INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

TWAIN HARTE PIPELINE IMPROVEMENT PROJECT



FEBRUARY 2022

INITIAL STUDY/MITIGATED NEGATIVE DECLARATION

TWAIN HARTE PIPELINE IMPROVEMENT PROJECT

Prepared for:

Twain Harte Community Service District
22912 Vantage Pointe Drive
Twain Harte, CA 95383
Contact Person: Jeff Black, PE
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February 2022

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Project #210348

NOTICE OF PUBLIC HEARING AND INTENT TO ADOPT
MITIGATED NEGATIVE DECLARATION

NOTICE IS HEREBY GIVEN that the Twain Harte Community Services District will conduct a special public meeting Wednesday, March 23, 2022, at 9:00 a.m. to consider and accept public comment for the proposed Twain Project Pipeline Improvement Project. This is to advise that the Twain Harte Community Services District has prepared a Mitigated Negative Declaration for the project. ***To help slow the spread of COVID-19, the District's board room is closed to the public. This meeting will be held remotely by teleconference using Zoom.***

Project Title: Twain Project Pipeline Improvement Project

Project Location: The proposed Project is located within the boundaries of the Twain Harte Community Service District (District). The District serves the unincorporated community of Twain Harte, Tuolumne County, California.

Project Description: The proposed project consists of the replacement of existing deteriorating 4- to 10-inch diameter sewer pipelines within existing road rights-of-way and utilities easements. In addition, severely damaged manhole covers will also be replaced. These areas include the following:

- Adjacent to Twain Harte Lake;
- Two (2) located around Marquis Drive;
- Twain Harte Drive to Spruce Drive;
- Fuller to Manzanita Drive;
- Golf Club Drive (South);
- Sewer crossing of inlet to Twain Harte Lake;
- Willowood Drive and Tuolumne Drive; and
- Golf Club Drive.

The District is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the areas listed above. Implementation of the proposed project will allow the District to maintain, replace, and upgrade its collection system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality. Some of the pipeline runs above ground sitting on cradles and in some areas the pipe is belowground. The pipelines being replaced belowground will be abandoned in place and remain under ground. Construction is anticipated to take approximately 5 months.

The document and documents referenced in the Initial Study/Mitigated Negative Declaration are available for review at the Twain Harte Community Services District at 22912 Vantage Pointe Drive, Twain Harte, CA 93245. Persons wishing to review information on file must contact staff by phone at (209) 586-3172. or by email at info@twainhartecsd.com to make arrangements. Due to the limits mandated by State law, mailed responses must be filed with the District office, 22912 Vantage Pointe Drive, Twain Harte CA 95383 no later than March 16, 2022, at 5:00 p.m.

Persons having comments or concerns about the proposed project ***must submit your public comments by e-mail to***: Jaymie.Brauer@qkinc.com. Persons unable to email comments may send them via USPS mail or other courier to Jaymie Brauer, c/o Quad Knopf, Inc, 5080 Californian Avenue, Ste 220, Bakersfield CA 93309. Mailed comments must be received by 5:00 p.m. the day of the meeting to be entered into record.

As mandated by the California Environmental Quality Act (CEQA), the public review period for this document is 30 days (CEQA Section 15073[b]). The public review period begins on February 15, 2022 and ends on March 16, 2022. For further information, please contact Jaymie Brauer at (661) 626-2600.

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Twain Harte Pipeline Improvement Project

Lead Agency: Twain Harte Community Service District | Contact Person: Jeff Black

Mailing Address: 22912 Vantage Pointe Drive | Phone: (209) 322-1820

City: Twain Harte | Zip: 95383 | County: Tuolumne

Project Location: County: Tuolumne | City/Nearest Community: Twain Harte

Cross Streets: Marquis Drive; Twain Harte Drive to Spruce Drive; Fuller to Manzanita Drive; Golf Club Drive; Willowood Drive and Tuolumne Drive; Golf Club Drive. | Zip Code: 95383

Longitude/Latitude (degrees, minutes and seconds): 38 ° 02 ′ 12.3 ″ N / 120 ° 14 ′ 22.2 ″ W | Total Acres: N/A

Assessor's Parcel No.: N/A | Section: 8, 9, 16, 17 | Twp.: 2N | Range: 16E | Base: MDB&M

Within 2 Miles: State Hwy #: SR 108 | Waterways: N/A

Airports: N/A | Railways: N/A | Schools: Twain Harte School

Document Type:

CEQA: ☐ NOP ☐ Draft EIR ☐ Early Cons ☐ Supplement/Subsequent EIR ☐ Neg Dec (Prior SCH No.) ☐ ■ Mit Neg Dec Other:

NEPA: ☐ NOI ☐ EA ☐ Draft EIS ☐ FONSI

Other: ☐ Joint Document ☐ Final Document ☐ Other:

Local Action Type:

☐ General Plan Update ☐ General Plan Amendment ☐ General Plan Element ☐ Community Plan
☐ Specific Plan ☐ Master Plan ☐ Planned Unit Development ☐ Site Plan
☐ Rezone ☐ Prezone ☐ Use Permit ☐ Land Division (Subdivision, etc.)
☐ Annexation ☐ Redevelopment ☐ Coastal Permit ■ Other: State Funding

Development Type:

☐ Residential: Units _____ Acres _____
☐ Office: Sq.ft. _____ Acres _____ Employees _____
☐ Commercial: Sq.ft. _____ Acres _____ Employees _____
☐ Industrial: Sq.ft. _____ Acres _____ Employees _____
☐ Educational: _____
☐ Recreational: _____
☐ Water Facilities: Type _____ MGD _____
☐ Transportation: Type _____
☐ Mining: Mineral _____
☐ Power: Type _____ MW _____
☐ Waste Treatment: Type _____ MGD _____
☐ Hazardous Waste: Type _____
■ Other: Pipeline Replacement

Project Issues Discussed in Document:

■ Aesthetic/Visual ■ Agricultural Land ■ Air Quality ■ Archeological/Historical ■ Biological Resources ☐ Coastal Zone ■ Drainage/Absorption ☐ Economic/Jobs
☐ Fiscal ■ Flood Plain/Flooding ■ Forest Land/Fire Hazard ■ Geologic/Seismic ■ Minerals ■ Noise ■ Population/Housing Balance ■ Public Services/Facilities
■ Recreation/Parks ■ Schools/Universities ■ Septic Systems ■ Sewer Capacity ■ Soil Erosion/Compaction/Grading ■ Solid Waste ■ Toxic/Hazardous ■ Traffic/Circulation
■ Vegetation ■ Water Quality ■ Water Supply/Groundwater ■ Wetland/Riparian ☐ Growth Inducement ■ Land Use ☐ Cumulative Effects ☐ Other:

Present Land Use/Zoning/General Plan Designation:

Existing roads/R/P- Parks and Recreation, GC- General Commercial, LDR- Low Density Residential, MU- Mixed Use/R-A: (Rural Residential) • C-1: (General Commercial)

Project Description: *(please use a separate page if necessary)*

The proposed Project consists of the replacement of existing deteriorating 4- to 10-inch diameter sewer pipelines, within existing rights-of-way (ROW) and utility easements. In addition, severely damaged manhole covers will also be replaced. These areas include the following: adjacent to Twain Harte Lake, two (2) located around Marquis Drive; Twain Harte Drive to Spruce Drive; Fuller to Manzanita Drive; Golf Club Drive (South); Sewer crossing of inlet to Twain Harte Lake; Willowood Drive and Tuolumne Drive; and Golf Club Drive.The District is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the areas listed above. Implementation of the proposed project will allow the District to maintain, replace, and upgrade its sewer system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality. Construction is expected to take approximately 5 months, with construction anticipated to start in Q2 of 2023 (depending on funding). Some of the pipeline runs above ground sitting on cradles and in some areas the pipe is below ground. The pipelines being replaced below ground will be abandoned in place and remain under ground..

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Reviewing Agencies Checklist

Lead Agencies may recommend State Clearinghouse distribution by marking agencies below with and "**X**".
If you have already sent your document to the agency please denote that with an "**S**".

x	Air Resources Board	X	Office of Historic Preservation
	Boating & Waterways, Department of		Office of Public School Construction
	California Emergency Management Agency		Parks & Recreation, Department of
	California Highway Patrol		Pesticide Regulation, Department of
	Caltrans District #		Public Utilities Commission
	Caltrans Division of Aeronautics	x	Regional WQCB # 5
	Caltrans Planning		Resources Agency
	Central Valley Flood Protection Board		Resources Recycling and Recovery, Department of
	Coachella Valley Mtns. Conservancy		S.F. Bay Conservation & Development Comm.
	Coastal Commission		San Gabriel & Lower L.A. Rivers & Mtns. Conservancy
	Colorado River Board		San Joaquin River Conservancy
	Conservation, Department of		Santa Monica Mtns. Conservancy
	Corrections, Department of		State Lands Commission
	Delta Protection Commission		SWRCB: Clean Water Grants
	Education, Department of	x	SWRCB: Water Quality
	Energy Commission		SWRCB: Water Rights
x	Fish & Game Region # 4		Tahoe Regional Planning Agency
	Food & Agriculture, Department of		Toxic Substances Control, Department of
	Forestry and Fire Protection, Department of	x	Water Resources, Department of
	General Services, Department of		
	Health Services, Department of	X	Other: Tuolumne County Community Development Department- Land Use Division
	Housing & Community Development	X	Other: California Environmental Protection Agency
x	Native American Heritage Commission		

Local Public Review Period (to be filled in by lead agency)

Starting Date February 15, 2022 Ending Date March 16, 2022

Lead Agency (Complete if applicable):

Consulting Firm: _____ Applicant: _____
Address: _____ Address: _____
City/State/Zip: _____ City/State/Zip: _____
Contact: _____ Phone: _____
Phone: _____

Signature of Lead Agency Representative: Jaymie Brauer **Date:** 2/15/22

Authority cited: Section 21083, Public Resources Code. Reference: Section 21161, Public Resources Code.

