction

This WQMP template has been prepared specifically for the Phase II Small MS4 General Permit in the Mojave River Watershed. This location is within the jurisdiction of the Lahontan Regional Water Quality Control Board (LRWQCB). This document should not be confused with the WQMP template for the Santa Ana Phase I area of San Bernardino County.

WQMP preparers must refer to the MS4 Permit for the Mojave Watershed WQMP template and Technical Guidance (TGD) document found at: http://cms.sbcounty.gov/dpw/Land/NPDES.aspx to find pertinent arid region and Mojave River Watershed specific references and requirements.

Section 1 Discretionary Permit(s)

Form 1-1 Project Information					
Project Name	KISS Logistics Center				
Project Owner Contact Name:	Jin Kim				
Mailing Address:	25 Harbor Park Drive Port Washington, NY 11050	E-mail Address:		Telephone:	
Permit/Application Number(s):		Tract/Parcel Map Number(s):	APN 3064-401-03, -04, -05		
Additional Information/ Comments:					
Description of Project:	The KISS Logistics Center is a proposed commercial/industrial warehouse project in the City of Hesperia, San Bernardino County, California. The approximate 29.5 acre project site is located on the immediate west side of Hwy 395 just north of Phelan Road and is currently on undeveloped land. Some industrial development exists in the nearby areas as do additional undeveloped parcels of land. The project will include one linear above-ground infiltration basin (with underdrain) for water quality treatement purposes				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	Infiltration will be achieved via an above-ground earthen basin that runs primarily along the north boundary of the project. The basin is somewhat linear in shape and a total of 5 infiltration test pits were utilized across the northern boundary to asses infiltration feasibility. The 5 test pits results in a relative broad range of factored percolation rates ranging from 7.5 in/hr down to 0.26 in/hr. As demostrated in the calculation tables below, an average infiltreation rate of 1.83 in/hr was applied to qualify for infiltration as the preffered method of treatment. However, the engineer is aware that the minimum infiltration rate of 0.26 in/hr should be considered and therefore additional measures will be applied within the basin to ensure proper treatment and drainage. A perforated underdrain will be provided in a 1' thick gravel layer to assist with drainage. The basin will also be equipped with 2' of soil media above the gravel underdrain layer and so this basin can be considered somewhat of a hybrid infiltration/bioinfiltration basin. However, the earthen boundary kayer below the gravel underdrain will be utilized for the primary method of infiltration. The basin will be equipped with an emergency overflow devise consisting of 3 riser pipes. The riser pipes will only be open at the top so that any ponded water below the design elevation will be forced to percolate down to through the media andp into the earth (or underdrain) below.				

Section 2 Project Description

2.1 Project Information

The WQMP shall provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

Form 2.1-1 Description of Proposed Project

[1] Regulated Development Project Category (Select all that apply):

☒ #1 New development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site	☐ #2 Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface

☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.

[2] Project Area (ft2):	1,284,765	[3] Number of Dwelling Units:	0	[4] SIC Code:	

[5] Is Project going to be phased? Yes ☐ No ☒ If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management
Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:
Long term maintenance of WQMP facilties will be performed by owner via a leasing management company.

2.3 Potential Stormwater Pollutants

Best Management Practices (BMP) measures for pollutant generating activities and sources shall be designed consistent with recommendations from the CASQA Stormwater BMP Handbook for New Development and Redevelopment (or an equivalent manual). Pollutant generating activities must be considered when determining the overall pollutants of concern for the Project as presented in Form 2.3-1.

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-2 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	
Nutrients - Phosphorous	E ☒	N ☐	
Nutrients - Nitrogen	E ☒	N ☐	
Noxious Aquatic Plants	E ☐	N ☒	Not expected in desert environment
Sediment	E ☒	N ☐	
Metals	E ☒	N ☐	
Oil and Grease	E ☒	N ☐	
Trash/Debris	E ☒	N ☐	
Pesticides / Herbicides	E ☒	N ☐	
Organic Compounds	E ☒	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

Section 3 Site and Watershed Description

Describe the project site conditions that will facilitate the selection of BMPs through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed Drainage Management Areas (DMAs)) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet. A map presenting the DMAs must be included as an appendix to the WQMP document.

Form 3-1 Site Location and Hydrologic Features

Site coordinates take GPS measurement at approximate center of site	Latitude 34* 25' 48.72" N	Longitude 117* 24' 6.15" W	Thomas Bros Map page
1 San Bernardino County climatic region: ☒ Desert			
2 Does the site have more than one drainage area (DA): Yes☐ No☒ If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached			

Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA1 DMA C flows to DA1 DMA A	Ex. Bioretention overflow to vegetated bioswale with 4' bottom width, 5:1 side slopes and bed slope of 0.01. Conveys runoff for 1000' through DMA 1 to existing catch basin on SE corner of property
DA1 DMA A to Outlet 1	Oniste flows routed via underground strom drain system to infiltration basin at north boundary. Infiltration basin is 1,150 in lnegth with 7' botom width and 2:1 sideslopes. A basin overflow will outlet to NE corner of property. An underdrain will be provided within this basin to assist with drainage as long term effects may reduce basin infiltration capacity over time.
DA1 DMA B to Outlet 1	
DA2 to Outlet 2	

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA A	DMA B	DMA C	DMA D
1 DMA drainage area (ft^2)	1,284,765			
2 Existing site impervious area (ft^2)	1,284,765			
3 Antecedent moisture condition For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf	3			
4 Hydrologic soil group Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf	A			
5 Longest flowpath length (ft)	1585			
6 Longest flowpath slope (ft/ft)	0.0151			
7 Current land cover type(s) Select from Fig C-3 of Hydrology Manual	Barren, Chapparel			
8 Pre-developed pervious area condition: Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating	Poor			

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA E	DMA F	DMA G	DMA H
1 DMA drainage area (ft^2)				
2 Existing site impervious area (ft^2)				
3 Antecedent moisture condition For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf				
4 Hydrologic soil group County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf				
5 Longest flowpath length (ft)				
6 Longest flowpath slope (ft/ft)				
7 Current land cover type(s) Select from Fig C-3 of Hydrology Manual				
8 Pre-developed pervious area condition: Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating				

Form 3-3 Watershed Description for Drainage Area	
Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River (below Lower Narrows)
Applicable TMDLs http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	n/a
303(d) listed impairments http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	n/a
Environmentally Sensitive Areas (ESA) Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP	n/a
Hydromodification Assessment	☒ Yes Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal ☐ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

The information and data in this section are required for both Regulated Development and Site Design Only Projects. Source Control BMPs and Site Design BMP Measures are the basis of site-specific pollution management.

4.1.1 Source Control BMPs

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	Info to be provided in Ooperations & Maintenance (O&M) manual
N2	Activity Restrictions	☒	☐	O&M Manual to outline: No vehicle car wash, vehicel mechanical repairs, unauthorized dumping, hazardous waste disposal, unauthorized painting, unauthorized chemical application, etc, etc
N3	Landscape Management BMPs	☒	☐	Landscape areas attempt to bbreak ling flow paths as best possible
N4	BMP Maintenance	☒	☐	O&M manual to outline maintenance procedures and provided to managemewnt entity
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	O&M to outline
N6	Local Water Quality Ordinances	☒	☐	All ordinances for City of Hesperia and San Bernardion Co to be adhered to
N7	Spill Contingency Plan	☒	☐	O&M to outline
N8	Underground Storage Tank Compliance	☒	☒	n/a
N9	Hazardous Materials Disclosure Compliance	☐	☒	n/a

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☒	☐	Applicable setbacks, hydrant locations, and fire lanes provided
N11	Litter/Debris Control Program	☒	☐	Covered trash enclosures, exterior waste cans, and routine trash maintenance to be provided
N12	Employee Training	☒	☐	Training dosumentation provided
N13	Housekeeping of Loading Docks	☒	☐	Routine maintence across all site facilites to be performed
N14	Catch Basin Inspection Program	☒	☐	CBs to be inspected pre- and post-rain event for debris and proper fuinction. Cleaning shall occur on as needed basis
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	Routine maintence across all site facilites to be performed
N16	Other Non-structural Measures for Public Agency Projects	☒	☐	Routine maintence across all site facilites to be performed
N17	Comply with all other applicable NPDES permits	☒	☐	NPDES permit to be adhered to

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Stencil to be used on all exterior CB inlets site wide
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No outdoor storage areas proposed for this site
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash bins to be in covered structures
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	SMART Irrigation system to be implemented
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Grading by civil to prevent flood potential per all local and State building codes
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Use of rock outlet pads within water quality basin to be implemented as needed
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☒	☐	Routine maintence across all site facilites to be performed
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☒	☐	No covered maintenance bays proposed for this site
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No wash areas proposed for this site
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☒	☒	No covered processing areas planned for this site

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Not proposed for this site
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	Not proposed for this site
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	Not proposed for this site
S14	Wash water control for food preparation areas	☐	☒	Not proposed for this site
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	Not proposed for this site

4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Site Design Practices Checklist
Site Design Practices If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets
Minimize impervious areas: Yes ☒ No ☐ Explanation: Given nature of commercial warhouse site and need for surrounding AC parking lot, boundary landscape areas have been maximixed as best possible.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Runoff is routed to earthen infiltration basin with open bottom to facilitate infiltration as best possible.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Flows continue to run in northern direction and proposed plan does not divert from existing condition.
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes ☒ No ☐ Explanation: Earthen infiltration basin is between all impervisou area and final poitn of discharge.
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: n/a
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: n/a
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: Various adajcent areas which are affected by general site grading to be landscaped witin the proposed design.

Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Heavy equipment directed to work along side and away from areas where direct infiltration will take place as best possible.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: n/a
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Landscaped areas to be protected using visual barriers.
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: n/a
Stream Setbacks. Includes a specified distance from an adjacent steam: : Yes ☐ No ☒ Explanation: n/a

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -
http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795

Recommended High-Desert Plants -
http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553

Mojave Water Agency:

Desert Ranch: http://www.mojavewater.org/files/desertranchgardenprototype.pdf

Summertree: http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf

Thornless Garden: http://www.mojavewater.org/files/thornlessgardenprototype.pdf

Mediterranean Garden: http://www.mojavewater.org/files/mediterraneangardenprototype.pdf

Lush and Efficient Garden: http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – http://hdawac.org/save-outdoors.html

4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evaportranspire, and/or bioretain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection from hydromodification.

If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.

It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)		
1 Project area DA 1 (ft^2): 1,284,765	2 Imperviousness after applying preventative site design practices (Imp%): 90.5	3 Runoff Coefficient (Rc): _0.74 $R_c = 0.858(Imp\%)^3-0.78(Imp\%)^2+0.774(Imp\%)+0.04$
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr-1hr}$ (in): 0.448 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.554 P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)		
6 Drawdown Rate Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 85,914 DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963) Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2		

Form 4.2-2 Summary of Hydromodification Assessment (DA 1)

Is the change in post- and pre- condition flows captured on-site? : Yes ☒ No ☒

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below (Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)

If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	1 Form 4.2-3 Item 12	2 Form 4.2-4 Item 13	3 Form 4.2-5 Item 10
Post-developed	4 Form 4.2-3 Item 13	5 Form 4.2-4 Item 14	6 Form 4.2-5 Item 14
Difference	7 Item 4 – Item 1	8 Item 2 – Item 5	9 Item 6 – Item 3
Difference (as % of pre-developed)	10 % Item 7 / Item 1	11 % Item 8 / Item 2	12 % Item 9 / Item 3

Form 4.2-3 Hydromodification Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 sum of areas of DMA should equal area of DA								
4a Curve Number (CN) use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 sum of areas of DMA should equal area of DA								
4b Curve Number (CN) use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP								

5 Pre-Developed area-weighted CN:	7 Pre-developed soil storage capacity, S (in): S = (1000 / Item 5) - 10	9 Initial abstraction, I_a (in): I_a = 0.2 * Item 7
6 Post-Developed area-weighted CN:	8 Post-developed soil storage capacity, S (in): S = (1000 / Item 6) - 10	10 Initial abstraction, I_a (in): I_a = 0.2 * Item 8

11 Precipitation for 10 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)

13 Post-developed Volume (ft^3):
V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)

14 Volume Reduction needed to meet hydromodification requirement, (ft^3):
Vhydro = (Item 13 * 0.95) – Item 12

Form 4.2-4 Hydromodification Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA (For projects using the Hydrology Manual complete the form below)

Variables	Pre-developed DA1 Use additional forms if there are more than 4 DMA				Post-developed DA1 Use additional forms if there are more than 4 DMA			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) Use Form 3-2 Item 5 for pre-developed condition								
2 Change in elevation (ft)								
3 Slope (ft/ft), S_o = Item 2 / Item 1								
4 Land cover								
5 Initial DMA Time of Concentration (min) Appendix C-1 of the TGD for WQMP								
6 Length of conveyance from DMA outlet to project site outlet (ft) May be zero if DMA outlet is at project site outlet								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5								
11 Travel time to outlet (min) T_t = Item 6 / (Item 10 * 60)								
12 Total time of concentration (min) T_c = Item 5 + Item 11								

13 Pre-developed time of concentration (min): Minimum of Item 12 pre-developed DMA

14 Post-developed time of concentration (min): Minimum of Item 12 post-developed DMA

15 Additional time of concentration needed to meet hydromodification requirement (min): $T_{C\text{-}Hydro}$ = (Item 13 * 0.95) – Item 14

Form 4.2-5 Hydromodification Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (Use additional forms if more than 3 DMA)			Post-developed DA to Project Outlet (Use additional forms if more than 3 DMA)		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.7 LOG Form 4.2-4 Item 5 /60)							
2 Drainage Area of each DMA (Acres) For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)							
3 Ratio of pervious area to total area For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)							
4 Pervious area infiltration rate (in/hr) Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP							
5 Maximum loss rate (in/hr) F_m = Item 3 * Item 4 Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)							
6 Peak Flow from DMA (cfs) Q_p =Item 2 * 0.9 * (Item 1 - Item 5)							
7 Time of concentration adjustment factor for other DMA to site discharge point Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)	DMA A	n/a			n/a		
	DMA B		n/a			n/a	
	DMA C			n/a			n/a

8 Pre-developed Q_p at T_c for DMA A: Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]	9 Pre-developed Q_p at T_c for DMA B: Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]	10 Pre-developed Q_p at T_c for DMA C: Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]

10 Peak runoff from pre-developed condition confluence analysis (cfs): Maximum of Item 8, 9, and 10 (including additional forms as needed)

11 Post-developed Q_p at T_c for DMA A: Same as Item 8 for post-developed values	12 Post-developed Q_p at T_c for DMA B: Same as Item 9 for post-developed values	13 Post-developed Q_p at T_c for DMA C: Same as Item 10 for post-developed values

14 Peak runoff from post-developed condition confluence analysis (cfs): Maximum of Item 11, 12, and 13 (including additional forms as needed)

15 Peak runoff reduction needed to meet Hydromodification Requirement (cfs): $Q_{p\text{-}hydro}$ = (Item 14 * 0.95) – Item 10

4.3 BMP Selection and Sizing

Complete the following forms for each project site DA to document that the proposed treatment (LID/Bioretention) BMPs conform to the project DCV developed to meet performance criteria specified in the Phase II Small MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design Measures (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

Please note that the selected BMPs may also be used as dual purpose for on-site, hydromodification mitigation and management.