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P.O. Box 2815
Sacramento, CA 95812
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Tuolumne County Community Development Department- Land Use and Natural Resources Division
2 South Green Street
Sonora, CA 95370

Tuolumne County Air Pollution Control District
22365 S Airport Rd, Sonora, CA 95370

U S. Fish and Wildlife Service
2800 Cottage Way
Rm W-2605
Sacramento, CA 95825

U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105

Chicken Ranch Rancheria of Me-Wuk Indians of California
Attn: Waylon Coates
PO Box 1159
Jamestown, CA 95327

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MITIGATED NEGATIVE DECLARATION

As Lead Agency under the California Environmental Quality Act (CEQA), the Twain Harte Community Service District (District) reviewed the project described below to determine whether it could have a significant effect on the environment because of its development. In accordance with CEQA Guidelines Section 15382: "significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.

Project Name

Twain Harte Pipeline Improvement Project

Project Location

The proposed project is located within the boundaries of the Twain Harte Community Service District (District). The District serves the unincorporated community of Twain Harte, Tuolumne County, California.

Project Description

The proposed project consists of the replacement of existing deteriorating 4- to 10-inch diameter sewer pipelines, within existing road rights of way and utility easements. In addition, severely damaged manhole covers will also be replaced. These areas include the following locations:

- Adjacent to Twain Harte Lake.
- Two located around Marquis Drive.
- Twain Harte Drive to Spruce Drive.
- Fuller to Manzanita Drive.
- Golf Club Drive (South).
- Sewer crossing of inlet to Twain Harte Lake.
- Willowood Drive and Tuolumne Drive.
- Golf Club Drive.

The District provides water, parks, recreation, and fire protection services and operates and maintains the sewer collection system serving the community with an estimated population of 2,500, which includes a total of 1,607 equivalent single-family resident units and 1,436 physical connections (1,347 residential, 84 commercial and 5 public facilities).

The District is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the areas listed above. Implementation of the proposed project will allow the District to maintain, replace, and upgrade its sewer system so that it can continue to comply

with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality.

Construction is expected to take approximately five months, with construction anticipated to start in Q2 of 2023 (depending on funding). Some of the pipeline runs above ground sitting on cradles and in some areas the pipe is belowground. The pipelines being replaced belowground will be abandoned in place and remain under ground.

The construction will require approximately 10 crew members. Construction equipment will include a backhoe, bobcat, trencher, generator, grader, dump truck, concrete truck, and three pickup trucks. Construction will include exposing the existing sewer pipeline for replacement. The depth of ground excavation or trenching will be no more than 6 ft below grade.

Mailing Address and Phone Number of Contact Person

Twain Harte Community Services District
22912 Vantage Pointe Drive
Twain Harte, CA 95383
Contact person: Jeff Black, PE
(209) 586-3172

Findings

As Lead Agency in compliance with CEQA Guidelines Section 15102, the Twain Harte Community Services District (District) finds that the project will not have a significant adverse effect on the environment. The Initial Study (IS) (see *Section 3 – Initial Study*) identified one or more potentially significant effects on the environment, but revisions to the project have been made before the release of this Mitigated Negative Declaration (MND) or mitigation measures would be implemented that reduce all potentially significant impacts less-than-significant levels. The County further finds that there is no substantial evidence that this project would have a significant effect on the environment.

Mitigation Measures Included in the Project to Avoid Potentially Significant Effects

MM BIO-1: If project construction activities will be initiated during the nesting season (February 1 to September 15), a pre-activity nesting bird survey shall be conducted within 14 days prior to the start of project activities. The surveys shall encompass the proposed project footprint and accessible areas or land visible from accessible areas within a 250-foot buffer for songbirds and a 500-foot buffer for raptors. If no active nests are found, no further action is required. However, existing nests may become active and new nests may be built at any time prior to and throughout the nesting season, including when construction activities are in progress.

If active nests are found during the survey or at any time during construction of the proposed project, an avoidance buffer ranging from 50 feet to 500 feet may be required, with the avoidance buffer from any specific nest being determined by a qualified biologist. The avoidance buffer will remain in place until the biologist has determined that the young are no longer reliant on the adults or the nest, or if breeding attempts have otherwise been unsuccessful. Work may occur within the avoidance buffer under the approval and guidance of the biologist, but full-time monitoring may be required. The biologist shall have the ability to stop construction if nesting adults show any sign of distress.

MM BIO-2: Prior to the initiation of construction activities, all construction personnel shall attend a Worker Environmental Awareness Training program developed by a qualified biologist. Any personnel associated with construction that did not attend the initial training shall be trained by the authorized biologist prior to working on the project area. Any employee responsible for the operations and maintenance or decommissioning of the project facilities shall also attend the Worker Environmental Awareness Training program prior to starting work on the project and on an annual basis. The Program shall be developed and presented by the project qualified biologist(s) or designee approved by the qualified biologist(s). The program shall include information on the life histories of special-status species with potential to occur on the proposed project, their legal status, course of action shall these species be encountered onsite, and avoidance and minimization measures to protect these species. It shall include the components described below:

a. Information on the life history and identification of special-status species that may occur or that may be affected by project activities. The program shall also discuss the legal protection status of each such species, the definition of "take" under the Federal Endangered Species Act and California Endangered Species Act, measures the project proponent/operator shall implement to protect the species, reporting requirements, specific measures for workers to avoid take of special-status plant and wildlife species, and penalties for violation of the requirements outlined in the California Environmental Quality Act mitigation measures and agency permit requirements.

b. An acknowledgement form signed by each worker indicating that the Worker Environmental Awareness Training and Education Program has been completed shall be kept on file at the construction site.

c. A copy of the training transcript and/or training video, as well as a list of the names of all personnel who attended the Worker Environmental Awareness Training and Education Program, and signed acknowledgement forms shall be submitted to the Tuolumne County Planning Department.

d. A copy of the training transcript, training video or informational binder for specific procedures shall be kept available for all personnel to review and be familiar with as necessary.

e. A sticker shall be placed on hard hats indicating that the worker has completed the Worker Environmental Awareness Training and Education Program. Construction

workers shall not be permitted to operate equipment within the construction areas unless they have attended the Worker Environmental Awareness Training and Education Program and are wearing hard hats with the required sticker.

MM BIO-3: If the proposed project is expected to occur during the blooming period, as listed in Table 3.4.4-1, positive plant identification may occur. If these species are observed, they shall be avoided to maximum extent possible. If project activities cannot avoid those areas, a qualified botanist or biologist may have opportunity to salvage and relocate the plants that will be impacted.

Table 3.4.4-1
Blooming Period of Special-status Plants with Potential to Occur

Special-Status Plant Species	Optimal Blooming Period
Clarkia australis Small's southern clarkia	May - August
Clarkia biloba ssp. *australis* Mariposa clarkia	April - July
Diplacus pulchellus yellow-lip pansy monkeyflower	April - July
Erythronium tuolumnense Tuolumne fawn lily	March - June
Iris hartwegii ssp. *columbiana* Tuolumne iris	May - June
Navarretia miwukensis Mi-Wuk navarretia	May - August
Rhynchospora capitellata brownish beaked-rush	July - August

MM BIO-4: The introduction and spread of invasive and non-native plant species shall be avoided and controlled wherever possible during construction, on both the project and surrounding areas. This may be achieved through measures such as cleaning vehicles and equipment before they enter construction areas, removing invasive species that exist on the site and disposing of the removed debris in a manner that prohibits their spread on- and off-site.

MM BIO-5: To reduce any indirect impacts to special-status plants that may be in the vicinity of the proposed project, best management practices (BMPs) shall be implemented to control dust pollution, prevent discharge of potentially harmful chemicals, and prevent changes in hydrology. BMPs may include the installation of erosion and sedimentation control devices, applying water to control dust, placing drip pans under equipment when not in use, refueling in designated areas, and containing concrete washout properly, among other practices.

MM CUL-1: Prior to any ground disturbance, the project developer/contractor shall retain a qualified archaeologist, defined as an archaeologist meeting the Secretary of the Interior's

Standards for professional archaeology (U.S. Department of the Interior, 2011), to carry out all mitigation measures related to archaeological and historical resources.

a. Prior to the start of any ground-disturbing or construction activities, Cultural Resources Sensitivity Training shall be conducted. This includes an overview of potential cultural resources that could be encountered during ground disturbing activities to facilitate worker recognition, avoidance, and subsequent immediate notification of the qualified archaeologist and/or Native American monitor for further evaluation and action, as appropriate; and penalties for unauthorized artifact collecting or intentional disturbance of archaeological resources.

b. The project operator shall ensure all new employees who have not participated in earlier Cultural Resources Sensitivity Trainings shall:

- Participate in Cultural Resources Sensitivity Training as described above.
- Shall be provided a Cultural Resources Sensitivity Training guide for all personnel that is approved by the Lead archaeologist and.
- The Cultural Resources Sensitivity Training guide shall be kept available for all personnel to review and be familiar with as necessary.

MM CUL-2: Prior to any ground disturbance, the developer/contractor shall enter into an agreement with the Chicken Ranch Rancheria of Me-Wuk Indians of California. If requested, the developer shall:

a. Retain a qualified native American monitor to be onsite during initial ground disturbance activities.

b. Retain a qualified tribal member to conduct a Cultural Resources Sensitivity training session with the construction crew prior to ground disturbance activities.

Evidence of the agreement with the Chicken Ranch Rancheria of Me-Wuk Indians of California tribe shall be submitted to the lead agency as evidence of compliance.

MM CUL-3: The Wildwood Ditch (**P-55-006544)** shall be substantially flagged as an Environmentally Sensitive Area (ESA) prior to construction as determined by the Lead Archaeologist in consultation with the Native American monitor and carefully monitored to ensure avoidance.

MM CUL-4: Prior to any excavation in Marquis Drive (Sections 3A and 3B), a Phase II test excavation program shall be implemented to determine whether significant artifacts or features occur in the proposed locations for sewer line improvements. Significant features would include, but not limited to, house and round house floors and other structural remains, human burials, cooking hearths, other stone features, storage pits, food processing areas and tool manufacturing loci.

MM CUL-5: If prehistoric or historic-era cultural materials are encountered during construction activities, all work in the immediate vicinity of the find shall halt until a

qualified archaeologist can evaluate the find and make recommendations. Cultural resource materials may include prehistoric resources such as flaked and ground stone tools and debris, shell, bone, ceramics, and fire-affected rock as well as historic resources such as glass, metal, wood, brick, or structural remnants. If the qualified archaeologist determines that the discovery represents a potentially significant cultural resource, additional investigations may be required to mitigate adverse impacts from project implementation. These additional studies may include avoidance, testing, and evaluation or data recovery excavation.