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Form 4.3-2 to determine the feasibility of applicable Site Design BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable Site Design BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of site design, retention and/or infiltration BMPs is unable to mitigate the entire DCV, then the remainder of the volume-based performance criteria that cannot be achieved with site design, retention and/or infiltration BMPs must be managed through biotreatment BMPs. If biotreatment BMPs are used, then they must be sized to provide equivalent effectiveness based on Template Section 4.3.4.

4.3.1 Exceptions to Requirements for Bioretention Facilities

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;

2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and

3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)
Feasibility Criterion – Complete evaluation for each DA on the Project Site
[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒ Refer to Section 5.3.2.1 of the TGD for WQMP
If Yes, Provide basis: (attach)
[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒ (Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert): • The location is less than 50 feet away from slopes steeper than 15 percent • The location is less than ten feet from building foundations or an alternative setback. • A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.
If Yes, Provide basis: (attach)
[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒
If Yes, Provide basis: (attach)
[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒ See Section 3.5 of the TGD for WQMP and WAP
If Yes, Provide basis: (attach)
[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒ If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP. If no, then proceed to Item 8 below. [8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒ If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP. If no, then proceed to Item 9, below. [9] All answers to Item 1 through Item 6 are "No": Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP. Proceed to Form 4.3-2, Site Design BMPs.

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive

with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design BMPs (DA 1)			
1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☒ No ☐ If yes, complete Items 2-5; If no, proceed to Item 6	DA 1 DMA A BMP Type INFILTRATION BASIN	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Total impervious area draining to pervious area (ft^2)	1,149,815		
3 Ratio of pervious area receiving runoff to impervious area	0.105		
4 Retention volume achieved from impervious area dispersion (ft^3) V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff	5,032		
5 Sum of retention volume achieved from impervious area dispersion (ft^3): 5,032 $V_{retention}$ =Sum of Item 4 for all BMPs			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☐ If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14	DA 1 DMA A BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
7 Ponding surface area (ft^2)	18,318		
8 Ponding depth (ft) (min. 0.5 ft.)	4.5		
9 Surface area of amended soil/gravel (ft^2)	7,950		
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)	2		
11 Average porosity of amended soil/gravel	0.30		
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)	87,201		
13 Runoff volume retention from on-lot infiltration (ft^3): 87,201 $V_{retention}$ =Sum of Item 12 for all BMPs			

Form 4.3-2 cont. Site Design BMPs (DA 1)

14 Implementation of Street Trees: Yes ☐ No ☐ If yes, complete Items 14-18. If no, proceed to Item 19	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) $V_{retention}$ = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches			
18 Runoff volume retention from street tree BMPs (ft^3): 0 $V_{retention}$ = Sum of Item 17 for all BMPs			
19 Total Retention Volume from Site Design BMPs: 92,233 Sum of Items 5, 13 and 18			

4.3.3 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix C of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.

2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a “flow-through planter”).

3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design BMP (ft^3): 0 V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19

BMP Type Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs	DA 1 DMA A BMP Type INFILTRATION BASIN	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
2 Infiltration rate of underlying soils (in/hr) See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods	3.67 * *AVG OF % TESTS		
3 Infiltration safety factor See TGD Section 5.4.2 and Appendix D	2.0		
4 Design percolation rate (in/hr) P_{design} = Item 2 / Item 3	1.83 * * AVG OF 5 TESTS		
5 Ponded water drawdown time (hr) Copy Item 6 in Form 4.2-1	48		
6 Maximum ponding depth (ft) BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details	4.5		
7 Ponding Depth (ft) d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6	4.5		
8 Infiltrating surface area, SA_{BMP} (ft^2) the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP	18,318		
9 Amended soil depth, d_{media} (ft) Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details	2		
10 Amended soil porosity	0.3		
11 Gravel depth, d_{media} (ft) Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details	1		
12 Gravel porosity	0.4		
13 Duration of storm as basin is filling (hrs) Typical ~ 3hrs	3		
14 Above Ground Retention Volume (ft^3) $V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]	103,039		
15 Underground Retention Volume (ft^3) Volume determined using manufacturer's specifications and calculations	n/a		

16 Total Retention Volume from LID Infiltration BMPs: 103,039 (Sum of Items 14 and 15 for all infiltration BMP included in plan)

17 Fraction of DCV achieved with infiltration BMP: 100% Retention% = Item 16 / Form 4.2-1 Item 7

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-4 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV. Biotreatment computations are included as follows:

- Use Form 4.3-5 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-6 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-7 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft^3): 0 Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16	List pollutants of concern Copy from Form 2.3-1.	
2 Biotreatment BMP Selected (Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)	Volume-based biotreatment Use Forms 4.3-5 and 4.3-6 to compute treated volume	Flow-based biotreatment Use Form 4.3-7 to compute treated flow
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): Form 4.3-5 Item 15 + Form 4.3-6 Item 13	4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): Item 1 – Item 3	5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % Item 4 / Item 1
6 Flow-based biotreatment BMP capacity provided (cfs): Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.		

Form 4.3-5 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type (Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
1 Pollutants addressed with BMP List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP			
2 Amended soil infiltration rate Typical ~ 5.0			
3 Amended soil infiltration safety factor Typical ~ 2.0			
4 Amended soil design percolation rate (in/hr) P_{design} = Item 2 / Item 3			
5 Ponded water drawdown time (hr) Copy Item 6 from Form 4.2-1			
6 Maximum ponding depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
7 Ponding Depth (ft) d_{BMP} = Minimum of (1/12 * Item 4 * Item 5) or Item 6			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
10 Amended soil porosity, n			
11 Gravel depth (ft) see Table 5-6 of the TGD for WQMP for reference to BMP design details			
12 Gravel porosity, n			
13 Duration of storm as basin is filling (hrs) Typical ~ 3hrs			
14 Biotreated Volume (ft^3) $V_{biotreated}$ = Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: Sum of Item 14 for all volume-based BMPs included in this form			

Form 4.3-6 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (E.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.	DA DMA BMP Type		DA DMA BMP Type (Use additional forms for more BMPs)	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = Item 2 * Item 3				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))				
8 Storage volume (ft^3) For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details V =Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]				
9 Drawdown Time (hrs) Copy Item 6 from Form 2.1				
10 Outflow rate (cfs) Q_{BMP} = (Item $8_{forebay}$ + Item 8_{basin}) / (Item 9 * 3600)				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = (Item $8_{forebay}$ + Item 8_{basin}) +(Item 10 * Item 11 * 3600)				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : (Sum of Item 12 for all BMP included in plan)				

Form 4.3-7 Flow Based Biotreatment (DA 1)			
Biotreatment BMP Type Vegetated swale, vegetated filter strip, or other comparable proprietary BMP	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type (Use additional forms for more BMPs)
1 Pollutants addressed with BMP List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5			
2 Flow depth for water quality treatment (ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
3 Bed slope (ft/ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
4 Manning's roughness coefficient			
5 Bottom width (ft) b_w = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)			
6 Side Slope (ft/ft) BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
7 Cross sectional area (ft^2) A = (Item 5 * Item 2) + (Item 6 * Item 2^2)			
8 Water quality flow velocity (ft/sec) V = Form 4.3-5 Item 6 / Item 7			
9 Hydraulic residence time (min) Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details			
10 Length of flow based BMP (ft) L = Item 8 * Item 9 * 60			
11 Water surface area at water quality flow depth (ft^2) SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10			

4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)
1 Total LID DCV for the Project DA-1 (ft^3): 85,914 Copy Item 7 in Form 4.2-1
2 On-site retention with site design BMP (ft^3): 92,233 Copy Item18 in Form 4.3-2
3 On-site retention with LID infiltration BMP (ft^3): 103,039 Copy Item 16 in Form 4.3-3
4 On-site biotreatment with volume based biotreatment BMP (ft^3): n/a Copy Item 3 in Form 4.3-4
5 Flow capacity provided by flow based biotreatment BMP (cfs): n/a Copy Item 6 in Form 4.3-4
6 LID BMP performance criteria are achieved if answer to any of the following is "Yes": • Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐ If yes, sum of Items 2, 3, and 4 is greater than Item 1 • Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☐ If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized ▪ On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☐ If yes, Form 4.3-1 Items 7 and 8 were both checked yes
7 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance: • Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐ Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)% • Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated: 1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐ 2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐ 3) Equal or greater protection against shock loadings and spills; ☐ 4) Equal or greater accessibility and ease of inspection and maintenance. ☐

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs (DA 1)	
1 Volume reduction needed for hydromodification performance criteria (ft^3): (Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1	2 On-site retention with site design and infiltration, BMP (ft^3): Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction
3 Remaining volume for hydromodification volume capture (ft^3): Item 1 – Item 2	4 Volume capture provided by incorporating additional on-site BMPs (ft^3):
5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐ If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below: • Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☐ • Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐	
6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐ If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below: • Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☐	

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance.

Alternative Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

1) Equal or greater amount of runoff infiltrated or evapotranspired;

2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;

3) Equal or greater protection against shock loadings and spills;

4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Note that at time of Project construction completion, the Maintenance Agreement must be completed, signed, notarized and submitted to the County Stormwater Department

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)			
BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
INFIL BASIN - DMA A	OWNER	PLS SEE O&M PROVIDED	

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C,C&R's & Lease Agreements

APPENDIX A

BASIN SIZING CALCS

NOAA Atlas 14, Volume 6, Version 2
Location name: Hesperia, California, USA*
Latitude: 34.4302°, Longitude: -117.4077°
Elevation: 3568.32 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.084 (0.070-0.103)	0.121 (0.100-0.148)	0.169 (0.139-0.207)	0.208 (0.170-0.257)	0.262 (0.207-0.335)	0.304 (0.235-0.397)	0.347 (0.262-0.464)	0.392 (0.288-0.539)	0.453 (0.319-0.650)	0.502 (0.341-0.745)
10-min	0.121 (0.100-0.148)	0.173 (0.143-0.212)	0.242 (0.199-0.296)	0.298 (0.244-0.369)	0.376 (0.297-0.480)	0.436 (0.337-0.569)	0.497 (0.376-0.665)	0.562 (0.413-0.772)	0.650 (0.458-0.932)	0.719 (0.489-1.07)
15-min	0.146 (0.121-0.178)	0.209 (0.173-0.256)	0.292 (0.241-0.358)	0.361 (0.295-0.446)	0.454 (0.359-0.580)	0.527 (0.408-0.688)	0.602 (0.454-0.804)	0.679 (0.499-0.934)	0.786 (0.554-1.13)	0.870 (0.592-1.29)
30-min	0.222 (0.184-0.271)	0.318 (0.263-0.388)	0.444 (0.366-0.544)	0.548 (0.448-0.677)	0.690 (0.545-0.881)	0.800 (0.620-1.04)	0.914 (0.690-1.22)	1.03 (0.758-1.42)	1.19 (0.841-1.71)	1.32 (0.899-1.96)
60-min	0.313 (0.259-0.382)	0.448 (0.371-0.548)	0.626 (0.516-0.768)	0.773 (0.632-0.955)	0.973 (0.769-1.24)	1.13 (0.874-1.47)	1.29 (0.974-1.72)	1.46 (1.07-2.00)	1.68 (1.19-2.41)	1.86 (1.27-2.77)
2-hr	0.456 (0.377-0.556)	0.618 (0.512-0.757)	0.841 (0.693-1.03)	1.03 (0.840-1.27)	1.29 (1.02-1.65)	1.50 (1.16-1.95)	1.71 (1.30-2.29)	1.95 (1.43-2.68)	2.27 (1.60-3.26)	2.53 (1.72-3.76)
3-hr	0.576 (0.476-0.703)	0.770 (0.636-0.941)	1.04 (0.854-1.27)	1.26 (1.03-1.56)	1.58 (1.25-2.02)	1.84 (1.42-2.40)	2.11 (1.60-2.82)	2.40 (1.77-3.31)	2.82 (1.99-4.04)	3.16 (2.15-4.69)
6-hr	0.814 (0.674-0.994)	1.08 (0.892-1.32)	1.45 (1.19-1.77)	1.76 (1.44-2.18)	2.22 (1.75-2.83)	2.59 (2.00-3.38)	2.99 (2.26-3.99)	3.42 (2.51-4.70)	4.04 (2.85-5.80)	4.56 (3.11-6.77)
12-hr	1.05 (0.872-1.29)	1.44 (1.19-1.76)	1.97 (1.63-2.42)	2.43 (1.99-3.00)	3.09 (2.44-3.95)	3.63 (2.81-4.74)	4.21 (3.18-5.63)	4.84 (3.56-6.66)	5.76 (4.06-8.25)	6.52 (4.43-9.67)
24-hr	1.43 (1.27-1.65)	2.03 (1.79-2.34)	2.85 (2.52-3.29)	3.55 (3.11-4.14)	4.57 (3.87-5.50)	5.40 (4.48-6.64)	6.28 (5.09-7.92)	7.25 (5.71-9.39)	8.64 (6.53-11.7)	9.79 (7.15-13.7)
2-day	1.63 (1.45-1.88)	2.30 (2.04-2.65)	3.24 (2.86-3.74)	4.05 (3.55-4.72)	5.23 (4.43-6.30)	6.21 (5.15-7.64)	7.27 (5.89-9.15)	8.42 (6.64-10.9)	10.1 (7.64-13.6)	11.5 (8.42-16.1)
3-day	1.75 (1.55-2.02)	2.46 (2.18-2.84)	3.46 (3.05-4.00)	4.33 (3.79-5.04)	5.60 (4.75-6.75)	6.66 (5.53-8.19)	7.81 (6.33-9.84)	9.08 (7.15-11.8)	10.9 (8.27-14.8)	12.5 (9.13-17.5)
4-day	1.89 (1.68-2.18)	2.65 (2.35-3.06)	3.72 (3.29-4.30)	4.65 (4.08-5.42)	6.03 (5.11-7.26)	7.17 (5.95-8.81)	8.40 (6.81-10.6)	9.77 (7.70-12.7)	11.8 (8.90-15.9)	13.5 (9.84-18.8)
7-day	2.12 (1.88-2.44)	2.94 (2.61-3.39)	4.09 (3.61-4.73)	5.10 (4.46-5.94)	6.56 (5.56-7.90)	7.78 (6.46-9.57)	9.10 (7.38-11.5)	10.6 (8.32-13.7)	12.7 (9.60-17.1)	14.5 (10.6-20.2)
10-day	2.27 (2.01-2.61)	3.14 (2.78-3.62)	4.34 (3.83-5.02)	5.39 (4.72-6.28)	6.91 (5.86-8.32)	8.18 (6.79-10.1)	9.54 (7.73-12.0)	11.1 (8.71-14.3)	13.2 (10.0-17.9)	15.1 (11.0-21.1)
20-day	2.74 (2.43-3.16)	3.76 (3.33-4.33)	5.17 (4.56-5.97)	6.38 (5.59-7.44)	8.15 (6.90-9.81)	9.60 (7.97-11.8)	11.2 (9.05-14.1)	12.9 (10.2-16.7)	15.4 (11.7-20.8)	17.5 (12.8-24.5)
30-day	3.24 (2.87-3.73)	4.41 (3.91-5.09)	6.02 (5.32-6.96)	7.41 (6.49-8.64)	9.42 (7.98-11.3)	11.1 (9.19-13.6)	12.9 (10.4-16.2)	14.8 (11.7-19.2)	17.7 (13.4-23.9)	20.2 (14.7-28.2)
45-day	3.86 (3.42-4.45)	5.18 (4.59-5.97)	7.00 (6.18-8.08)	8.55 (7.49-9.97)	10.8 (9.15-13.0)	12.7 (10.5-15.6)	14.7 (11.9-18.5)	16.9 (13.3-21.9)	20.1 (15.2-27.2)	22.9 (16.7-32.0)
60-day	4.40 (3.90-5.07)	5.81 (5.15-6.70)	7.75 (6.84-8.95)	9.40 (8.24-11.0)	11.8 (10.00-14.2)	13.8 (11.4-16.9)	15.9 (12.9-20.0)	18.3 (14.4-23.7)	21.8 (16.5-29.4)	24.8 (18.1-34.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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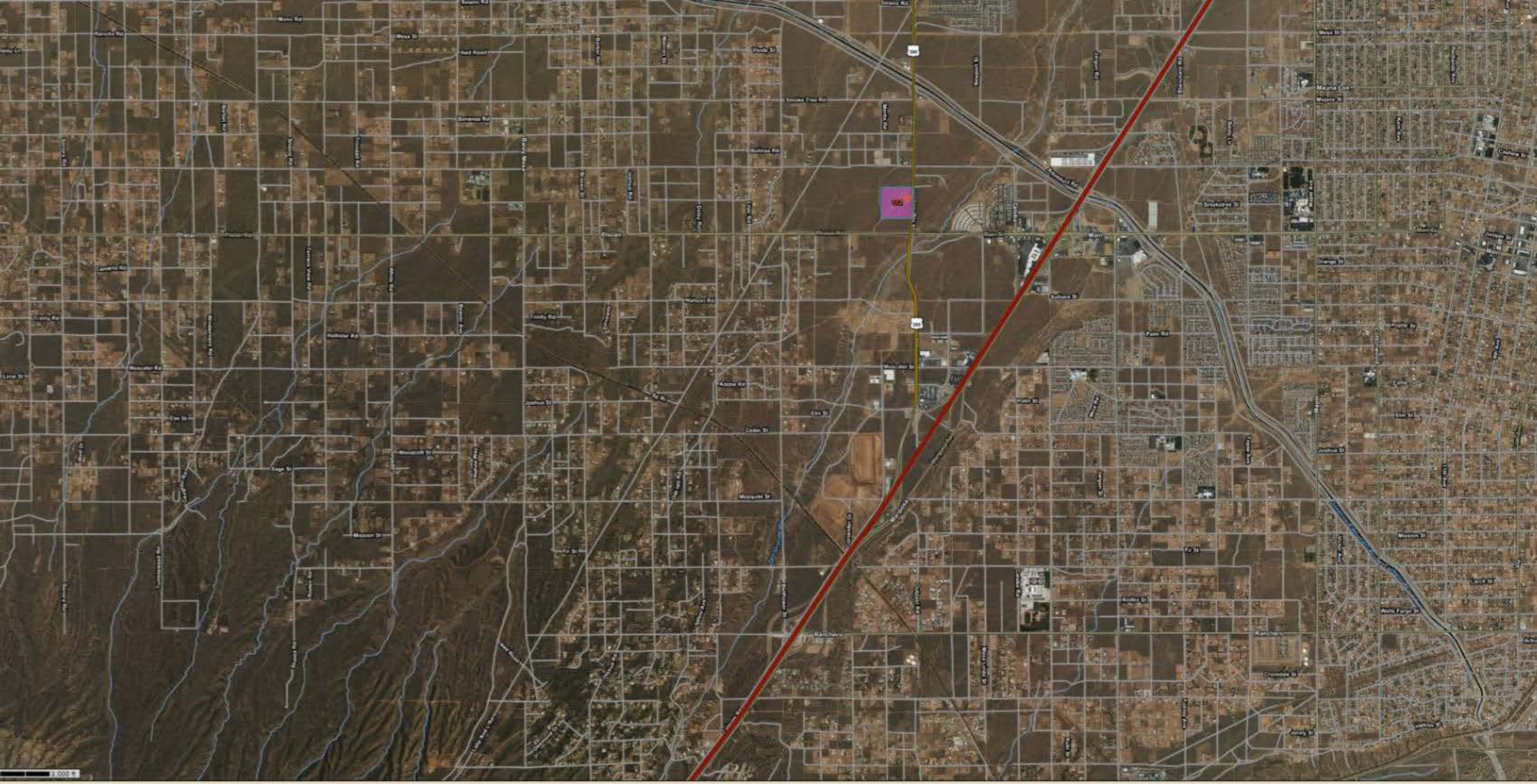
PF graphical


Mesa Rd
Mesa St
Red Road
Verde St
Sunset Tree Rd
Bonanza Rd
Hollister Rd
Phelan Rd
Phelan
Pinion Rd
Cedar St
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Mission St
Fir St
Rodeo St
Ranchero
Chamisal St
Pepper St
Maple St
Oak St
Joshua St
Sage St
Woodcliff St
Elm St
Lime St
Cherry St
Pine St
Palm St
Palm Rd
Sultana St
Smoketree St
Mojave St
Orange St
Jacaranda St
Cypress St
Cactus St
Aviation Rd
Apache Rd
Muscatel St
Main
Mojave Dr
Mojave Ln
Mojave Vista Dr
Mojave Vista Ln
Mojave Vista Cir
Mojave Vista Ct
Mojave Vista Pl
Mojave Vista Way
Mojave Vista Trl
Mojave Vista Sq

KISS Logistics Center - WQMP

DETENTION BASIN SIZING

Area			Depth
Top (sf)	Bottom (sf)	Average (sf)	ft
28,685	7,950	18,318	4.5

Basin has 7' bottom width and sideslopes are 2:1. The "Ponded' Area is taken as midway point, or average, of surface area at top compared to surface area at bottom. Areas were calcuated using CAD software.

APPENDIX B

INFILTRATION REPORT

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Suite B
Escondido, California 92029
Telephone: (619) 867-0487 Fax: (714) 409-3287

C. H. Realty Partners, LCC
18032 Lemon Drive, Suite 367
Yorba Linda, California 92886

March 23, 2022
P/W 2202-09
Report No. 2202-09-B-3

Attention: **Mr. Michael Masterson**

Subject: **Infiltration Feasibility Level Study, Proposed Industrial Development, APNs 3064-401-03, -04, -05, West Side of Highway 395, Hesperia, California**

References: Appendix A

Gentlemen:

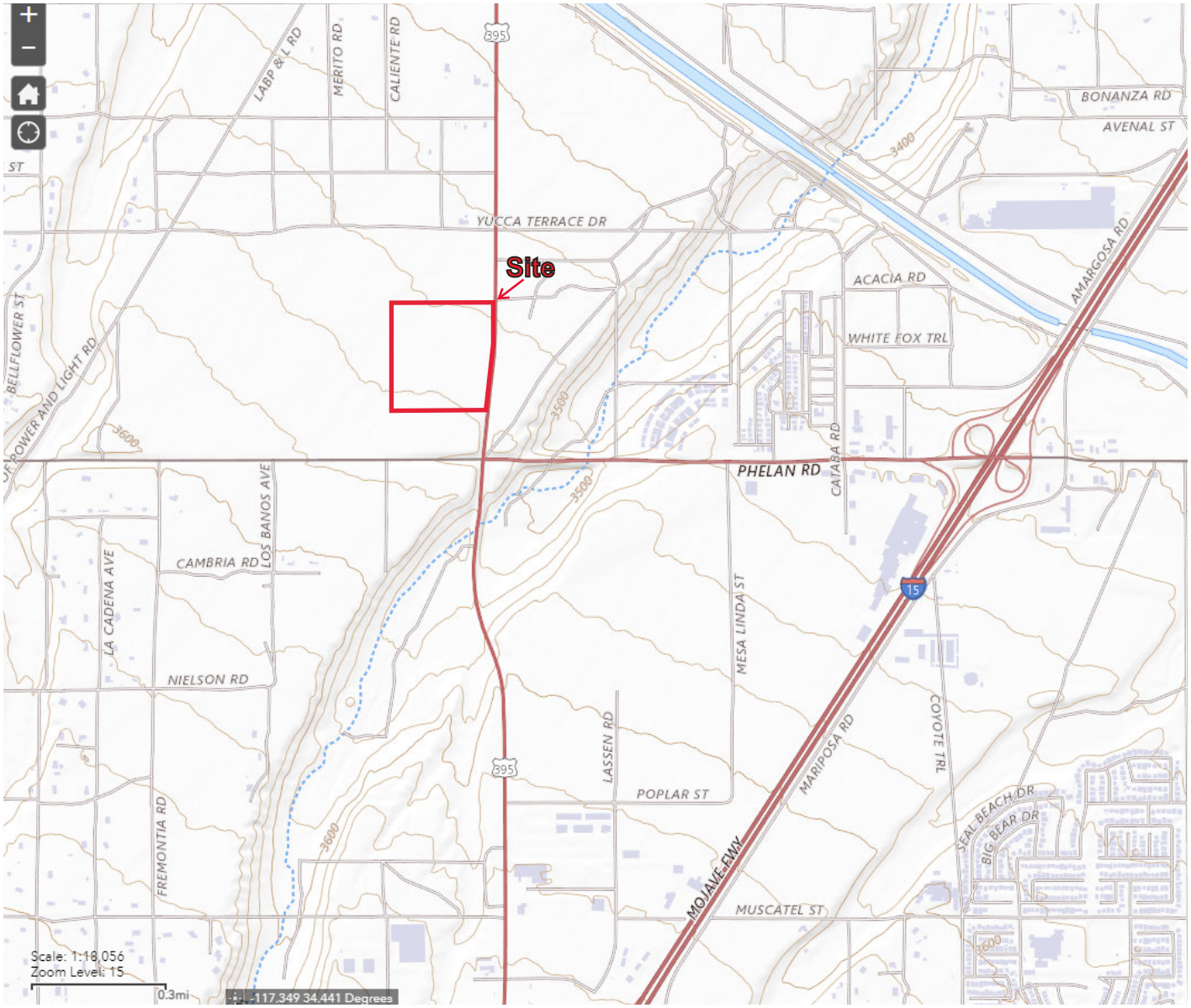
In accordance with your request, Advanced Geotechnical Solutions, Inc. (AGS) has prepared this infiltration feasibility study for the proposed 29-acre industrial development located on three contiguous parcels west of Highway 395 in Hesperia, California. This report is intended to meet the preliminary infiltration testing requirements of the City of Hesperia. AGS has evaluated the feasibility for storm water infiltration in accordance with the Mojave River Watershed Technical Guidance Document for Water Quality Management Plans (2016 Edition). Supporting data are presented in Appendix A.