MM CUL-6: If human remains are discovered during construction or operational activities, further excavation or disturbance shall be prohibited pursuant to Section 7050.5 of the California Health and Safety Code. The specific protocol, guidelines, and channels of communication outlined by the NAHC, in accordance with Section 7050.5 of the Health and Safety Code, Section 5097.98 of the Public Resources Code (Chapter 1492, Statutes of 1982, Senate Bill 297), and Senate Bill 447 (Chapter 44, Statutes of 1987), shall be followed. Section 7050.5(c) shall guide the potential Native American involvement, in the event of discovery of human remains, at the direction of the county coroner.

MM GEO-1: Prior to issuing of grading or building permits, if required, (a) the project developer shall prepare and implement a Type 1 Linear Underground/Overhead Projects SWPPP (LUP SWPPP), if applicable. The LUP SWPPP shall comply with the General National Pollutant Discharge Elimination System (NPDES) from the Central Valley Regional Water Quality Control Board. The requirements of the SWPPP and NPDES shall be incorporated into design specifications and construction contracts.

MM GEO-2: The project shall avoid and minimize impacts to paleontological resources. If a potentially significant paleontological resource is encountered during ground disturbance activities, all construction within a 100-foot radius of the find shall immediately cease until a qualified paleontologist determines whether the resources require further study. The owner shall include a standard inadvertent discovery clause in every construction contract to inform contractors of this requirement. The paleontologist shall notify the Lead Agency and the project proponent of the procedures that must be followed before construction is allowed to resume at the location of the find.

If the find is determined to be significant and the Lead Agency determines avoidance is not feasible, the paleontologist shall design and implement a data recovery plan consistent with the applicable standards. The plan shall be submitted to the Lead Agency for review and approval. Upon approval, the plan shall be incorporated into the project.

MM NSE-1: During construction, the project developer shall implement the following measures:

a. All stationary construction equipment on the project site shall be located so that noise emitting objects or equipment faces away from any potential sensitive receptors.

b. The construction contractor shall ensure that all construction equipment is equipped with manufacturer-approved mufflers and baffles and cover equipment with sound

blankets, to the extent feasible. During construction, stationary construction equipment shall be placed such that emitted noise is directed away from sensitive noise receivers.

c. Construction activities shall take place during daylight hours, when feasible.

SECTION 1 - INTRODUCTION

1.1 - Overview

The Twain Harte Community Service District (District/Lead Agency) proposes the replacement of existing deteriorated sewer pipelines and the replacement of manhole covers project. The project will be funded with State Revolving Funds. The Lead Agency has developed this CEQA document to fulfill both the CEQA and the federal cross-cutter regulation requirements.

1.2 - California Environmental Quality Act

This IS/MND examines the potential environmental effects of the replacement of existing 4- to 10-inch diameter pipelines, within existing rights of way and utility easements. In addition, severely damaged manhole covers will also be replaced. The project site is located within the Twain Harte Community Service District service area.

The Twain Harte Community Service District is the Lead Agency for this project pursuant to the CEQA Guidelines (Public Resources Code Section 15000 *et seq.*). Section 15063 of the CEQA Guidelines requires the Lead Agency to prepare an IS to determine whether a discretionary project will have a significant effect on the environment. A Mitigated Negative Declaration (MND) is appropriate when an IS has been prepared and a determination can be made that no significant environmental effects will occur because revisions to the project have been made or mitigation measures will be implemented that reduce all potentially significant impacts to less-than-significant levels. The content of an MND is the same as a Negative Declaration, with the addition of identified mitigation measures and a Mitigation Monitoring and Reporting Program (MMRP) (See *Section 4 - Mitigation Monitoring and Reporting Plan*).

Based on the IS, the Lead Agency has determined that the environmental review for the proposed application can be completed with an MND.

1.3 - Impact Terminology

The following terminology is used to describe the level of significance of impacts.

- A finding of *no impact* is appropriate if the analysis concludes that the project would not affect the particular topic area in any way.
- An impact is considered *less than significant* if the analysis concludes that it would cause no substantial adverse change to the environment and requires no mitigation.
- An impact is considered *less than significant with mitigation incorporated* if the analysis concludes that it would cause no substantial adverse change to the environment with the inclusion of environmental commitments that have been agreed to by the applicant.
- An impact is considered *potentially significant* if the analysis concludes that it could have a substantial adverse effect on the environment.

1.4 - Document Organization and Contents

The content and format of this IS/MND is designed to meet the requirements of CEQA. The report contains the following sections:

- *Section 1 – Introduction:* This section provides an overview of CEQA requirements, intended uses of the IS/MND, document organization, and a list of regulations that have been incorporated by reference.
- *Section 2 – Project Description:* This section describes the project and provides data on the site's location.
- *Section 3 – Initial Study:* This section contains the evaluation of 21 different environmental resource factors contained in Appendix G of the CEQA Guidelines. Each environmental resource factor is analyzed to determine whether the proposed project would have an impact. One of four findings is made which include: no impact, less-than-significant impact, less than significant with mitigation, or significant and unavoidable. If the evaluation results in a finding of significant and unavoidable for any of the 21 environmental resource factors, then an Environmental Impact Report will be required.
- *Section 4 – Mitigation Monitoring and Reporting Plan:* This section contains a Mitigation Monitoring and Reporting Program that summarizes the impacts, mitigation measures, and level of significance after mitigation.
- *Section 5 – List of Preparers:* This section identifies the individuals who prepared the IS/MND.
- *Section 6 – References:* This section contains a full list of references that were used in the preparation of this IS/MND.

1.5 - Regulation Incorporated by Reference

The following regulations are incorporated into this IS/MND by reference. Other applicable federal, State, and regional regulations are referenced throughout this document:

- Tuolumne County General Plan.
- Tuolumne County Zoning Ordinance.
- Tuolumne County Water Urban Management.
- Tuolumne County Airport Land Use Compatibility Plan.
- Tuolumne County Multi-Jurisdictional Hazard Mitigation Plan- Annex C Twain Harte Community Services District.
- Tuolumne County Multi-Hazard Emergency Response Plan.
- Twain Harte Community Services District Strategic Plan.

SECTION 2 - PROJECT DESCRIPTION

2.1 - Introduction/Background

The Twain Harte Community Service District (District/Lead Agency) proposes the replacement of existing deteriorated 4- to 10-inch diameter sewer pipelines so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality (project). In addition, severely damaged manhole covers will also be replaced.

The project will be funded with State Revolving Funds. The Lead Agency has developed this CEQA document to fulfill both the CEQA and the federal cross-cutter regulation requirements.

2.2 - Project Location

The proposed project is located in the unincorporated community of Twain Harte, Tuolumne County, California (Figure 2-1). The project area is within the boundaries of the Twain Harte Community Service District (Figure 2-2).

2.3 - Project Environment

The proposed project is located in the unincorporated community of Twain Harte in Tuolumne County, California. Twain Harte is accessible via State Route (SR) 108 and is in the foothills of the western Sierra Nevada Mountain range, approximately 50 miles northeast of Modesto, California and 8.5 miles northeast of Sonora, California. The topography of Twain Harte comprises of hillsides slope upward away from this valley to the northwest and southeast with various changes in topography. Elevation in the project area ranges from approximately 3,500 feet above mean sea level at the southwest end of the project to approximately 3,760 feet above mean sea level at its northern end.

The proposed project is in portions of Sections 8, 9, 16 and 17, Township 2 North, Range 16 East, Mount Diablo Base & Meridian of the Public Land Survey System. It located within the Twain Harte United States Geological (USGS) 7.5-minute topographic quadrangle.



Figure 2-1
Regional Map

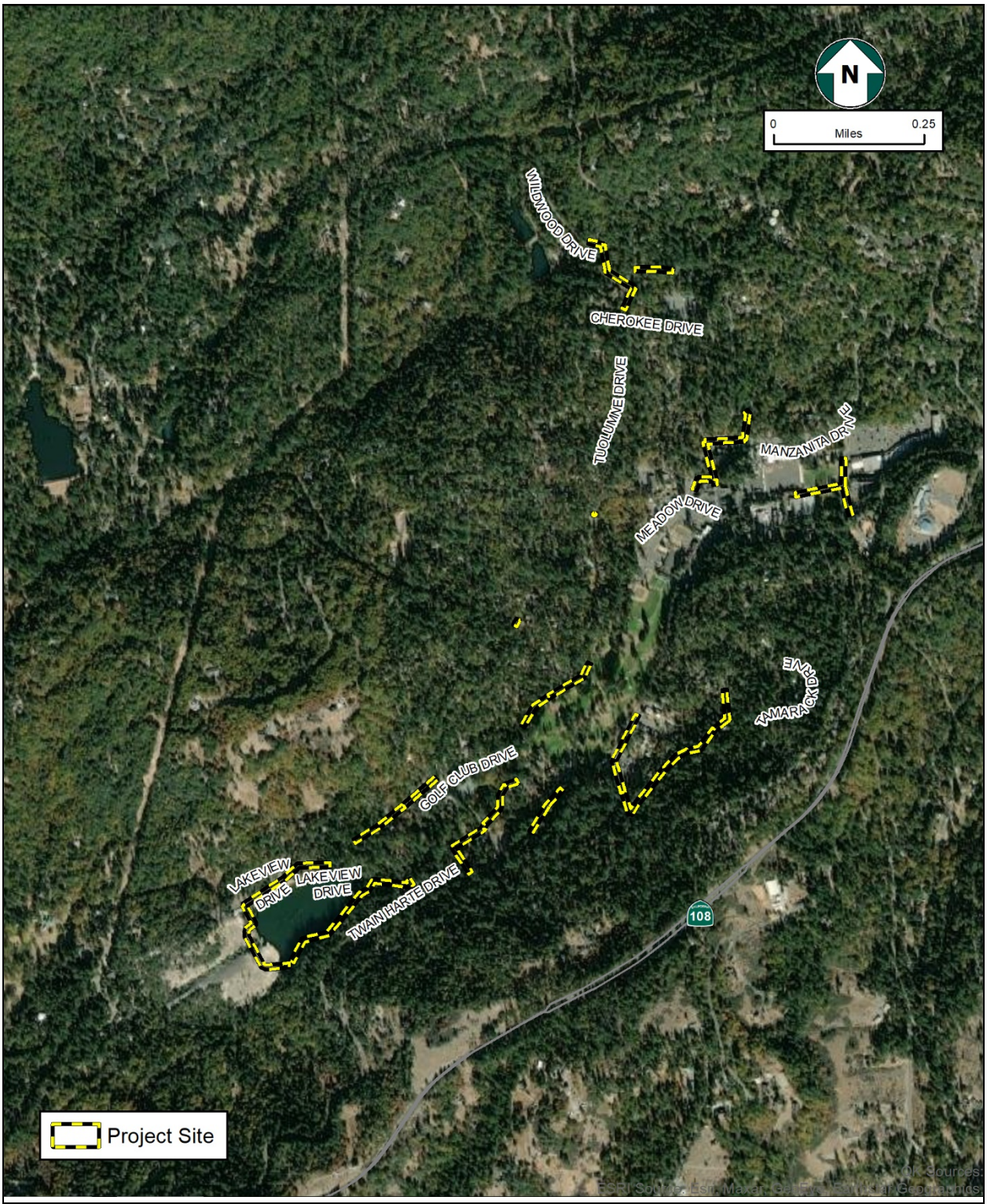


Figure 2-2
Project Area

2.4 - Proposed Project

The proposed project consists of the replacement of existing deteriorating 4- to 10-inch diameter sewer pipelines within existing road rights of way and utilities easements. In addition, severely damaged manhole covers will also be replaced. These areas include the following:

- Adjacent to Twain Harte Lake.
- Two located around Marquis Drive.
- Twain Harte Drive to Spruce Drive.
- Fuller to Manzanita Drive.
- Golf Club Drive (South).
- Sewer crossing of inlet to Twain Harte Lake.
- Willowood Drive and Tuolumne Drive.
- Golf Club Drive.

The District provides water, parks, recreation, and fire protection services and operates and maintains the sewer collection system serving the community with an estimated population of 2,500, which includes a total of 1,607 equivalent single-family resident units and 1,436 physical connections (1,347 residential, 84 commercial and 5 public facilities).

The District is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the areas listed above. Implementation of the proposed project will allow the District to maintain, replace, and upgrade its sewer system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality.

Construction is expected to take approximately five months, with construction anticipated to start in Q2 of 2023 (depending on funding). Some of the pipeline runs above ground sitting on cradles and in some areas the pipe is belowground. The pipelines being replaced belowground will be abandoned in place and remain under ground. The depth of ground excavation or trenching will be no more than 6 ft below grade.

The construction will require approximately 10 crew members. Construction equipment will include a backhoe, bobcat, trencher, generator, grader, dump truck, concrete truck, and three pickup trucks. Some of the pipeline runs above ground sitting on cradles and in some areas the pipe is belowground. The pipelines being replaced belowground will be abandoned in place and remain under ground.

SECTION 3 - INITIAL STUDY

3.1 - Environmental Checklist

1. **Project Title:**

   Twain Harte Pipeline Improvement Project

2. **Lead Agency Name and Address:**

   Twain Harte Community Services District
   22912 Vantage Pointe Drive
   Twain Harte, CA 95383

3. **Contact Person and Phone Number:**

   Jeff Black, PE
   (209) 322-1820

4. **Project Location:**

   The proposed project is located within the boundaries of the Twain Harte Community Service District (District). The District serves the unincorporated community of Twain Harte, Tuolumne County, California.

5. **Project Sponsor's Name and Address:**

   Same as above

6. **Tuolumne County General Plan Designation:**

   The unincorporated community of Twain Harte consists of the following designations:

   - R/P- Parks and Recreation
   - GC- General Commercial
   - LDR- Low Density Residential
   - MU- Mixed Use

7. **Zoning:**

   Zoning within the project area consists of these zones:

   - R-A: (Rural Residential) allows single-family dwellings and farming uses.
   - C-1: (General Commercial) Zone is intended for retail stores and businesses, which do not involve manufacturing and/or processing.

8. Description of Project:

The proposed project consists of the replacement of existing deteriorating 4- to 10-inch diameter sewer pipelines within existing rights of way and utility easements. In addition, severely damaged manhole covers will also be replaced. These areas include the following:

- Adjacent to Twain Harte Lake.
- Two located around Marquis Drive.
- Twain Harte Drive to Spruce Drive.
- Fuller to Manzanita Drive.
- Golf Club Drive (South).
- Sewer crossing of inlet to Twain Harte Lake.
- Willowood Drive and Tuolumne Drive.
- Golf Club Drive.

The District is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the areas listed above. Implementation of the proposed project will allow the District to maintain, replace, and upgrade its sewer system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality. Construction will include exposing the existing sewer pipeline, which will be abandoned in place and remain under ground replacement, and a new pipeline will be installed.

9. Surrounding Land Uses and Setting:

The surrounding land uses includes residential and commercial land uses, and undeveloped parcels. The replacement of the pipelines would occur along existing rights-a-way and utility easements.

Other Public Agencies Whose Approval May be Required:

- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- California Department of Water Resources
- Central Valley Regional Water Quality Control Board
- California Department of Fish and Wildlife- Region 4
- Native American Heritage Commission
- Tuolumne County Air Pollution Control District
- County of Tuolumne

3.2 - Environmental Factors Potentially Affected

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture and Forestry Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Energy
☐ Geology / Soils	☐ Greenhouse Gas Emissions	☐ Hazards & Hazardous Materials
☐ Hydrology / Water Quality	☐ Land Use / Planning	☐ Mineral Resources
☐ Noise	☐ Population / Housing	☐ Public Services
☐ Recreation	☐ Transportation	☐ Tribal Cultural Resources
☐ Utilities / Service Systems	☐ Wildfire	☐ Mandatory Findings of Significance

3.3 - Determination

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a “potentially significant impact” or “potentially significant unless mitigated” impact on the environment, but at least one effect (a) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (b) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENT IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed

adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Signature	Date
Printed Name	For

3.4 - Evaluation of Environmental Impacts

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a Lead Agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2. All answers must take account of the whole action involved, including offsite as well as onsite, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3. Once the Lead Agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4. "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less-Than-Significant Impact." The Lead Agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less-than-significant level (mitigation measures from "Earlier Analyses," as described in (5) below, may be cross-referenced).

5. Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

    a. Earlier Analysis Used. Identify and state where they are available for review.

    b. Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

    c. Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9. The explanation of each issue should identify:

    a. The significance criteria or threshold, if any, used to evaluate each question.
    b. The mitigation measure identified, if any, to reduce the impact to less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.1 - AESTHETICS					
Except as provided in Public Resources Code Section 21099, would the project:					
a.	Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b.	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?	☐	☐	☒	☐
c.	In nonurbanized area, substantially degrade the existing visual character or quality of public views of the site and its surroundings? If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☐	☒
d.	Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

Discussion

Impact #3.4.1a – Would the project have a substantial adverse effect on a scenic vista?

The proposed project area is located in an area that is developed and not located in or near any designated scenic vistas. There are only three vistas points officially designated by Caltrans. These vistas points are located along SR 120, located approximately 25 miles southwest of the project area. There are no known aesthetic resources existing on or near the project site (Tuolumne County, 2018b). Additionally, the pipelines being replaced will be abandoned in place and remain under ground and any obstruction cause by equipment would be temporary in nature. The proposed project will be installed underground. The proposed project will not have an adverse effect on known scenic vistas. Therefore, impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact.*

Impact #3.4.1b – Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?

See Impact #3.4.1a, above.

The project area does not contain any designated scenic highways, pursuant to the California Streets and Highways Code, Sections 260 through 263 The closest designated Scenic Highway is a portion of SR 4 near Arnold, which is approximately 15 miles to the northwest (California Department of Transportation, 2022). The project would be visible from that roadway. here are eligible segments of SR 49 that are being considered as State scenic highways, but at this time, neither road has been formally designated as such (Tuolumne County, 2018b).

During project-related activities, the visual character of the project would be impacted as a result of trenching and other construction-related activities. However, these impacts would be short-term, temporary, and are typical of these types of activities. The long-term operation of the underground pipelines would not present the potential to impact the visual character. There are no known historic buildings, trees, rock outcroppings, historic buildings or scenic highways that have been identified. Therefore, the proposed project would have a less-than-significant impact on scenic resources within a scenic highway.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.1c – In nonurbanized area, substantially degrade the existing visual character or quality of public views of the site and its surroundings? If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

See discussion of Impact #3.4.1a and #3.4.1b, above.

All project work will be limited to the pipeline route and temporary. Construction equipment may temporarily obstruct views within the community during the installation of the pipeline along each section of road. Once completed the proposed project's appearance will not substantially degrade the existing visual character or quality of public views of the site and its surroundings. The proposed project will not conflict with local zoning or other regulations governing scenic quality. Therefore, the proposed project will have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact.***

Impact #3.4.1d – Would the project create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

Construction activities on the proposed project would typically be conducted during daylight hours, from 7:00 a.m. to 6:00 p.m. In the unlikely event that work is performed between dusk and 6:00 a.m., construction crews will use minimal illumination to perform the work safely. All construction lighting would be directed downward and shielded to focus illumination on the desired work areas only and prevent light spillage onto adjacent properties.

Compliance with the Twain Harte Design Review and Planning Advisory Guidelines (Tuolumne County, 2007) would ensure that the proposed project would not adversely affect day or nighttime views significantly in the area and impacts related to light or glare would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant***.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact

3.4.2 - AGRICULTURE AND FORESTRY RESOURCES

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the State's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

a.	Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?	☐	☐	☐	☒
b.	Conflict with existing zoning for agricultural use or a Williamson Act Contract?	☐	☐	☐	☒
c.	Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220[g]), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104[g])?	☐	☐	☐	☒
d.	Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e.	Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to nonagricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

Discussion

Impact #3.4.2a – Would the project convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?

The project is primarily located within existing ROW the area is not designated as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland) as

designated by the Department of Conservation's (DOC) Farmland Mapping and Monitoring Program (FMMP). The project area is designated as Urban and Built-up Land by the DOC FMMP (Department of Conservation, 2021). The proposed project will not convert Prime, Unique or Statewide Important Farmland; therefore, the project will have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.2b – Would the project conflict with existing zoning for agricultural use or a Williamson Act Contract?