1.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The ~29 acre site is located west of Highway 395 and north of Phelan Road / Main Street in Hesperia, California (Figure 1, Site Location Map). The site encompasses three contiguous parcels- APNs 3064-401-03, 3064-401-04, and 3064-401-05 with a total area of 29.37 acres. The site is currently vacant. Based on our review of historical aerial imagery, the site appears to have been mostly undeveloped except for some dirt roads and the unpaved Caliente Road crossing from the northeastern corner to the southwestern corner.

The site slopes and drains gently to the northeast. Based on the Site Development Plan prepared by Alliance Land Planning dated February 23, 2022, approximate site elevations range between 3,562 feet above mean sea level (msl) on the southwestern corner to 3,537 ft. msl on the northeastern corner of the site.

According to the site development plan, the project consists of a 655,520 square foot warehouse with loading docks to the east and west, offices and mezzanine areas. Associated improvements including a retaining wall along the southern boundary, driveways, parking areas, landscape areas, a storm water detention basin on the northern boundary, a public road on the western boundary and utility installations. Cuts up to 7 feet in depth and fills to about 10 feet are anticipated.



N

SCALE: 1 in. = 2000 ft.

SITE LOCATION MAP
29-ACRE PROPERTY
HESPERIA, CALIFORNIA

FIGURE 1

SOURCE MAP(S): USGS The National Map

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Ste B, Escondido, California 92029
Telephone: (619) 867-0487
P/W 2201-09

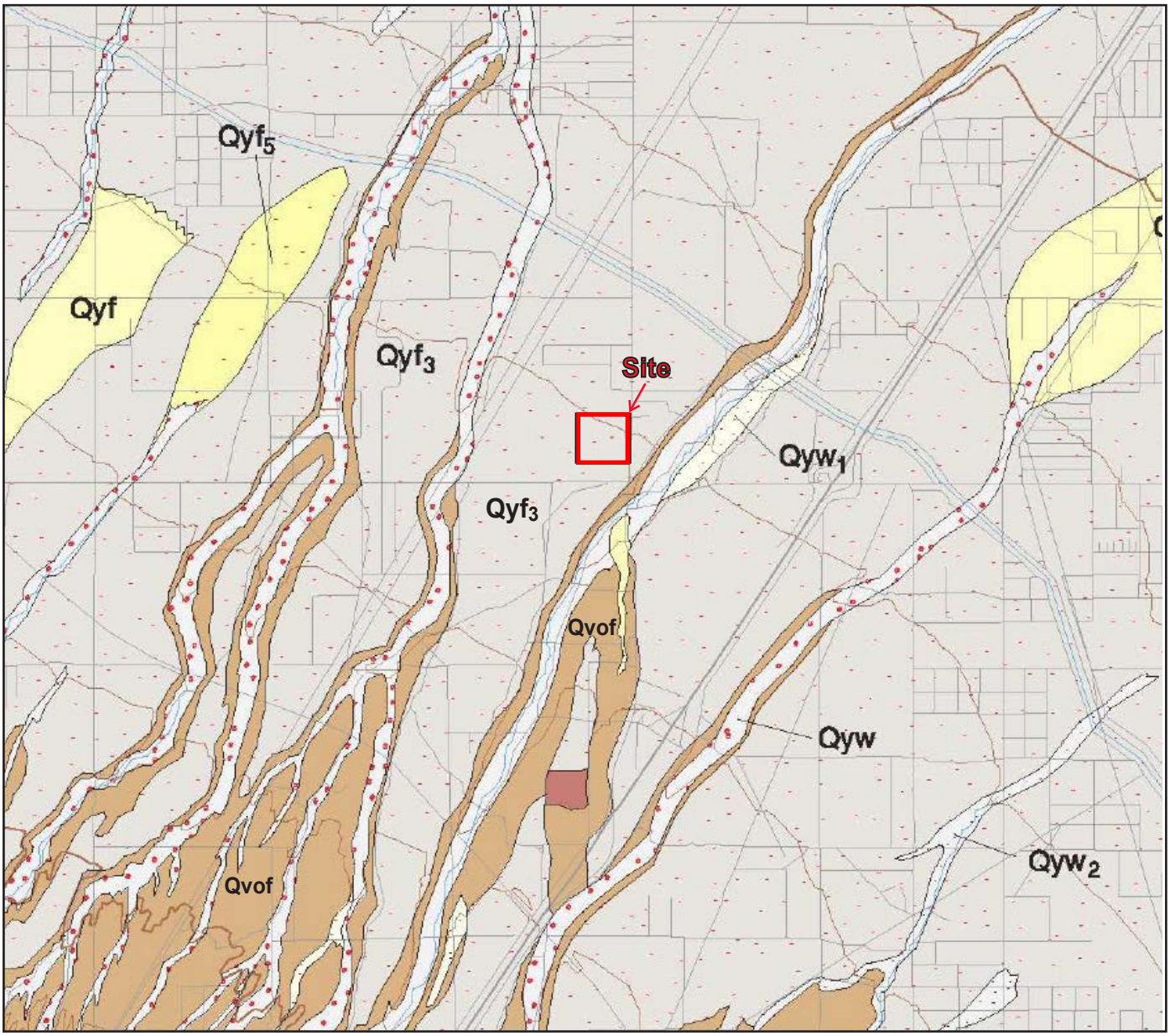
2.0 FIELD INVESTIGATION

On February 21, 2022, AGS performed subsurface exploration at the site which consisted of advancing five hollow-stem auger borings (B-1 through B-5) and four percolation test borings (P-1 through P-4) with a truck-mounted drill rig to approximate depths of 5 and 51.5 feet below existing ground surface (bgs). On March 3, 2022, AGS drilled an additional percolation test borings (P-5) with a hand auger to an approximate depth 6.5 feet bgs and excavated seven trenches (T-1 through T-7) to approximate depths ranging between 4 and 10 feet bgs with a JD 410J backhoe (22,000 lb). All borings and trenches were logged and sampled by our geologist or engineer. Logs of the borings and trenches are presented in Appendix A. The approximate trench locations are shown on Plate 1, Exploration Location Map. Percolation testing was performed on March 4, 2022, in an effort to evaluate the feasibility of storm water infiltration on the site and provide preliminary design infiltration rates in general conformance with Appendix C of the Mojave River Watershed Technical Guidance Document for Water Quality Management Plans (2016).

3.0 GEOLOGY

The site is not within a mapped liquefaction potential zone by the County of Riverside nor within a mapped fault zone. Regional geologic maps show that the site is underlain by alluvial fan deposits (Figure 2, Regional Geologic Map). Based on our site reconnaissance, subsurface excavations, and review of the referenced geologic maps, the site is mantled by topsoil and alluvium underlain by old alluvial-fan deposits. A brief description of the earth materials encountered onsite is presented below, and more detailed descriptions of these materials are provided in the subsurface logs included in Appendix A.

The majority of the site is mantled by topsoil consisting as light yellow brown to light brown, dry to slightly moist, fine- to coarse-grained, silty sand with some roots that is in a loose condition. The topsoil was observed to be 0.3 to 1 foot thick. The topsoil is underlain by alluvium consisting of light brown to yellow brown, dark brown and black, dry to slightly moist, loose to medium dense, porous, fine- to coarse-grained, silty sand with trace gravel and some roots. The alluvium extended to variable depths ranging between 1.7 and 3.3 feet. Older alluvium underlie the younger alluvium onsite. The differentiation is based upon the density changes observed. This unit consists of light brown, orange brown and red brown, slightly moist to moist, medium dense to very dense, fine- to coarse-grained, silty sand and sand with silt; which is slightly indurated and cemented, and contains gravel and cobbles. The older alluvium extended to the maximum depth of exploration of 51.5 feet. A discontinuous fine to coarse-grained sand layer was encountered at depths of around 5.5 to 7 feet below the ground along the northerly side of the site where the proposed basin is planned. This layer was encountered within P-5, T-1, and T-3 but was not encountered in T-2.



N

SCALE: 1 in. = 4000 ft.

REGIONAL GEOLOGIC MAP
29-ACRE PROPERTY
HESPERIA, CALIFORNIA

Qyf_3	Young Alluvial Fan Deposits, Unit 3 (Middle Holocene)
Qvof	Very Old Alluvial Fan Deposits (Middle to Early Pleistocene)

FIGURE 2

SOURCE MAP(S): Morton and Miller, 2006, Digital Geologic Map of the San Bernardino and Santa Ana 30' by 60' Quadrangles

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P/W 2202-09

4.0 TEST PROCEDURE

Percolation testing per the Orange County standards (TGD Appendix VII, 2011) was performed within the test borings as referenced in Appendix C of the Mojave River Watershed Technical Guidance Document for Water Quality Management Plans (2016).

The test holes were cleaned of loose debris then successively filled with more than 5 gallons of clean, potable water and allowed to pre-soak. The same day the test holes were cleaned of sediment and the bottom was lined with approximately 2 inches of washed gravel prior to infiltration testing.

A series of falling head percolation tests were performed. The test holes were filled with clean, potable water to approximately 1 to 2 feet above the infiltration surface and allowed to infiltrate. The water level was allowed to drop for a 30-minute period and then measured to calculate the drop rate in inches per hour. Reading were taken at 1-minute intervals in percolation test hole P-5 due to the high rates observed. The test hole was then refilled with water as necessary and the test procedure was repeated over the course of several hours until a stabilized percolation rate was recorded. The stabilized percolation rate was then converted to an infiltration rate based on the "Porchet Method" utilizing the following equation:

$$I_t = \frac{\Delta H\, \pi r^2\, 60}{\Delta t(\pi r^2 + 2\pi r H_{avg})} = \frac{\Delta H\, 60\, r}{\Delta t(r + 2H_{avg})}$$

Where:

I_t = tested infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
r = effective radius of test hole
H_{avg} = average head over the time interval, inches

Logs of the field testing and graphical representations of the test data presented as infiltration versus time interval are included in Appendix A.

5.0 TEST RESULTS AND PRELIMINARY DESIGN VALUES

The results of our testing are summarized in Table 1 below.

TABLE 1
SUMMARY OF INFILTRATION TEST RESULTS

Test Hole No.	Depth of Test Hole	Approximate Test Elevation	Description (USCS)	Tested Infiltration Rate (in./hr.)
P-1	5.9 feet	3534 ft msl	Silty Sand (SM)	0.55
P-2	4.9 feet	3535 ft msl	Silty Sand (SM)	0.52
P-3	4.0 feet	3537 ft msl	Silty Sand (SM)	1.02
P-4	3.9 feet	3541 ft msl	Silty Sand (SM)	1.27
P-5	6.4 feet	3539 ft msl	Sand with Silt (SP-SM)	15

Infiltration BMPs have the potential to fail over time when not adequately designed or maintained. The infiltration rate will decline between maintenance cycles as the BMP surface becomes occluded and particulates accumulate in the infiltrative layer. The methodology for estimating an appropriate infiltration factor of safety is provided in Appendix C of the TGD.

The measured infiltration rate calculated for the purpose of infiltration infeasibility screening shall be based on a factor of safety of 2.0 applied to the rates obtained from the infiltration test results. No adjustments from this value are permitted. Soils would be considered potentially feasible for infiltration if the measured infiltration rate obtained from field testing is greater than 0.3 inches per hour. Measured rates shall account for uncertainty and bias in measurement methods by applying a factor of safety of 2.0 to testing results. Table 2 below summarizes the preliminary design infiltration rates for the subject test holes utilizing a factor of safety of 2.0.

The field measured infiltration rate is divided by the infiltration safety factor to obtain the design infiltration rate. The design safety factor varies between 2 and 9. A safety factor less than 2.0 must use 2.0, while a safety factor greater than 9 can be used at the discretion of the design engineer. The factor of safety to be used when determining the design infiltration rates should be determined once detailed information on the proposed BMPs are available.

TABLE 2
PRELIMINARY DESIGN INFILTRATION RATES

Test Hole No.	Tested Infiltration Rate (in. /hr.)	Factor of Safety	Measured Infiltration Rate (in. /hr.)
P-1	0.55	2.0	0.28
P-2	0.52	2.0	0.26
P-3	1.02	2.0	0.51
P-4	1.27	2.0	0.64
P-5	15	2.0	7.5

6.0 DESIGN CONSIDERATIONS

6.1. Groundwater

Groundwater was not encountered during our subsurface exploration. Nearby groundwater wells indicate groundwater depths are several hundred feet below the surface. Localized perched groundwater may develop at a later date, most likely at or near fill/bedrock contacts, due to fluctuations in precipitation, irrigation practices, or factors not evident at the time of our field explorations..

6.2. Soil Characteristics and Anticipated Flow Paths

Based on our subsurface exploration and infiltration testing performed at the site, the underlying soils will allow for vertical infiltration with preliminary measured infiltration rates on the order 0.26 to 15 inches per hour, with the higher rates obtained within the underlying sand lens. This lens was capped by less permeable materials near the surface. Some of the underlying soils below this sand lens are less permeable.

Within the sand lens, storm water is anticipated to have very high vertical flow down to less permeable layers, at which point variable lateral flow is anticipated along the contact of dissimilar permeability.