The majority project area is generally within a Low Density Residential and General Commercial land use designation. As previously mentioned, no parcels in the project area are subject to a Williamson Act Land Use contract. There are no surrounding properties that are zoned for agricultural, under cultivation and/or subject to a Land Use contract. However, implementation of the project would not conflict with land zoned for agricultural uses or cause conversion to a nonagricultural use of a property under a Williamson Act land use contract. Therefore, the project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***no impact.***

Impact #3.4.2c – Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code Section 12220[g]), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104[g])?

The California Public Resources Code Section 12220(g) defines "Forest Land" as "land that can support 10-percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits."

There is no land in or near the project site that is identified as forest land or timberland. The project areas are within existing roads. Therefore, implementation of the project would have no impact on forest land or timberland.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.2d – Would the project result in the loss of forest land or conversion of forest land to non-forest use?

See discussion of Impact #3.4.2c, above.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.2e – Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to nonagricultural use or conversion of forest land to non-forest use?

See discussion of Impacts #3.4.2a, #3.4.2b, and #3.4.2c, above. The project site consists of developed areas within the community of Twain Harte, and will use existing road rights of way, paved roadways and utility easements. As such, no Farmland or forest land would be impacted or converted to a nonagricultural use during construction-related activities. The project would not result in the conversion of agriculturally productive land to nonagricultural uses. There would be no impacts.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***no impact.***

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact

3.4.3 - AIR QUALITY

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

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

Discussion

The following analysis is based on the Air Quality Conformity Analysis prepared for the proposed project (Trinity Consultants, 2021) found in Appendix A of this document.

Impact #3.4.3a – Would the project Conflict with or obstruct implementation of the applicable air quality plan?

The project site and all of Tuolumne County is within the Mountain Counties Air Basin. The Tuolumne County Air Pollution Control District (TCAPCD) has jurisdiction over most air quality matter in the County.

Under the provisions of the U.S. Clean Air Act, the Tuolumne County portion of the MCAB has been classified as nonattainment/extreme, nonattainment/severe, nonattainment, attainment/unclassified, attainment, or unclassified under the established NAAQS and CAAQS for various criteria pollutants.

The Environmental Protection Act (EPA) has established pollutant specific "significant impact levels" (SIL) to be used in the PSD program to determine whether proposed construction would impact the NAAQS in attainment areas. The PSD SIL thresholds are used with ambient air quality modeling for a CEQA project to address whether the project would "violate any air quality standard or contribute substantially to an existing or projected air quality violation." A project's impacts are considered less than significant if emissions are

below the PSD SIL for a particular pollutant. Ambient air quality emissions estimates below the PSD SIL thresholds would result in less-than-significant ambient air quality impacts on both a project and cumulative CEQA impact analysis. When a SIL is exceeded, an additional "increment analysis" is required. PSD SILs and increments are more stringent than the CAAQS or NAAQS and represent the most stringent thresholds of significance.

TCAPCD's Air Rules and Regulations define a "major source" as a stationary source which has the potential to emit a regulated air pollutant or Hazardous Air Pollutant (HAP) in quantities equal to or exceeding the lesser of any of the following thresholds:

- 100 tons per year (tpy) of any regulated air pollutant.
- 10 tpy of one HAP or 25 tpy of two or more HAPs.
- Any lesser quantity threshold promulgated by the U.S. EPA.

As the project would not include any new major sources or major modifications to existing stationary sources under NSR, it would not be subject to either PSD or NSR review. The MCAB is classified as nonattainment for the O3 NAAQS and as attainment or unclassifiable for the PM, CO, NOx, SOx, and Lead NAAQS.

TCAPCD's Rule 408 (Attainment Pollutant Air Quality Analysis) states, "The [air quality simulation model designated in Rule 407] shall consider air quality impacts projected for the area as a result of general commercial, residential, industrial, and other growth associated with the facility if such facility or modification is proposed to employ more than 2,000 new residents" (TCAPCD 2020). The proposed project will not house any new residents; therefore, air quality simulation modeling for MCAB attainment pollutants is not required.

TCAPCD's Rule 419 (Nonattainment Pollutant Air Quality Analysis) states, "Where a facility or modification is constructed in phases which individually do not emit more than 100 tons per year of a nonattainment pollutant or precursor, the allowable emissions from all such phases granted an Authority to Construct after December 21, 1976, shall be added together and this Rule shall be applicable when a proposed phase would cause the sum of the allowable emissions to exceed 100 tons per year of such nonattainment pollutant or precursor. The proposed project is not anticipated to increase operational emissions and will not exceed a combined total of less than 100 tons per year of O3 precursor pollutants (ROG, NOx, and CO); therefore, air quality simulation modeling for MCAB nonattainment pollutants is not required.

The project is in compliance with TCAPCD plans, rules, goals and policies, and will not contribute significantly to violations of the NAAQS or CAAQS.

Construction

The project would generate short-term construction emissions generated by the replacement of existing pipeline. Construction emissions of the proposed project were estimated using a 5-month construction schedule and using the following equipment: backhoe, bobcat, trencher, generator, grader, dump truck and concrete truck. All

construction equipment activity levels were assumed based on the specified CalEEMod default values for type and number of equipment, hours per day and horsepower.

As seen on Tables 3.4.3-1 and 3.4.3-2 the emissions from short-term pipeline replacement activities emissions would be minimal and would not exceed TCAPCD significance thresholds levels during any given year.

Table 3.4.3-1
Short-Term Project Emissions- Annual

	ROG	NOx	CO	SO2	PM10	PM2.5
			(Tons/Year)			
2023	0.09	0.80	0.74	0.00	0.04	0.04
TCAPCD Significance Threshold	100	100	100	NA	100	NA
Exceeds Threshold for a Single Year after Mitigation?	**No**	**No**	**No**	**NA**	**No**	**NA**

Source: (Trinity Consultants, 2021).

Table 3.4.3-2
Short-Term Project Emissions- Daily

	ROG	NOx	CO	SO2	PM10	PM2.5
			(Tons/Year)			
Summer	1.56	14.57	13.60	0.03	0.82	0.68
Winter	1.56	14.58	13.54	0.03	0.82	0.68
Max	1.56	14.58	13.60	0.03	0.82	0.68
TCAPCD Significance Threshold	1,000	1,000	1,000	NA	1,000	NA
Exceeds Threshold for a Single Year after Mitigation?	**No**	**No**	**No**	**NA**	**No**	**NA**

Source: (Trinity Consultants, 2021).

Based on these anticipated levels, project activities would not exceed construction emission thresholds. Therefore, construction emissions were found to be less than significant.

Long-term emissions are caused by operational mobile, area, and energy sources. Long-term emissions are not expected from the proposed project since there are no operational changes of the pipelines. Therefore, operational emissions were not quantified (Trinity Consultants, 2021).

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant.***

Impact #3.4.3b – Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

As discussed in Impact #3.4.3a above, the project would be required to comply with all applicable Air District and ARB standards, rules, and regulations for construction activities. As shown in Tables 3.4.3-1 and 3.4.3-2, project-related construction emissions do not exceed the Air District's thresholds of significance for any criteria pollutant.

Pipeline replacement activities would result in a limited number of vehicle trips associated with maintenance of the pipeline. As discussed in Impact #3.4.3a above, the project activities related emissions would not exceed the Air District's thresholds of significance and would not contribute substantially to an existing or projected air quality violations. Therefore, impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant.***

Impact #3.4.3c – Would the project expose sensitive receptors to substantial pollutant concentrations?

Sensitive receptors are those individuals who are sensitive to air pollution and include children, the elderly, and persons with pre-existing respiratory or cardiovascular illness. Examples of sensitive receptors include schools, parks and playgrounds, daycare centers, nursing homes, hospitals, and residential dwelling units. The nearest residential sensitive receptor to the proposed project site is 0.01 miles east of the project. The three known non-residential sensitive receptors within two miles of the proposed project site are listed below in Table 3.4.3-3.

Table 3.4.3-3
Sensitive Receptors Located < 2 Miles from Project

Receptor	Type of Facility	Distance from Project in Miles	Direction from Project
Twain Harte School	PK-8 Public	0.1	East
Crystal Falls Family Care Home	Nursing Home	0.83	West
Bellview Elementary School	K-6 Public	1.43	West

Source: (Trinity Consultants, 2021).

The closest school is Twain Harte School at 0.1 miles to the east. The closest hospital is Sierra Valley Medical Center at 7.8 miles southwest. The closest nursing home is Crystal Falls Family Care Home, approximately 0.8 miles to the west.

The proposed project would result in emissions of Hazardous Air Pollutants (HAPs) and would be located near sensitive receptors and workers. The only HAP expected to be emitted is Diesel Particulate Matter (DPM) from construction equipment and diesel trucks. There is currently no acute risk associated with DPM emissions. Chronic non-cancer and cancer risk are expected from long-term exposure, typically over one year of exposure. The project construction is expected to only last for five months; therefore, there would be no chronic non-cancer or cancer risk associated with exposure to the project's DPM construction emissions.

Naturally occurring asbestos can be released from serpentinite and ultramafic rocks when the rock is broken or crushed. At the point of release, the asbestos fibers may become airborne, causing air quality and human health hazards. These rocks have been commonly used for unpaved gravel roads, landscaping, fill projects, and other improvement projects in some localities. Asbestos may be released to the atmosphere due to vehicular traffic on unpaved roads, during grading of development projects, and at mining operations (Trinity Consultants, 2021).

Serpentinite and/or ultramafic rock are known to be present in 44 of California's 58 counties. These rocks are particularly abundant in the counties associated with the Sierra Nevada foothills, the Klamath Mountains, and Coast Ranges. However, according to information provided by the Department of Conservation Division of Mines and Geology, the project site is not located in an area where naturally occurring asbestos is likely to be present (CDCDMG, 2000). Therefore, impacts associated with exposure of construction workers and nearby sensitive receptors to asbestos would be less than significant(Trinity Consultants, 2021).