6.3. Geotechnical Hazards

The introduction of water into hydro-collapsible soils may cause differential settlement and potential distress to improvements. Infiltration may saturate the near surface soils, which can potentially cause hydro-collapse prone soils to settle. The soils encountered onsite may be potentially hydro-collapsible. Setbacks from buildings and offsite improvements (minimum 25 feet) should mitigate the potential for settlement to occur below the proposed structures. It is possible that additional settlement of non-structural improvements may occur near infiltration devices. The owner should be aware of the potential need for additional long term maintenance for improvements constructed adjacent to the infiltration BMPs. Additional mitigation may include deeper removals below the improvements or construction of cut-off walls to mitigate the potential for lateral movement of water below the proposed improvements.

The introduction of water into expansive soils can cause heaving and potential distress to improvements, including flatwork, foundations, walls, etc., founded on the expansive soils or bedrock. The upper onsite soils are not considered expansive; therefore ,the infiltration of water is not expected to cause heaving.

The site is not located near nearby slopes. As such, the infiltration of water is not expected to cause slope instability.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Infiltration rates are generally greater than 0.3 inches per hour and infiltration type BMPs are considered feasible subject to the constraints described herein. If infiltration type BMPs are proposed, the infiltration layer can be placed within the sandier layer to yield higher infiltration rates. Additional exploration may be needed to further evaluate the limits and depths of the sandier soil layers.

This report is based on the project as described and the information obtained from the percolation borings at the locations indicated on the plan. The findings are based on the review of the field data combined with an interpolation and extrapolation of conditions between and beyond the exploratory excavations. The results reflect an interpretation of the direct evidence obtained. Services performed by AGS have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The data, opinions, and recommendations of this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of AGS.

The infiltration rates presented in this report are based on limited testing performed as part of a preliminary screening for feasibility purposes. Dependent upon the final location, depth, and type of proposed BMP, additional testing may be warranted.

Advanced Geotechnical Solutions, Inc. appreciates the opportunity to provide you with geotechnical consulting services and professional opinions. If you have any questions, please contact the undersigned at (619) 867-0487.

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

JOHN J. DONOVAN
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Distribution: (1) Addressee

Attachments: References
Figure 1 - Site Location Map
Figure 2- Regional Geologic Map
Plate 1 - Exploration Location Plan
Appendix A – Field Date- Percolation Test Results and Boring and Test Pit Logs

REFERENCES

Advanced Geotechnical Solutions, Inc., 2022, "EIR Level Geotechnical Study, Proposed Industrial Development, APNs 3064-401-03, -04, -05, West Side of Highway 395, Hesperia, California," Report No. 2202-09-B-2, March 22, 2022.

California Building Standards Commission, 2019, California Building Code, Title 24, Part 2, Volumes 1 and 2.

County of San Bernardino, 2016, *Mojave River Watershed Technical Guidance Document for Water Quality Management Plans*, April 4, 2016.

Morton, D. M., and Miller, F. K., 2006, *Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles, California*, with digital preparation by Cossette, Pamela M., and Bovard, Kelly R.: United States Geological Survey (USGS) Open-File Report 2006-1217.

Orange County Public Works. (2013). *Exhibit 7.III, Technical Guidance Document (TGD) for the Preparation of Conceptual/ Preliminary and/or Project Water Quality Management Plans (WQMPs)*, December 20, 2013.

State of California Water Boards, May 16, 2019, http://geotracker.waterboards.ca.gov/

APPENDIX A

FIELD DATA- PERCOLATION TEST RESULTS AND BORING AND TEST PIT LOGS

PERCOLATION TEST DATA SHEET

Project: Hesperia 29-Acre Business | Project No.: 2202-09 | Date: 3/4/2022

Test Hole No.: P-1 | Tested By: SD | Water Temp.:

Depth of Test Hole: 71 inches | USCS: SM | Air Temp.: 48

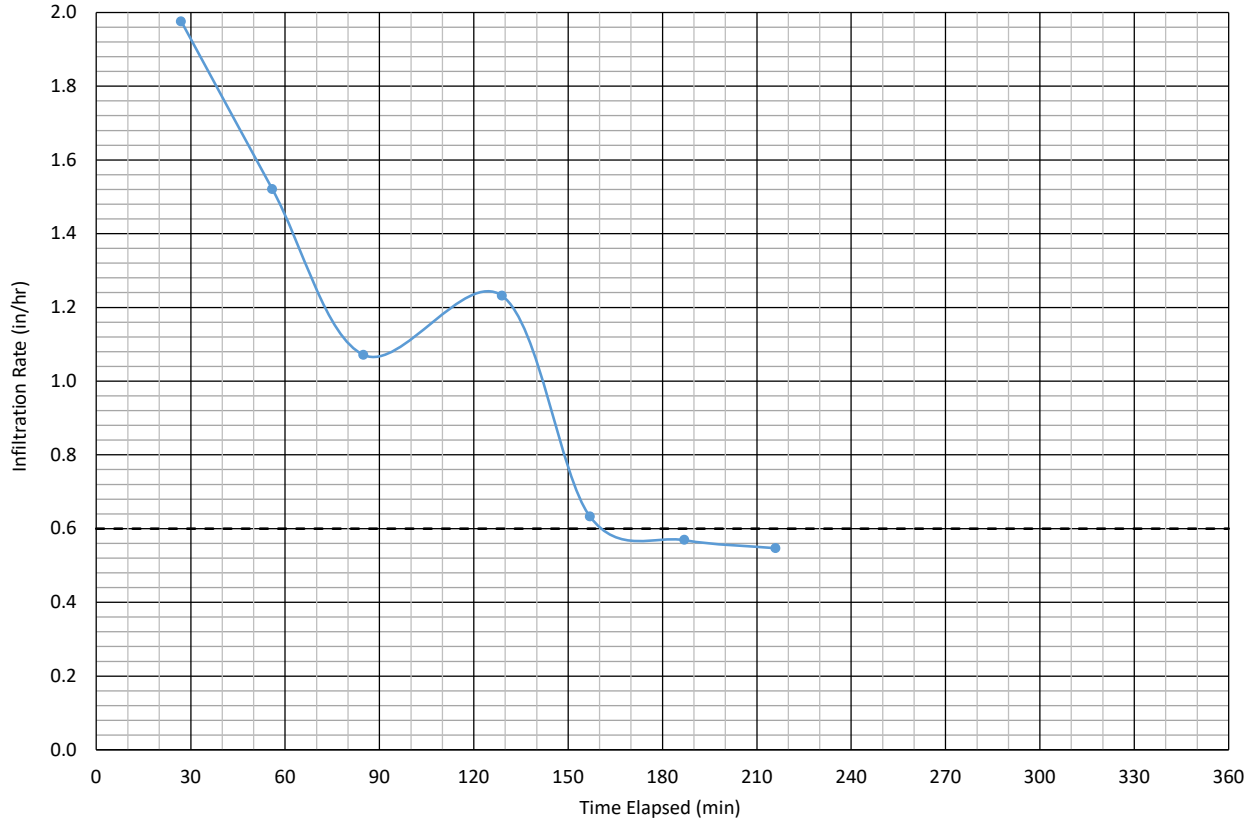
Test Hole Dimensions (Inches)

Length: 71 | Diameter: 8

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	Piezometric Surface (inches)			Average Water Column	Perc Rate (in./hr.)	Infiltration Rate* (in./hr.)
				Start Depth	End Depth	Depth Change			
1	12:42	13:09	27	25 8/16	15 8/16	10	20.50	22.22	1.98
2	13:11	13:40	29	27	18	9	22.50	18.62	1.52
3	13:41	14:10	29	28	21 2/16	6 14/16	24.56	14.22	1.07
4	14:11	14:55	44	26 8/16	16	10 8/16	21.25	14.32	1.23
5	14:58	15:26	28	28	23 14/16	4 2/16	25.94	8.84	0.63
6	15:28	15:58	30	28 2/16	24 2/16	4	26.13	8.00	0.57
7	16:00	16:29	29	29 4/16	25 6/16	3 14/16	27.31	8.02	0.55

*Calculated via Porchet Method



PERCOLATION TEST DATA SHEET

Project: Hesperia 29-Acre Business | Project No.: 2202-09 | Date: 3/4/2022

Test Hole No.: P-2 | Tested By: SD | Water Temp.:

Depth of Test Hole: 59 inches | USCS: SM | Air Temp.: 48

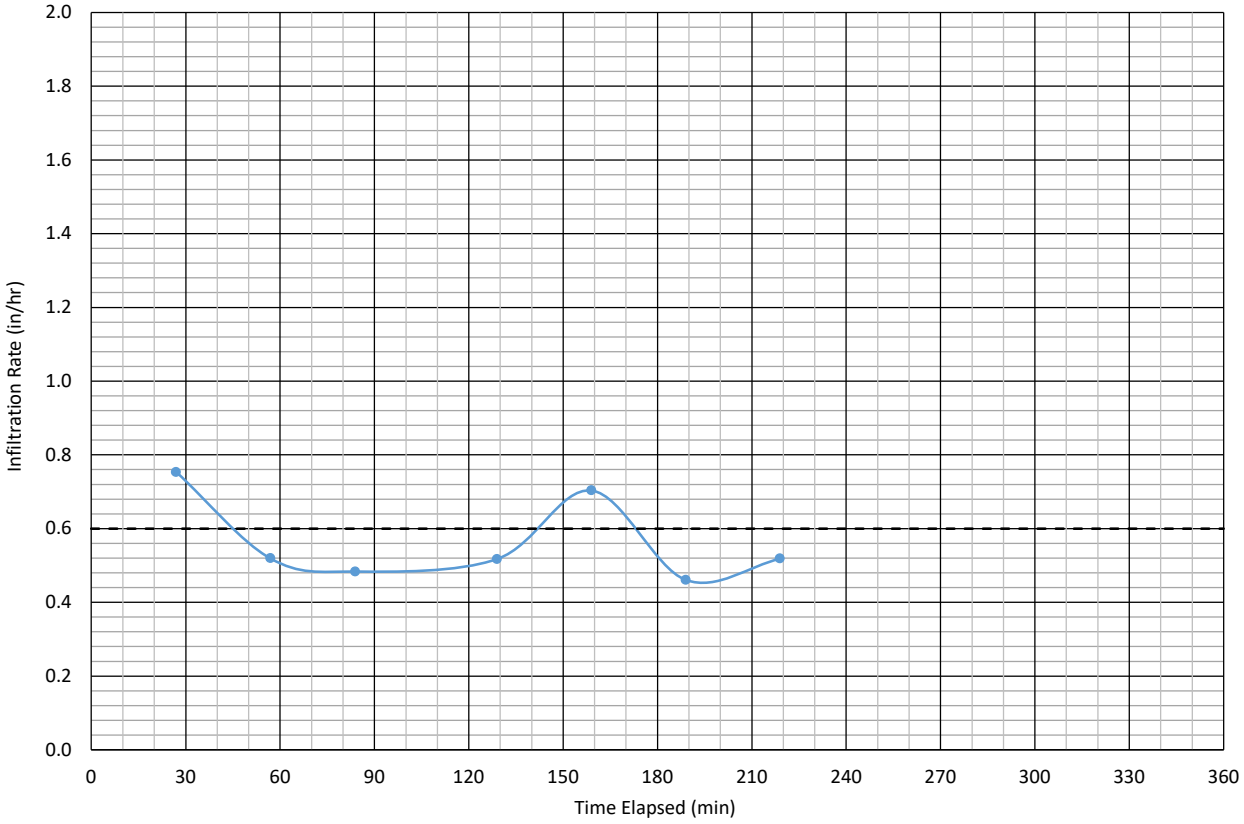
Test Hole Dimensions (Inches)

Length: 59 | Diameter: 8

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	Piezometric Surface (inches)			Average Water Column	Perc Rate (in./hr.)	Infiltration Rate* (in./hr.)
				Start Depth	End Depth	Depth Change			
1	12:39	13:06	27	18	14 14/16	3 2/16	16.44	6.94	0.75
2	13:07	13:37	30	18 8/16	16	2 8/16	17.25	5.00	0.52
3	13:39	14:06	27	18	15 15/16	2 1/16	16.97	4.58	0.48
4	14:07	14:52	45	18 8/16	14 14/16	3 10/16	16.69	4.83	0.52
5	14:53	15:23	30	18 14/16	15 8/16	3 6/16	17.19	6.75	0.70
6	15:25	15:55	30	16 15/16	14 14/16	2 1/16	15.91	4.12	0.46
7	15:56	16:26	30	17 8/16	15 2/16	2 6/16	16.31	4.75	0.52

*Calculated via Porchet Method



PERCOLATION TEST DATA SHEET

Project: Hesperia 29-Acre Business | Project No.: 2202-09 | Date: 3/4/2022

Test Hole No.: P-3 | Tested By: SD | Water Temp.:

Depth of Test Hole: 48 inches | USCS: SM | Air Temp.: 48

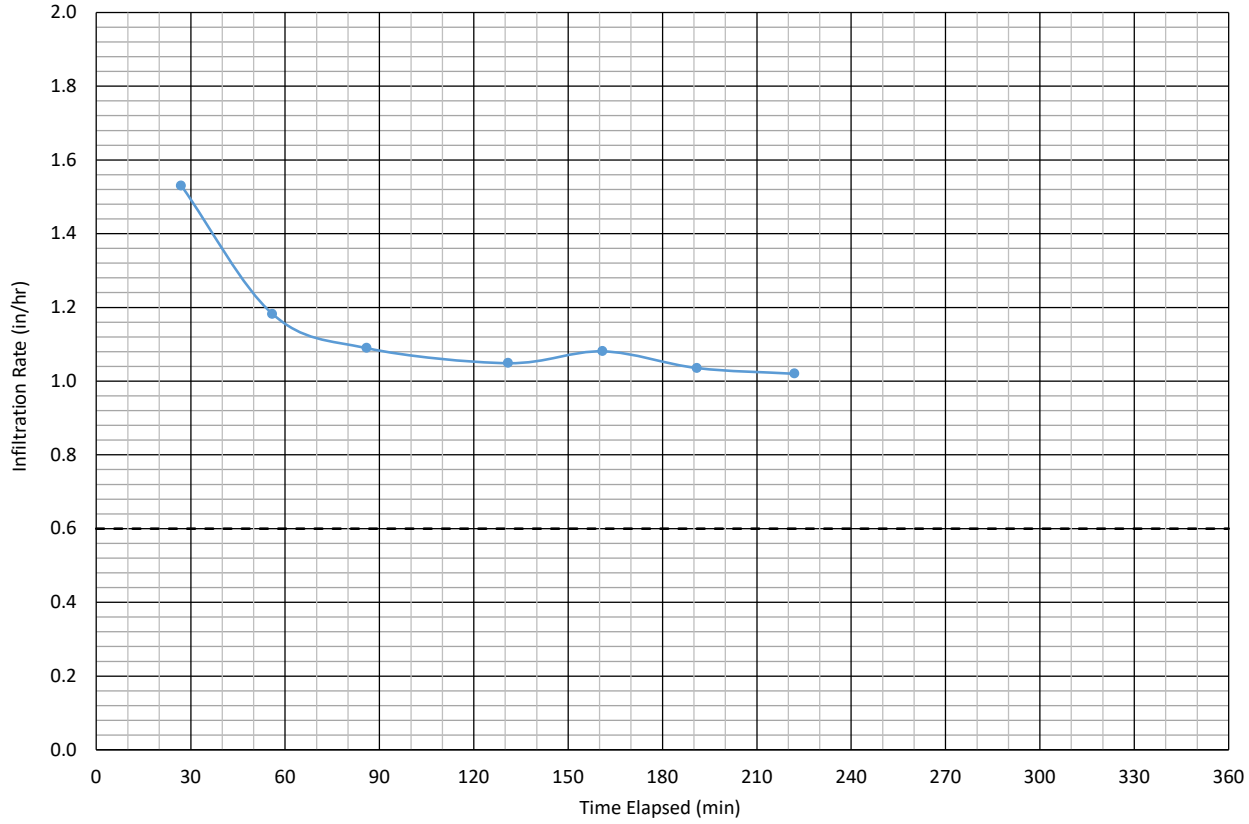
Test Hole Dimensions (Inches)

Length: 48 | Diameter: 8

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	Piezometric Surface (inches)			Average Water Column	Perc Rate (in./hr.)	Infiltration Rate* (in./hr.)
				Start Depth	End Depth	Depth Change			
1	12:36	13:03	27	16 15/16	11 6/16	5 9/16	14.16	12.36	1.53
2	13:03	13:32	29	16	11 8/16	4 8/16	13.75	9.31	1.18
3	13:33	14:03	30	16 4/16	11 14/16	4 6/16	14.06	8.75	1.09
4	14:04	14:49	45	15 14/16	10	5 14/16	12.94	7.83	1.05
5	14:50	15:20	30	16 6/16	12	4 6/16	14.19	8.75	1.08
6	15:21	15:51	30	16	11 14/16	4 2/16	13.94	8.25	1.04
7	15:53	16:24	31	16 4/16	12	4 4/16	14.13	8.23	1.02

*Calculated via Porchet Method



PERCOLATION TEST DATA SHEET

Project: Hesperia 29-Acre Business | Project No.: 2202-09 | Date: 3/4/2022

Test Hole No.: P-4 | Tested By: SD | Water Temp.:

Depth of Test Hole: 46.5 inches | USCS: SM | Air Temp.: 48

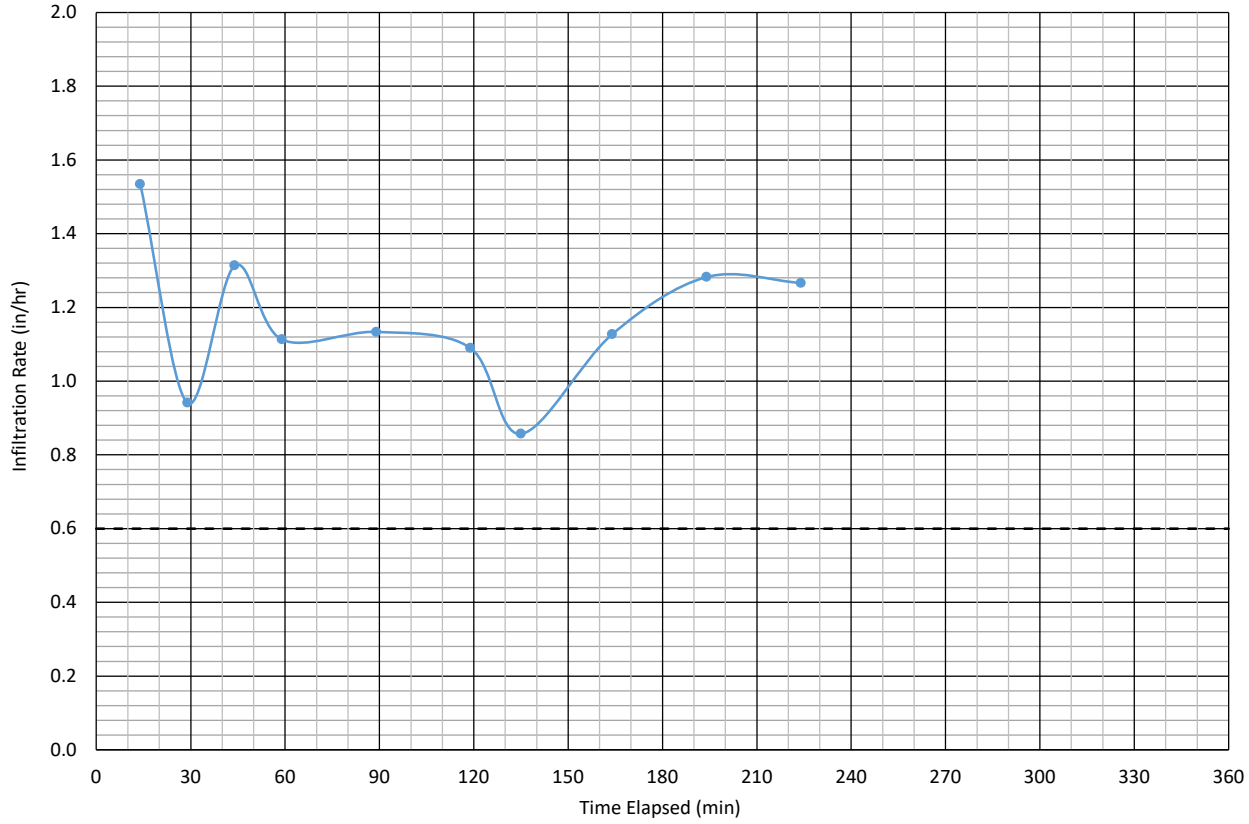
Test Hole Dimensions (Inches)

Length: 46.5 | Diameter: 8

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	Piezometric Surface (inches)			Average Water Column	Perc Rate (in./hr.)	Infiltration Rate* (in./hr.)
				Start Depth	End Depth	Depth Change			
1	12:31	12:45	14	15 8/16	12 10/16	2 14/16	14.06	12.32	1.53
2	12:45	13:00	15	12 10/16	11	1 10/16	11.81	6.50	0.94
3	13:00	13:15	15	16 2/16	13 6/16	2 12/16	14.75	11.00	1.31
4	13:15	13:30	15	13 6/16	11 6/16	2	12.38	8.00	1.11
5	13:30	14:00	30	15 10/16	11 4/16	4 6/16	13.44	8.75	1.13
6	14:00	14:30	30	16 4/16	11 14/16	4 6/16	14.06	8.75	1.09
7	14:30	14:46	16	11 14/16	10 6/16	1 8/16	11.13	5.62	0.86
8	14:47	15:16	29	16 4/16	11 14/16	4 6/16	14.06	9.05	1.13
9	15:18	15:48	30	17	11 12/16	5 4/16	14.38	10.50	1.28
10	15:50	16:20	30	16 12/16	11 10/16	5 2/16	14.19	10.25	1.27

*Calculated via Porchet Method



PERCOLATION TEST DATA SHEET

Project: Hesperia 29-Acre Business | Project No.: 2202-09 | Date: 3/4/2022

Test Hole No.: P-5 | Tested By: SD | Water Temp.:

Depth of Test Hole: 77 inches | USCS: SP-SM | Air Temp.: 48

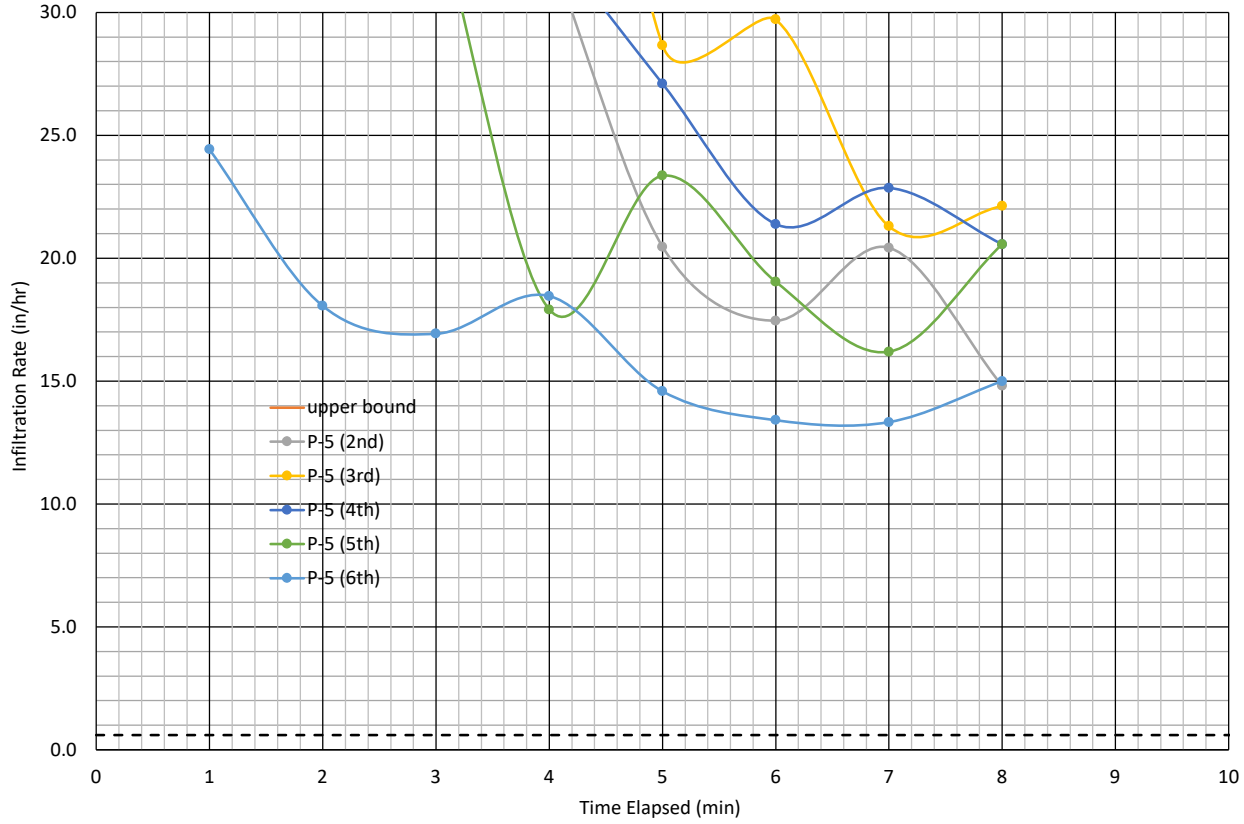
Test Hole Dimensions (Inches)

Length: 77 | Diameter: 8

Infiltration Test

Trial No.	Start Time (hr and min)	Stop Time (hr and min)	Time Interval (min.)	Piezometric Surface (inches)			Average Water Column	Perc Rate (in./hr.)	Infiltration Rate* (in./hr.)
				Start Depth	End Depth	Depth Change			
6			1	21	16 12/16	4 4/16	18.88	255.00	24.43
			1	16 12/16	14 2/16	2 10/16	15.44	157.50	18.06
			1	14 2/16	12	2 2/16	13.06	127.50	16.93
			1	12	10	2	11.00	120.00	18.46
			1	10	8 10/16	1 6/16	9.31	82.50	14.59
			1	8 10/16	7 8/16	1 2/16	8.06	67.50	13.42
			1	7 8/16	6 8/16	1	7.00	60.00	13.33
			1	6 8/16	5 8/16	1	6.00	60.00	15.00

*Calculated via Porchet Method



BORING NUMBER B-1

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3554 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SC	**Older Alluvium (Qoal):** Clayey SAND, yellowish brown, slightly moist, dense, fine- to coarse-grained; some gravel.	BU					RV				
5				MC	17-21-27 (48)	125	4.1	33	Consol				
10		SM	@ 10 ft. Silty SAND, yellowish brown, moist, dense, fine-grained; some clay.	MC	18-20-31 (51)	113	7.5	43					
15			@ 15 ft. brown with iron oxide staining, very dense, fine- to coarse-grained; some fine gravel.	MC	19-38-46 (84)	130	5.7	55					
20			@ 20 ft. with sub-rounded gravel.	MC	18-33-48 (81)	122	1.8	13					
25				MC	12-22-38 (60)	127	3.9	34					