Based on the predicted non-existent operational emissions, the proposed project is not expected to affect any onsite or offsite sensitive receptors and is not expected to have any adverse impacts on any known sensitive receptor. Therefore, the proposed project will have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.3d – Would the project result in emissions (such as those leading to odors) adversely affecting a substantial number of people?

Some common types of facilities that have been known to produce odors in the SJVAB such as wastewater treatment facilities, sanitary landfills, transfer stations, composting facilities,

petroleum refinery, asphalt batch plants, chemical manufacturing plants, fiberglass manufacturing, paint/coating operations, food processing facilities, feed lot/dairy, and rendering plants. Any project with the potential to expose members of the public to objectionable odors has the potential to adversely impact the atmosphere (environment). Because of the subjective nature of odor impacts, the number of variables that may influence the potential for an odor impact, and the variety of odor sources; there are no quantitative or formulaic methodologies to determine if potential odors would have a significant impact. Projects should be evaluated on a case-by-case basis to determine if there are anticipated impacts to the environment associated with objectionable odors.

It is anticipated that the project construction-related activities would result in diesel emissions exhaust from equipment used for trenching along the existing pipeline system. These activities may release odors into the atmosphere. However, emissions would be short-term, temporary, and are not anticipated to affect a substantial number of receptors at any given time. The project is not expected to have an increase in operational emissions; therefore, it is not expected to be a source of objectionable odors Therefore, the proposed project will have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant***.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact

3.4.4 - BIOLOGICAL RESOURCES

Would the project:

a.	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
b.	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☒	☐	☐
c.	Have a substantial adverse effect on State or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d.	Interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f.	Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan?	☐	☐	☐	☒

Discussion

As described in the Clean Water State Revolving Fund (CWSRF) Cross-Cutting Environmental Review Process Guidelines for State Revolving Fund Loan Applications, CEQA-Plus requires compliance with the Federal Endangered Species Act. Applicants would need to provide State Water Resources Control Board (SWRCB) with any species lists,

biological assessments, and other documents that disclose information on a project's effect on sensitive species at the earliest date. SWRCB would confer informally with United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS), as appropriate. If there are federally-listed species that may be affected by a project, either directly or indirectly, SWRCB would evaluate the extent of any impacts as part of its environmental review process and submit its findings to the USFWS/NMFS. The analysis of impacts to Biological Resources is based upon a Biological Analysis Report prepared for the proposed project (QK, 2021), which is included as Appendix B.

Impact #3.4.4a – Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

The biological resources evaluation is based upon a review of available literature and databases and existing site conditions evaluated during a reconnaissance survey. These studies evaluated the potential for sensitive biological resources to occur on and in the vicinity of the project, and any impacts that could potentially occur.

A reconnaissance level survey conducted on September 15, 2021; one special-status wildlife species was determined to have potential to occur within the Biological Study Area (BSA): Northern goshawk (*Accipiter gentilis*). Nesting migratory birds also have the potential to occur within the BSA. These two biological resources have the potential to be impacted by the project. Direct impacts could include direct injury or mortality of individual special-status species and/or their young during the breeding and/or nesting season.

All project activities will occur on previously developed land (i.e., paved surfaces, residential lots and existing utility easements), so habitat loss for special-status species would be minimal. Indirect impacts are not expected to occur because the proposed project would have a short duration of construction, the timing of the project may occur during the nesting season, and project activities will not alter the general composition of the BSA. The proposed project is not expected to impact any other sensitive resources and would not conflict with local policies or ordinances, or conservation plans.

Special-Status Species

One special-status wildlife species determined to have potential to occur onsite.

NORTHERN GOSHAWK

The northern goshawk is a large raptor that prefers mature old-growth forests with relatively high canopy closures (QK, 2021). It typically nests in large trees on moderate slopes with open understories. Nests are built in coniferous, deciduous, or mixed-pine forests, usually in the largest tree available. Preferred prey items include rabbits, large rodents, and other birds, which goshawks will aggressively capture from an observation perch.

The nearest CNDDB occurrence for northern goshawk is approximately 2.8 miles northeast of the BSA, where a nest was observed in a stand of tall conifers between the Stanislaus River and Deer Creek in 1996 (EONDX 29760). This species was not observed during the September 15, 2021, reconnaissance survey, which was conducted on the last day of the accepted "nesting bird season", (February 1 and ends on September 15). There is suitable habitat for northern goshawk in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA and in the lands surrounding the BSA.

NESTING BIRDS

Habitat within the BSA would support nesting native bird species, which are protected by the federal Migratory Bird Treaty Act (MBTA) and the California Fish and Game Code. The site survey for the project was conducted on the last day of the nesting bird season (February 1 to September 15). No bird nests, active or inactive, were observed during the survey.

Various species of migratory birds will construct nests in a variety of habitats and structures, and nests may be constructed in trees or shrubs, man-made structures, and directly on the ground at any time during the nesting season. Since the BSA supports several types of habitats and characteristics suitable for nesting birds, it is likely that birds will nest within the BSA.

Construction

The project activities will occur on previously disturbed, developed land, and habitat loss would be minimal. Indirect impacts are not expected to occur because the project will have a short duration of construction.

CONCLUSION

The limited disturbance footprint for the proposed project and the short duration of construction activities at any given location, coupled with implementation of the proposed mitigation measures would reduce impacts to less-than-significant levels and would not result in a substantial adverse effect on special-status wildlife species and migratory birds. Mitigation Measure BIO-1 requires a pre-activity clearance survey prior to project activities. This measure will ensure that the proposed project site and vicinity is clear to avoid and minimize impacts to northern goshawk and nesting birds, as well as other special status species. Mitigation Measures BIO-2 requires construction personnel to receive training and information on the life histories of special-status species with potential to occur on the proposed project area, their legal status, course of action should these species be encountered onsite, and avoidance and minimization measures to protect these species. Implementation of Mitigation Measures BIO-1 and BIO-2 would reduce project-related construction impacts to less-than-significant levels.

MITIGATION MEASURE(S)

MM BIO-1: If project construction activities will be initiated during the nesting season (February 1 to September 15), a pre-activity nesting bird survey shall be conducted within 14 days prior to the start of project activities. The surveys shall encompass the proposed project footprint and accessible areas or land visible from accessible areas within a 250-foot buffer for songbirds and a 500-foot buffer for raptors. If no active nests are found, no further action is required. However, existing nests may become active and new nests may be built at any time prior to and throughout the nesting season, including when construction activities are in progress.

If active nests are found during the survey or at any time during construction of the proposed project, an avoidance buffer ranging from 50 feet to 500 feet may be required, with the avoidance buffer from any specific nest being determined by a qualified biologist. The avoidance buffer will remain in place until the biologist has determined that the young are no longer reliant on the adults or the nest, or if breeding attempts have otherwise been unsuccessful. Work may occur within the avoidance buffer under the approval and guidance of the biologist, but full-time monitoring may be required. The biologist shall have the ability to stop construction if nesting adults show any sign of distress.

MM BIO-2: Prior to the initiation of construction activities, all construction personnel shall attend a Worker Environmental Awareness Training program developed by a qualified biologist. Any personnel associated with construction that did not attend the initial training shall be trained by the authorized biologist prior to working on the project area. Any employee responsible for the operations and maintenance or decommissioning of the project facilities shall also attend the Worker Environmental Awareness Training program prior to starting work on the project and on an annual basis. The Program shall be developed and presented by the project qualified biologist(s) or designee approved by the qualified biologist(s). The program shall include information on the life histories of special-status species with potential to occur on the proposed project, their legal status, course of action shall these species be encountered onsite, and avoidance and minimization measures to protect these species. It shall include the components described below:

a. Information on the life history and identification of special-status species that may occur or that may be affected by project activities. The program shall also discuss the legal protection status of each such species, the definition of "take" under the Federal Endangered Species Act and California Endangered Species Act, measures the project proponent/operator shall implement to protect the species, reporting requirements, specific measures for workers to avoid take of special-status plant and wildlife species, and penalties for violation of the requirements outlined in the California Environmental Quality Act mitigation measures and agency permit requirements.

b. An acknowledgement form signed by each worker indicating that the Worker Environmental Awareness Training and Education Program has been completed shall be kept on file at the construction site.

c. A copy of the training transcript and/or training video, as well as a list of the names of all personnel who attended the Worker Environmental Awareness Training and Education Program, and signed acknowledgement forms shall be submitted to the Tuolumne County Planning Department.

d. A copy of the training transcript, training video or informational binder for specific procedures shall be kept available for all personnel to review and be familiar with as necessary.

e. A sticker shall be placed on hard hats indicating that the worker has completed the Worker Environmental Awareness Training and Education Program. Construction workers shall not be permitted to operate equipment within the construction areas unless they have attended the Worker Environmental Awareness Training and Education Program and are wearing hard hats with the required sticker.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated.*

Impact #3.4.4b – Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

There are seven special-status plant species that may occur within and near the project area and be potentially impacted by project activities, as detailed below. No plant species that may occur on the project area are federally or State listed for protection, but rare plants should be conserved to the extent possible.

SMALL'S SOUTHERN CLARKIA

The Small's southern clarkia is endemic to California and typically occurs in open, rocky sites within cismontane woodland and lower montane coniferous forest habitats. It blooms from May to August and occurs at elevations between 2,625 and 6,810 feet. The Small's southern clarkia is primarily threatened by logging activities.

The is one CNDDB record of this species from 1965 that overlaps the 250-foot survey buffer for the project. This species was not observed during the September 15, 2021, reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat for Small's southern clarkia in the Montane Hardwood-Conifer habitat that is present throughout much of project area (QK, 2021).

MARIPOSA CLARKIA

The Mariposa clarkia is an annual herb, endemic to California. It occurs in serpentinite soils, in chaparral, ultramafic, and foothill and cismontane woodlands and sometimes in riparian areas as well as large talus rockslides (QK, 2021). The Mariposa clarkia has a blooming

period from April to July and occurs at elevations between 980 and 4,790 feet. It is threatened by road maintenance, foot traffic and competition with non-native plants.

The nearest CNDDB record for Mariposa clarkia is approximately 1.1 miles southwest of the BSA, from 1958 (QK, 2021). Another CNDDB occurrence is approximately 2.1 miles southeast of the proposed project, where a large population was observed over multiple years between 2001 and 2008 (QK, 2021). This species was not observed during the September 15, 2021, site visit, which was conducted outside of the blooming period for this species. There is suitable habitat for Mariposa clarkia in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA (QK, 2021).