(Continued Next Page)

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BORING NUMBER B-1

CLIENT Landstar Companies **PROJECT NAME** Industrial Development

PROJECT NUMBER 2202-09 **PROJECT LOCATION** APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
		SM	**Older Alluvium (Qoal):** (continued) Silty SAND, yellowish brown, moist, dense, fine-grained; some clay; with gravel.										
30		SP-SM	@ 30 ft. interbedded Silty SAND and gravelly SAND, fine-to coarse-grained, yellowish brown, dry, dense.	SPT	11-14-15 (29)								
35		SP	@ 35 ft. SAND, fine-to coarse-grained, light gray, dry, friable.	MC	13-37-48 (85)	114	2.3	13					
40		SP-SM	@ 40 ft. interbedded Silty SAND and SAND, fine-to coarse-grained, yellowish brown, dry, dense.	SPT	11-11-18 (29)								
45		ML	@ 46 ft. SILT, brown, wet, stiff; some clay.	MC	13-15-35 (50)	124	9.0	73					
50		SP	@ 50 ft. Gravelly SAND, brown, very dense, fine- to coarse-grained; some silt, metamorphic and granitic clasts to 1/2-inch size.	MC	18-34-40 (74)	117	2.4	15					

Total Depth= 51.5 ft.
No water. No caving

BORING NUMBER B-2

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3553 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, slightly moist, dense, fine- to coarse-grained.	BU					EI Max DSR Chem				
				MC	8-16-17 (33)	124	2.0	16					
5													
				MC	16-22-27 (49)	123	4.7	36					
10													
15			@ 15 ft. some metamorphic clasts to 1/2-inch size (quartzite).	MC	16-22-25 (47)	126	8.1	69					
20		SP	@ 20 ft. SAND, fine-to coarse-grained, light yellowish brown to light reddish brown, dry.	MC	12-19-27 (46)	121	3.1	22					
25				MC	12-15-29 (44)	115	3.1	18					

Total Depth= 26.5 ft.
No water. No caving

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:09 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

BORING NUMBER B-3

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3553 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, slightly moist, medium dense, fine- to coarse-grained.										
5				MC	5-7-8 (15)	118	1.8	12					
10			@ 10 ft. medium- to coarse-grained, light yellowish brown, dry.	MC	24-41-50 (91)	129	2.5	24					
15			@ 15 ft. Silty SAND, yellowish brown, slightly moist, dense, fine-grained; abundant subrounded gravel to 1/2-inch size.	MC	35-50/5"	132	4.1	42					
20		SP	@ 20 ft. Gravelly SAND, yellowish to reddish brown, very dense, fine- to coarse-grained; metamorphic clasts to 1/2-inch size.	MC	32-39-50 (89)	121	1.9	14					

Total Depth= 21.5 ft.
No water. No caving

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BORING NUMBER B-4

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3554 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, dry, medium dense, fine- to medium-grained.	MC	6-9-11 (20)	117	1.9	12					
5		SP	@ 7 ft. SAND, light red, slightly moist, dense, fine-grained to coarse-grained; some subrounded gravel to 3/4-inch size.	MC	6-10-14 (24)	111	2.8	15	Consol				
10													
15				MC	27-36-50 (86)	130	5.4	53					
20			@ 20 ft. Gravelly SAND, light red, dry, very dense, fine- to coarse-grained; some gravel to 3/4-inch size.	MC	16-27-48 (75)	119	3.0	20					

Total Depth= 21.5 ft.
No water. No caving

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:09 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

BORING NUMBER B-5

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 2/21/22
GROUND ELEVATION 3545 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	**Older Alluvium (Qoal):** Silty SAND, yellowish brown, dry, medium dense, fine- to medium-grained.										
5				MC	24-50/5"	115	2.7	16					
			@ 7 ft. less silt; with coarse gravel.	BU									
10				MC	27-39-43 (82)	121	2.7	19	Consol				
15		SC	@ 15 ft. Clayey SAND, light yellowish brown, dry, dense, fine- to medium-grained; some gravel to 3/4-inch size.	MC	29-50/5"	134	5.2	58					
20		SP	@ 20 ft. SAND, light gray, dry, dense, fine- to coarse-grained; friable.	SPT	5-12-17 (29)								

Total Depth= 21.5 ft.
No water. No caving

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:09 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

BORING NUMBER P-1

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3540 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	Silty SAND, fine- to coarse-grained, yellowish brown, slightly moist, loose; with subrounded gravel to 3/4-inch size.										
			@ 2 ft. light yellowish brown, slightly moist.										
5													
			Total Depth= 6 ft. No water. No caving										

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:09 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

BORING NUMBER P-2

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3540 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	Silty SAND, fine- to coarse-grained, yellowish brown, slightly moist, loose; with subrounded gravel to 3/4-inch size.										
5													

Total Depth= 5 ft.
No water. No caving

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:10 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

BORING NUMBER P-3

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3541 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	Silty SAND, fine- to coarse-grained, yellowish brown.										
			Total Depth= 4 ft. No water. No caving										

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:10 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

BORING NUMBER P-4

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 2/21/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3545 ft **HOLE SIZE** 8
DRILLING CONTRACTOR 2R-Drilling
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	Silty SAND, fine to coarse-grained, light brown, dry.										
			Total Depth= 4 ft. No water. No caving										

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:10 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

BORING NUMBER P-5

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Landstar Companies
PROJECT NAME Industrial Development
PROJECT NUMBER 2202-09
PROJECT LOCATION APN 3064-401-03, 04, 05, W. of Hwy 395, Hesperia
DATE STARTED 3/4/22 **COMPLETED** 3/4/22
GROUND ELEVATION 3545 ft **HOLE SIZE** 8
DRILLING CONTRACTOR
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger
AT TIME OF DRILLING ---
LOGGED BY SD **CHECKED BY** AB
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	OTHER TESTS	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		SM	Silty SAND, fine to coarse-grained, light brown, dry.										
5		SP	SAND with silt, fine to coarse-grained, light brown.										

Total Depth= 7 ft.
No water. No caving

AGS BORING LOG V2 - GINT STD US LAB.GDT - 3/24/22 14:10 - \\SERVER\PUBLIC\PROJECT FILES\2202-09 HESPERIA 29-ACRE BUSINESS CENTER\2202-09 LOGS AND LAB\2202-09 LOGS.GPJ

Date Excavated: 2/21/2022, 3/4/2022
Logged by: SD
Equipment: JD 410J Backhoe

LOG OF TEST PITS

Excavation No.	Depth (ft.)	USCS	Description
T-1	0.0 – 0.5	SM	**Topsoil** SILTY SAND, fine- to coarse-grained, light brown, with roots, dry, loose, numerous rodent holes.
	0.5 – 3.3	SM	**Alluvium (Qal)?** SILTY SAND, fine- to coarse-grained, trace gravel, light brown, dry, loose, porous.
	3.3 – 10.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, trace gravel, light brown, medium dense, rodent hole at 3.8 feet in depth.
			@ 5 ft., coarser grained, slightly moist, medium dense.
		SP-SM	@ 5.5 ft., SAND with Silt, trace cobbles.
			@ 9 ft., more cobbles, medium dense to dense.
			TOTAL DEPTH 10 FT. NO WATER, SOME CAVING BELOW 6 FT.

Excavation No.	Depth (ft.)	USCS	Description
T-2	0.0 – 0.3	SM	**Topsoil** SILTY SAND, fine- to medium-grained, light yellow brown, some roots, dry, loose.
	0.3 – 1.7	SM	**Alluvium (Qal)?** SILTY SAND, fine-grained, yellow brown, slightly moist, loose.
	1.7 – 8.5	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, light brown, dry, medium dense. @ 4.5 ft., dense. @ 5.5 ft., fine-grained, slightly indurated, very dense. TOTAL DEPTH 8.5 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-3	0.0 – 0.7	SM	**Topsoil** SILTY SAND, fine- to medium-grained, light yellow brown, some roots, dry, loose.
	0.7 – 2.8	SM	**Alluvium (Qal)?** SILTY SAND, fine-grained, light yellow brown, slightly moist.
	2.8 – 6.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, less silt, yellow brown, medium dense.
	6.0 – 10.0	SP-SM	@ 6 ft., SAND with Silt, fine to coarse-grained, with gravel, light yellow brown, dense. @ 8 ft., dense to very dense. TOTAL DEPTH 10 FT. NO WATER, NO CAVING

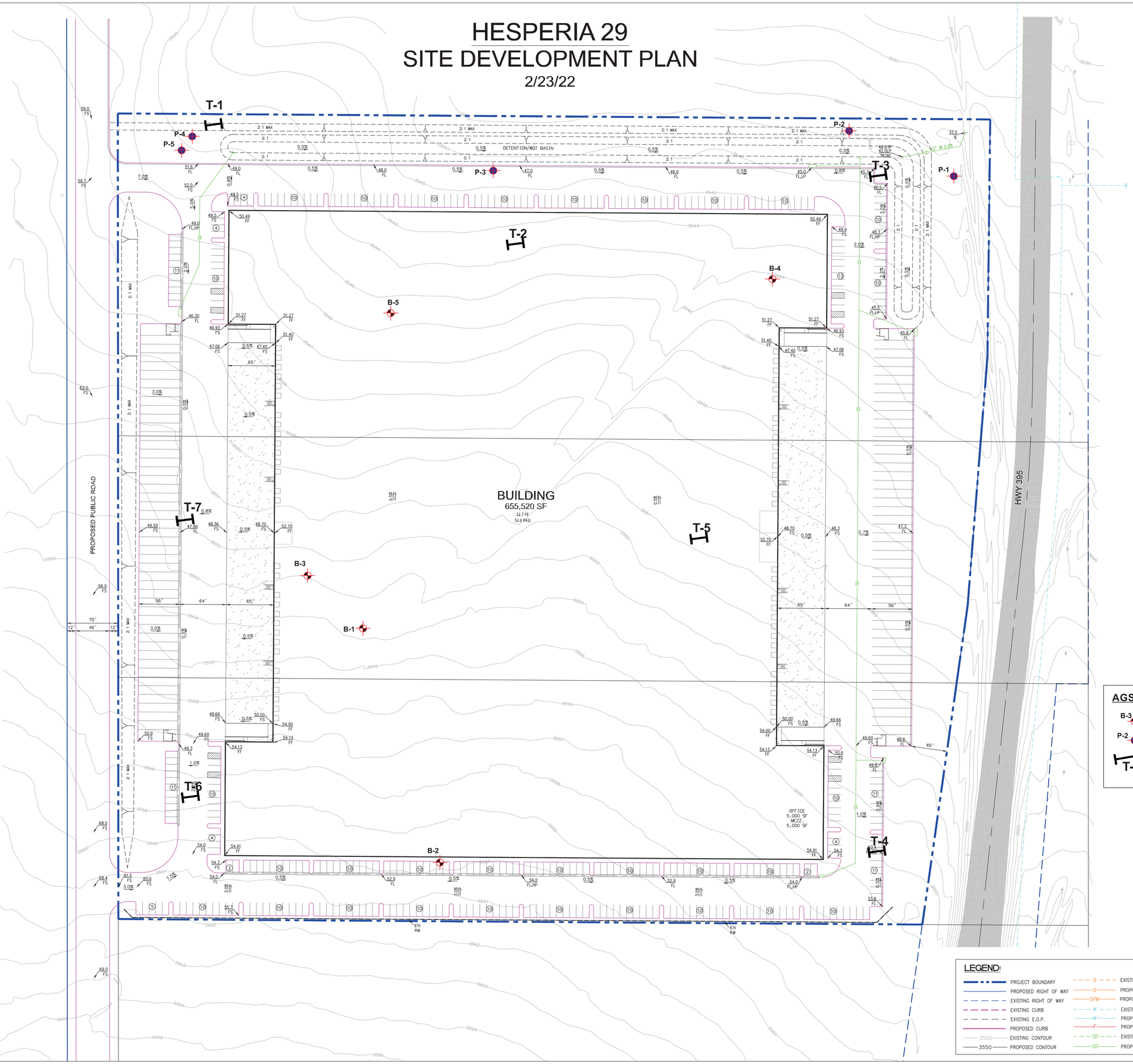
Excavation No.	Depth (ft.)	USCS	Description
T-4	0.0 – 1.0	SM	**Topsoil** SILTY SAND, fine- to coarse-grained, yellow brown, some roots, slightly moist, loose.
	1.0 – 3.0	SM	**Alluvium (Qal)?** SILTY SAND, fine- to coarse-grained, yellow brown, dry to slightly moist, loose, roots down to 30 inches in depth.
	3.0 – 5.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, less silt, light yellow brown, medium dense.
	5.0 – 6.0	SP-SM	@ 5 ft., SAND with Silt, fine to coarse-grained, some gravel, orange brown, slightly moist, medium dense.
	6.0 – 8.0	SM	@ 6 ft., SILTY SAND, fine to coarse-grained, orange brown, slightly indurated, dense, more difficult to excavate. TOTAL DEPTH 8 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-5	0.0 – 2.0	SM	**Alluvium (Qal)** SILTY SAND, fine- to medium-grained, yellow brown, slightly moist, loose, some roots.
	2.0 – 4.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, some gravel, less silt, yellow brown, dry, medium dense.
	4.0 – 5.0	SM	@ 4 ft., fine to coarse-grained, with gravel, medium dense to dense.
	5.0 – 10.5	SP-SM	@ 5 ft., SAND with silt, fine to coarse-grained, some gravel, orange brown, slightly moist, slightly indurated, dense. TOTAL DEPTH 10.5 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-6	0.0 – 2.0	SM	**Alluvium (Qal)** SILTY SAND, fine- to medium-grained, yellow brown, slightly moist, loose to medium dense.
	2.0 – 2.5	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, trace gravel, less silt, lightly moist, light brown, dry, medium dense.
	2.5 – 7.5	SM	@ 2.5 ft., fine to coarse-grained, with gravel, light brown, dry, dense. @ 4 ft., slightly indurated, dense, harder to excavate. TOTAL DEPTH 7.5 FT. NO WATER, NO CAVING

Excavation No.	Depth (ft.)	USCS	Description
T-7	0.0 – 2.7	SM	**Alluvium (Qal)** SILTY SAND, fine -grained, yellow brown, dry to slightly moist, loose, some roots down to 2 feet in depth.
	2.7 – 4.0	SM	**Older Alluvium (Qoal)?** SILTY SAND, fine- to coarse-grained, some gravel, yellow brown, dry, medium dense to dense.
	4.0 – 7.5	SP-SM	@ 4 ft., SAND with silt, fine to coarse-grained, with gravel, red brown, moist, slightly indurated, dense.
	7.5 – 10.0	SP	@ 7.5 ft., SAND, fine to coarse-grained, with gravel and cobbles, red brown, dense.
	10.0 – 12.0	SP-SM	@ 10 ft., SAND with silt, fine to coarse-grained, slightly indurated, dense, harder to excavate. @ 11 ft., light grey brown, slightly cemented. TOTAL DEPTH 12 FT. NO WATER, SLIGHT CAVING 7.5 to 10 FEET

HESPERIA 29
SITE DEVELOPMENT PLAN
2/23/22



NOTE: ADD 3500 TO ALL PROPOSED ELEVATIONS SHOWN.