YELLOW-LIP PANSY MONKEYFLOWER

The yellow-lip pansy monkeyflower is an annual herb, endemic to California. It occurs in vernally wet and often disturbed areas, either on clay, volcanic or granitic soils in lower montane coniferous forest and meadows and seeps (QK, 2021). The yellow-lip pansy monkeyflower blooms from April to July and occurs in elevations from approximately 1,960 to 6,565 feet. It is generally threatened by vehicles, logging, competition from non-native plants, and grazing, and potentially threatened by development.

The nearest CNDDB occurrence for the species approximately 0.5 miles southeast is from 1971 and is presumed extant, of the (QK, 2021). This species was not observed during the reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat within the BSA for yellow-lip pansy monkeyflower in the Valley Foothill Riparian habitat along the unnamed creek that runs through Twain Harte, and potentially in the Montane Hardwood-Conifer habitat (QK, 2021). However, construction of the project is not anticipated to impact that area directly.

TUOLUMNE FAWN LILY

Tuolumne fawn lily is perennial bulbiferous species endemic to California that blooms between March and June. It occurs in cismontane woodland, lower montane coniferous forest, and chaparral habitats, often on clay soils and on cliffs and near drainages in broadleaf upland forests, at elevations between 1,675 and 4,480 feet. The species is threatened by competition with non-native plants, grazing, and mining activities.

The nearest CNDDB occurrence for Tuolumne fawn lily is from 2003 and approximately 1.7 miles northwest of the BSA, on a steep north-facing slope above the South Fork Stanislaus River (QK, 2021). This species was not observed during the September 15, 2021, reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat for Tuolumne fawn lily in the Montane Hardwood-Conifer habitat that is precent throughout much of the BSA (QK, 2021).

TUOLUMNE IRIS

Tuolumne iris is a perennial herb that is endemic to California and blooms between May and June (QK, 2021). It occurs is cismontane woodland, lower montane coniferous forest, and yellow pine forest habitats at elevations between 1,395 and 4, 595 feet.

The nearest CNDDB occurrence for Tuolumne iris is from 2006, approximately 2.8 miles northwest of the BSA, in mixed oak-conifer forest (QK, 2021). This species was not observed during the September 15, 2021, reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat for Tuolumne iris in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA (QK, 2021).

MI-WUK NAVARRETIA

Mi-Wuk navarretia is an annual herb endemic to California and blooms between May and July or August. It occurs is openings on gentle slopes in lower montane coniferous forest habit on pyroclastic (volcanic) soils, at elevation between 2,625 and 4,920 feet (QK, 2021). Threats to the species include urbanization, off-road vehicle and recreational activities, and competition with non-native plants.

The nearest CNDDB occurrence for Mi-Wuk navarretia overlaps the south side of the BSA documenting a population observed over a road cut in 2014. This species was not observed during the reconnaissance survey, which was conducted outside of the blooming period of this species. There is suitable habitat for the species in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA (QK, 2021).

BROWNISH BEAKED-RUSH

Brownish beaked rush is perennial herb that blooms between July and August (QK, 2021). It occurs in mesic montane coniferous forest, in meadows and seeps, and in marshes and swamps at elevations between 150 and 6,560 feet.

The nearest CNDDB occurrence for the species is from 2014 and over 10 miles southeast of the BSA. This species was not observed during the reconnaissance survey, which was conducted outside of the blooming period for these species. There is suitable habitat within the BSA for this species in the Valley Foothill Riparian habitat along the unnamed creek that runs through Twain Harte, and potentially in the Montane Hardwood-Conifer habitat (QK, 2021). However, construction of the project is not anticipated to impact that area directly.

If any of these species were present within the BSA, direct impacts could include the mortality of or injury to individual plants. During the growth and blooming period, the spread of dust during construction, soil contamination, or alteration of existing hydrology could cause an indirect impact to the species, as could the spread of non-native or invasive species caused by project activities. Because the proposed project may impact the vegetated areas along roadway shoulders and the southern bank of Twain Harte Lake, Measures BIO-3 through BIO-5 shall be implemented, as outlined below. Implementation of these measures would reduce impacts to these plant species to a less-than-significant level.

Additionally, no sensitive natural communities are present that would be impacted by the proposed project.

MITIGATION MEASURE(S)

MM BIO-3: If the proposed project is expected to occur during the blooming period, as listed in Table 3.4.4-1, positive plant identification may occur. If these species are observed, they shall be avoided to maximum extent possible. If project activities cannot avoid those areas, a qualified botanist or biologist may have opportunity to salvage and relocate the plants that will be impacted.

Table 3.4.4-1
Blooming Period of Special-status Plants with Potential to Occur

Special-Status Plant Species	Optimal Blooming Period
Clarkia australis Small's southern clarkia	May - August
Clarkia biloba ssp. *australis* Mariposa clarkia	April - July
Diplacus pulchellus yellow-lip pansy monkeyflower	April - July
Erythronium tuolumnense Tuolumne fawn lily	March - June
Iris hartwegii ssp. *columbiana* Tuolumne iris	May - June
Navarretia miwukensis Mi-Wuk navarretia	May - August
Rhynchospora capitellata brownish beaked-rush	July - August

MM BIO-4: The introduction and spread of invasive and non-native plant species shall be avoided and controlled wherever possible during construction, on both the project and surrounding areas. This may be achieved through measures such as cleaning vehicles and equipment before they enter construction areas, removing invasive species that exist on the site and disposing of the removed debris in a manner that prohibits their spread on- and off-site.

MM BIO-5: To reduce any indirect impacts to special-status plants that may be in the vicinity of the proposed project, best management practices (BMPs) shall be implemented to control dust pollution, prevent discharge of potentially harmful chemicals, and prevent changes in hydrology. BMPs may include the installation of erosion and sedimentation control devices, applying water to control dust, placing drip pans under equipment when not in use, refueling in designated areas, and containing concrete washout properly, among other practices.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated.*

Impact #3.4.4c – Would the project have a substantial adverse effect on State or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

During the reconnaissance survey, an unnamed creek was observed, running northeast to southwest through the town of Twain Harte and feeding Twain Harte Lake. This creek is mapped by the NHD and is traced as a tributary to the Tuolumne River, so it is likely to be federally jurisdictional as a Traditionally Navigable Water under the U.S. Army Corps of Engineers (QK, 2021).

Project activities will occur only on previously disturbed areas, beneath previously disturbed roadways paved with asphalt. The unnamed creek and Twain Harte Lake will be avoided, and not impacted by project activities. Therefore, the proposed project would not have no impact on any jurisdictional aquatic resources and no mitigation measures are warranted.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *no impact.*

Impact #3.4.4d – Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Wildlife migratory corridors are described as a narrow stretch of land that connects two open pieces of habitat that would otherwise be unconnected. These routes provide shelter and sufficient food supplies to support wildlife species during migration. Movement corridors generally consist of riparian, woodlands, or forested habitats that span contiguous acres of undisturbed habitat and are important elements of resident species' home ranges.

No movement corridors are present that would be impacted by the proposed project. The project would not interfere with the movement of any native resident or migratory fish and wildlife species or with established native resident or migratory wildlife corridoes or impede the use of native wildlife nursery sites. Therefore, there would be no impacts as a result of the proposed project.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact.*

Impact #3.4.4e – Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

The project does not conflict with the Tuolumne County General Plan (Tuolumne County, 2018a), and is not subject to any local ordinances. No trees will be removed as a result of the proposed project. Therefore, there are no impacts with respect to local policies and ordinances and no measures are warranted. Therefore, there would be no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact*.

Impact #3.4.4f – Would the project conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan?

The proposed project will not conflict with any adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or State habitat conservation plan, so there will be no impacts and no measures are warranted (QK, 2021). Therefore, implementation of the proposed project would have no impacts related to habitat conservation or natural community plans.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact*.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.5 - CULTURAL RESOURCES				
Would the project:				
a. Cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines Section 15064.5?	☐	☒	☐	☐
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?	☐	☒	☐	☐
c. Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐

Discussion

The following analysis is based on the Phase I Cultural Resource Assessment prepared for the proposed project (Paleo Solutions, Inc., 2021), which is included as Appendix C of this document.

Impact #3.4.5a – Would the project cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines Section 15064.5?

As defined by CEQA Guidelines Section 15064.5, "historical resources" are:

- A resource listed in or determined to be eligible by the State Historical Resources Commission, for listing in the California Register of Historical Resources (Public Resource Code Section 5024.1, Title 14 California Code of Regulations, Section 4850 et seq.).
- A resource included in a local register of historical resources, as defined in Section 5020.1(k) of the Public Resources Code, or identified as significant in a historical resource survey meeting the requirements Section 5024.1(g) of the Public Resources Code, shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of the evidence demonstrates that it is not historically or culturally significant.

Any object, building, structure, site, area, place, record, or manuscript that a Lead Agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource, provided the Lead Agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the Lead Agency to be "historically significant" if the

resource meets the criteria for listing on the California Register of Historical Resources (Public Resources Code Section 5024.1, Title 14 CCR, Section 4852) including the following:

- Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
- Is associated with the lives of persons important in our past.
- Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
- Has yielded, or may be likely to yield, information important in prehistory or history.

A Phase I survey was conducted for the proposed project. The project Area of Potential Effects (APE) will occur in areas where existing sewer lines occur, construction activities will occur on previously disturbed areas. Trenching to replace or repair sewer lines will be roughly 2 to 3 feet wide and excavated up to 6-feet deep for the new sewer pipe placement. The abandoned pipes located below ground will be left in place.

The Native American Heritage Commission (NAHC) was contacted to conduct a sacred lands files (SLF) search. The NAHC provided the results of its SLF search dated November 1, 2021, indicating "negative results" (that is, no sacred lands are known to be located in the Twain Harte area) and they provided a list of potentially interested tribal groups. A letter requesting consultation was sent to the tribes on November 3, 2021, in order to solicit their interest regarding tribal consultation: Chicken Ranch Rancheria of Me-Wuk Indians; Nashville Enterprise Miwok-Maidu-Nishinam Tribe; North Fork Rancheria of Mono Indians; Picayune Rancheria of Chukchansi Indians; Tule River Indian Tribe; Tuolumne Band of Me-Wuk Indians; Washoe Tribe of Nevada and California; and Wuksache Indian Tribe. A follow-up phone call was also made to the groups on the NAHC list. An email from the representative of the Chicken Ranch Rancheria of Me-Wuk Indians was received requesting the use of Native American monitors onsite during construction. To date, no other tribal group A copy of these correspondences is included in Appendix C of this document.