AGS LEGEND:

B-3	Approximate location of hollow stem auger borings (AGS, 2022)
P-2	Approximate location of percolation (AGS, 2022)
T-6	Approximate location of test pit (AGS, 2022)

PLATE 1
Exploration Location Plan

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

Project:	Report:	Date:
P/W 2202-09	2202-09-B-2	Mar. 2022

LEGEND:

PROJECT BOUNDARY	EXISTING SEWER
PROPOSED RIGHT OF WAY	PROPOSED SEWER
EXISTING RIGHT OF WAY	PROPOSED SEWER FORCE MAIN
EXISTING CURB	EXISTING WATER
EXISTING E.O.P.	PROPOSED WATER
PROPOSED CURB	PROPOSED FIRE WATER
3550 EXISTING CONTOUR	EXISTING STORM DRAIN
3550 PROPOSED CONTOUR	PROPOSED STORM DRAIN

SCALE: 1"=50'

ALLIANCE
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VALENCIA, CA 91355
TEL: (661) 799-2760
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APPENDIX C

HYDROMODIFICATION SUMMARY

Hydromodification was calculated using the 100-Year event and is summarized in detail within the hydrology report for this project. The summary table below, taken from the hydrology report, presents the 100-Yr volume results as taken from the Unit Hydrograph model.

1.22 ac-ft = 53,143 CF and is less than the requitred DCV of 85,914 CF

UH RUNOFF VOLUME - 100-YR EVENT

	Existing	Developed	Volume Required
	ac-ft	ac-ft	ac-ft
TOTAL	12.67	13.89	1.22

APPENDIX D

OPERATIONS & MAINTENANCE MANUAL

Infiltration Area[1] Maintenance Plan for
KISS Logistics Center

6/21/2022

Project Address and Cross Streets_____

Assessor's Parcel No.: _____

Property Owner: _____ Phone No.:_____

Designated Contact: _____ Phone No.:_____

Mailing Address:_____

The property contains one (1) bioretention area(s), located as described below and as shown in the attached site plan[2].

- **Infiltration Area No. 1** is located at north boundary of site.

I. Routine Maintenance Activities

The principal maintenance objective is to prevent sediment buildup and clogging, which reduces pollutant removal efficiency and may lead to bioretention area failure. Routine maintenance activities, and the frequency at which they will be conducted, are shown in Table 1.

Table 1
Routine Maintenance Activities for Bioretention Areas

No.	Maintenance Task	Frequency of Task
1	Remove obstructions, debris and trash from bioretention area and dispose of properly.	Monthly, or as needed after storm events
2	Inspect bioretention area to ensure that it drains between storms and within five days after rainfall.	Monthly, or as needed after storm events
3	Inspect inlets for channels, soil exposure or other evidence of erosion. Clear obstructions and remove sediment.	Monthly, or as needed after storm events
4	Remove and replace all dead and diseased vegetation.	Twice a year
5	Maintain vegetation and the irrigation system. Prune and weed to keep bioretention area neat and orderly in appearance.	Before wet season begins, or as needed
6	Check that mulch is at appropriate depth (3 inches per soil specifications) and replenish as necessary before wet season begins.	Monthly
7	Inspect bioretention area using the attached inspection checklist.	Monthly, or after large storm events, and after removal of accumulated debris or material

II. Prohibitions

The use of pesticides and quick release fertilizers shall be minimized, and the principles of integrated pest management (IPM) followed:

1. Employ non-chemical controls (biological, physical and cultural controls) before using chemicals to treat a pest problem.

[1] Bioretention areas include linear treatment measures designed for water to filter through biotreatment soils. A bioretention area that is unlined and has a raised underdrain in the underlying rock layer to promote infiltration, as shown in Section 6.1, may also be called a "bioinfiltration area".

[2] Attached site plan must match the site plan exhibit to Maintenance Agreement.

2. Prune plants properly and at the appropriate time of year.
3. Provide adequate irrigation for landscape plants. Do not over water.
4. Limit fertilizer use unless soil testing indicates a deficiency. Slow-release or organic fertilizer is preferable. Check with municipality for specific requirements.
5. Pest control should avoid harming non-target organisms, or negatively affecting air and water quality and public health. Apply chemical controls only when monitoring indicates that preventative and non-chemical methods are not keeping pests below acceptable levels. When pesticides are required, apply the least toxic and the least persistent pesticide that will provide adequate pest control. Do not apply pesticides on a prescheduled basis.
6. Sweep up spilled fertilizer and pesticides. Do not wash away or bury such spills.
7. Do not over apply pesticide. Spray only where the infestation exists. Follow the manufacturer's instructions for mixing and applying materials.
8. Only licensed, trained pesticide applicators shall apply pesticides.
9. Apply pesticides at the appropriate time to maximize their effectiveness and minimize the likelihood of discharging pesticides into runoff. With the exception of pre-emergent pesticides, avoid application if rain is expected.
10. Unwanted/unused pesticides shall be disposed as hazardous waste.

Standing water shall not remain in the treatment measures for more than five days, to prevent mosquito generation. Should any mosquito issues arise, contact the Alameda County Mosquito Abatement District (ACMAD), as needed for assistance. In Albany, contact the Alameda County Vector Control Services District (ACVCSD). Mosquito larvicides shall be applied only when absolutely necessary, as indicated by the ACMAD or ACVCSD, and then only by a licensed professional or contractor. Contact information for ACMAD and ACVCSD is provided below.

III. Vector Control Contacts

TBD

IV. Inspections

The attached Bioretention Area Inspection and Maintenance Checklist shall be used to conduct inspections monthly (or as needed), identify needed maintenance, and record maintenance that is conducted.

Infiltration Basin

Inspection and Maintenance Checklist

Property Address: KISS Logistics Center Property Owner: KISS Hesperia Venture, LLC

Treatment Measure No.: _____ Date of Inspection: _____ Type of Inspection: Monthly Pre-Wet Season After heavy runoff End of Wet Season

Inspector(s): _____ Other:_____

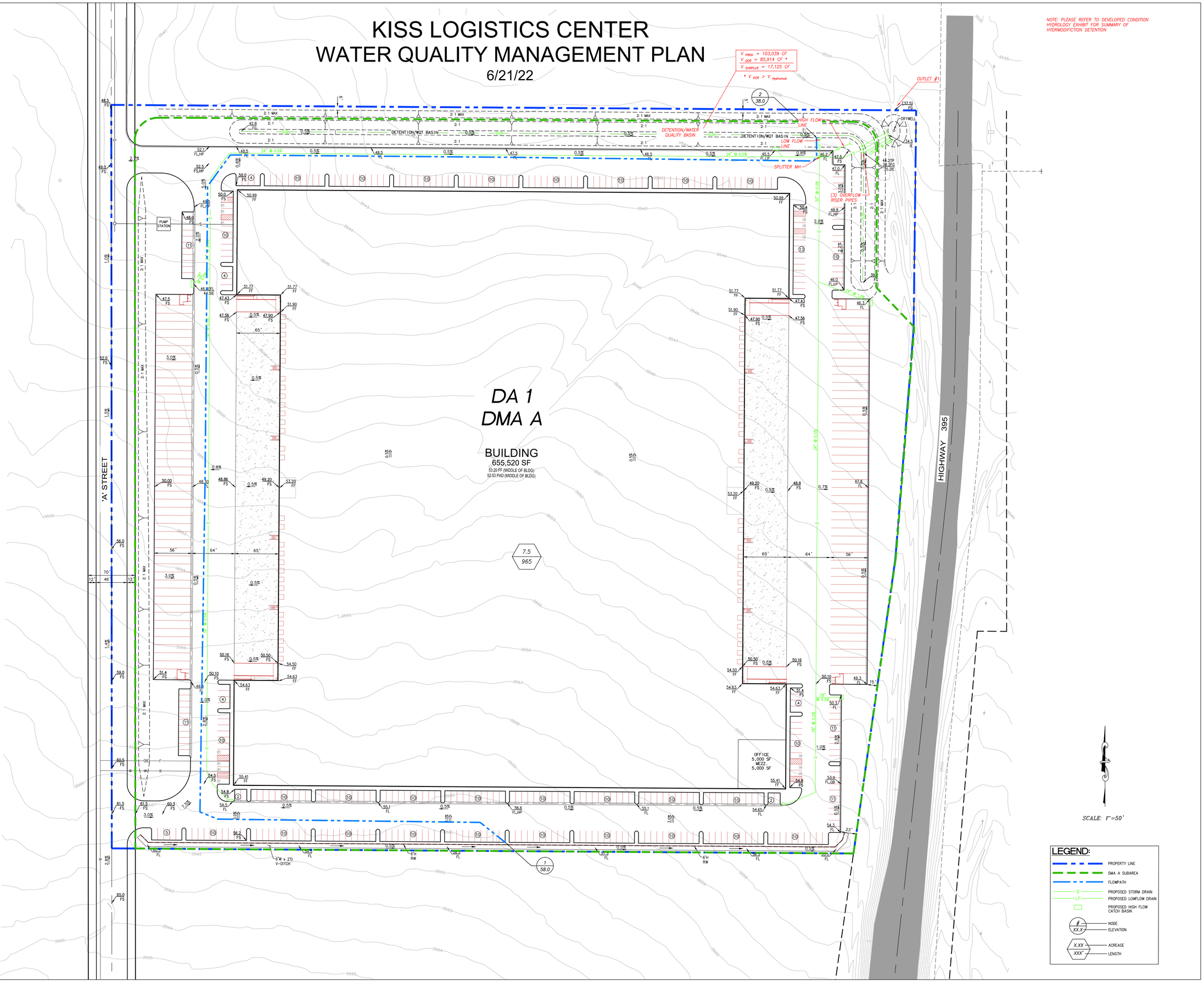
Defect	Conditions When Maintenance Is Needed	Maintenance Needed? (Y/N)	Comments (Describe maintenance completed and if needed maintenance was not conducted, note when it will be done)	Results Expected When Maintenance Is Performed
1. Standing Water	When water stands in the bioretention area between storms and does not drain within five days after rainfall.			There should be no areas of standing water once inflow has ceased. Any of the following may apply: sediment or trash blockages removed, improved grade from head to foot of bioretention area, or added underdrains.
2. Trash and Debris Accumulation	Trash and debris accumulated in the bioretention area.			Trash and debris removed from bioretention area and disposed of properly.
3. Sediment	Evidence of sedimentation in bioretention area.			Material removed so that there is no clogging or blockage. Material is disposed of properly.
4. Erosion	Channels have formed around inlets, there are areas of bare soil, and/or other evidence of erosion.			Obstructions and sediment removed so that water flows freely and disperses over a wide area. Obstructions and sediment are disposed of properly.
5. Vegetation	Vegetation is dead, diseased and/or overgrown.			Vegetation is healthy and attractive in appearance.
6. Mulch	Mulch is missing or patchy in appearance. Areas of bare earth are exposed, or mulch layer is less than 3 inches in depth.			All bare earth is covered, except mulch is kept 6 inches away from trunks of trees and shrubs. Mulch is even in appearance, at a depth of 3 inches.
7. Miscellaneous	Any condition not covered above that needs attention in order for the bioretention area to function as designed.			Meet the design specifications.

APPENDIX E

WQMP EXHIBIT

KISS LOGISTICS CENTER
WATER QUALITY MANAGEMENT PLAN
6/21/22

NOTE: PLEASE REFER TO DEVELOPED CONDITION HYDROLOGY EXHIBIT FOR SUMMARY OF HYDROMODIFICTION DETENTION



NOTE: ADD 3500 TO ALL PROPOSED ELEVATIONS SHOWN.

LEGEND:

- PROPERTY LINE
- DMA A SUBAREA
- FLOWPATH
- D — PROPOSED STORM DRAIN
- LF — PROPOSED LOWFLOW DRAIN
- PROPOSED HIGH FLOW CATCH BASIN
- # / XX.X — NODE / ELEVATION
- X.XX / XXX' — ACREAGE / LENGTH

ALLIANCE
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