A cultural resources records search was requested on September 14, 2021, from the California Historical Resources Information System (CHRIS) facility at the Central California Information Center (CCIC) at California State University Stanislaus. Field surveys were conducted on September 29, 2021. The records on file at the CCIC indicate six cultural resources are present in the APE. These resources include four historic resources and two prehistoric resources.

The prehistoric resources include:

- P-55-000130 (Bald Rock)
- P-55-001422 (Prehistoric Encampment)

The historic resources include:

- P-55-007116 (Twain Harte Dam)
- P-55-007117 (Twain Harte Lake)

- P-55-000054 (Sonora-Mono Road)
- P-55-006544 (Wildwood Ditch)

The proposed project would not have adverse effects on Bald Rock (P-55-000130). Additionally, there are no indications of prehistoric settlement or use within the APE surrounding Twain Harte Lake. The Marquis Drive sewer line easement is within the recorded boundary of P-55-001422 east of Marquis Drive. No documented features at the site are within the APE, but soils on sections along Marquis Drive may contain artifacts and buried features that may suffer adverse effects from equipment transport and excavation (Paleo Solutions, Inc., 2021).

The proposed project would have no adverse effects on P-55-007116, P-55-007117, or P-55-000054. The Wildwood Ditch (P-55-006544) is very close to intersecting the sewer line easement and may suffer adverse impacts from equipment transport and excavation (Paleo Solutions, Inc., 2021). However, Mitigation Measure CUL-3 requires the establishment of an Environmentally Sensitive Area (ESA) prior to construction and monitoring by a qualified cultural resource specialist and Native American monitor during construction activities in that area. With implementation of this measure, impacts would be less than significant.

Avoidance is the preferred measure for mitigating adverse effects to cultural resources. However, there is the potential during construction to unearth, damage, or destroy previously unknown subsurface resources. These previously unidentified are potentially significant cultural resources within the project area, including historical resources. MM CUL-1 through CUL-5 would be implemented prior to the initiation of ground disturbance activities. Implementation of Mitigation Measure CUL-1 through CUL-5 includes engaging a qualified cultural resource specialist and Native American monitor, who will conduct a cultural resources training with the crew and be onsite during construction activities. Other actions include establishing an ESA prior to construction (CUL-3) and to complete a Phase II test excavation to determine whether significant artifacts or features occur in the proposed locations along Sections 3A and 3B of Marquis Drive. Mitigation Measure MM CUL-5 requires if prehistoric or historic-era cultural materials are encountered during construction activities, all work in the immediate vicinity of the find would stop until a qualified archaeologist can evaluate the find and make recommendations. With implementation of MM CUL-1 through MM CUL-5, impacts to known or unknown cultural resources would be less than significant.

MITIGATION MEASURE(S)

MM CUL-1: Prior to any ground disturbance, the project developer/contractor shall retain a qualified archaeologist, defined as an archaeologist meeting the Secretary of the Interior's Standards for professional archaeology (U.S. Department of the Interior, 2011), to carry out all mitigation measures related to archaeological and historical resources.

a. Prior to the start of any ground-disturbing or construction activities, Cultural Resources Sensitivity Training shall be conducted. This includes an overview of potential cultural resources that could be encountered during ground disturbing

activities to facilitate worker recognition, avoidance, and subsequent immediate notification of the qualified archaeologist and/or Native American monitor for further evaluation and action, as appropriate; and penalties for unauthorized artifact collecting or intentional disturbance of archaeological resources.

b. The project operator shall ensure all new employees who have not participated in earlier Cultural Resources Sensitivity Trainings shall:

- Participate in Cultural Resources Sensitivity Training as described above.
- Shall be provided a Cultural Resources Sensitivity Training guide for all personnel that is approved by the Lead archaeologist and.
- The Cultural Resources Sensitivity Training guide shall be kept available for all personnel to review and be familiar with as necessary.

MM CUL-2: Prior to any ground disturbance, the developer/contractor shall enter into an agreement with the Chicken Ranch Rancheria of Me-Wuk Indians of California. If requested, the developer shall:

a. Retain a qualified native American monitor to be onsite during initial ground disturbance activities.

b. Retain a qualified tribal member to conduct a Cultural Resources Sensitivity training session with the construction crew prior to ground disturbance activities.

Evidence of the agreement with the Chicken Ranch Rancheria of Me-Wuk Indians of California tribe shall be submitted to the lead agency as evidence of compliance.

MM CUL-3: The Wildwood Ditch (**P-55-006544)** shall be substantially flagged as an Environmentally Sensitive Area (ESA) prior to construction as determined by the Lead Archaeologist in consultation with the Native American monitor and carefully monitored to ensure avoidance.

MM CUL-4: Prior to any excavation in Marquis Drive (Sections 3A and 3B), a Phase II test excavation program shall be implemented to determine whether significant artifacts or features occur in the proposed locations for sewer line improvements. Significant features would include, but not limited to, house and round house floors and other structural remains, human burials, cooking hearths, other stone features, storage pits, food processing areas and tool manufacturing loci.

MM CUL-5: If prehistoric or historic-era cultural materials are encountered during construction activities, all work in the immediate vicinity of the find shall halt until a qualified archaeologist can evaluate the find and make recommendations. Cultural resource materials may include prehistoric resources such as flaked and ground stone tools and debris, shell, bone, ceramics, and fire-affected rock as well as historic resources such as glass, metal, wood, brick, or structural remnants. If the qualified archaeologist determines that the discovery represents a potentially significant cultural resource, additional investigations

may be required to mitigate adverse impacts from project implementation. These additional studies may include avoidance, testing, and evaluation or data recovery excavation.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

Impact #3.4.5b – Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?

See response to Impact #3.4.5a, above.

MITIGATION MEASURE(S)

Implementation of Mitigation Measure MM CUL-1 through MM CUL-5.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

Impact #3.4.5c – Would the project disturb any human remains, including those interred outside of formal cemeteries?

There are no known cemeteries or burials on or near the project. Although unlikely, subsurface construction activities, such as trenching and grading, associated with the proposed project could potentially disturb previously undiscovered human burial sites. Accordingly, this is a potentially significant impact. Although considered unlikely subsurface project activities could cause a potentially significant impact to previously undiscovered human burial sites. The cultural resources and Sacred Lands File records searches did not indicate the presence of human remains, burials, or cemeteries within or in the vicinity of the project site. No human remains have been discovered at the project site, and no burials or cemeteries are known to occur within the area of the site. However, project activities would involve earth-disturbing activities, and it is still possible that human remains may be discovered, possibly in association with archaeological sites. Implementation of the mitigation measure below would ensure that the proposed project would not directly or indirectly destroy previously unknown human remains. It is unlikely that the proposed project would disturb any known human remains, including those interred outside of formal cemeteries. However, with implementation of MM CUL-6, the project would have a less-than-significant impact.

MITIGATION MEASURE(S)

MM CUL-6: If human remains are discovered during construction or operational activities, further excavation or disturbance shall be prohibited pursuant to Section 7050.5 of the California Health and Safety Code. The specific protocol, guidelines, and channels of communication outlined by the NAHC, in accordance with Section 7050.5 of the Health and Safety Code, Section 5097.98 of the Public Resources Code (Chapter 1492, Statutes of 1982,

Senate Bill 297), and Senate Bill 447 (Chapter 44, Statutes of 1987), shall be followed. Section 7050.5(c) shall guide the potential Native American involvement, in the event of discovery of human remains, at the direction of the county coroner.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant with mitigation incorporated***.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact

3.4.6 - ENERGY

Would the project:

a.	Result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☒	☐
b.	Conflict with or obstruct a State or local plan for renewable energy or energy efficiency?	☐	☐	☒	☐

Discussion

The following analysis is based on the Air Quality Conformity Analysis prepared for the project (Trinity Consultants, 2021), which is included as Appendix A of this document.

Impact #3.4.6a – Would the project result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Energy demand during the project activities would result from the transportation of materials, construction equipment, and construction worker vehicle trips. Construction equipment includes backhoe, bobcat, trencher, generator, grader, dump truck and concrete truck. The fuel usage to complete the project construction was calculated to be 24,592 gallons. Once operational, there is no energy demand beyond what is currently being used for ongoing maintenance activities by the District.

There are no unusual project characteristics that would cause construction equipment to be less energy efficient compared with other similar construction activities in other areas within the area. Construction-related fuel consumption is not expected to result in inefficient, wasteful, or unnecessary energy use. The proposed project will comply with the goals of the Tuolumne County General Plan related to the conservation of energy resources, and the policies and provisions of the Tuolumne County Code of Ordinances. Therefore, the project would have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.6b – Would the project conflict with or obstruct a State or local plan for renewable energy or energy efficiency?

As stated in Impact #3.4.6a above, the project will comply with the goals of the Tuolumne County General Plan related to the conservation of energy resources policies and provisions of the Tuolumne County Code of Ordinances. Therefore, the proposed project would have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.7 - GEOLOGY AND SOILS				
Would the project:				
a. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
(i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
(ii) Strong seismic ground shaking?	☐	☐	☒	☐
(iii) Seismic-related ground failure, including liquefaction?	☐	☐	☒	☐
(iv) Landslides?	☐	☐	☒	☐
b. Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐

Discussion

Impact #3.4.7a(i) – Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving – rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

According to the County of Tuolumne General Plan, there are no known major fault systems within the unincorporated area of Twain Harte (Tuolumne County, 2018a)The closest fault line is the Mono Lake Fault located approximately 55 miles east of the proposed project area (California Department of Conservation, 2021).

The proposed project area is not within an Alquist-Priolo earthquake fault zone. There are no active fault traces in the project vicinity. Accordingly, the proposed project area is not within an earthquake fault zone (Special Studies Zone) and will not require a special site investigation by an engineering Geologist. Since there are no permanent structures being built as part of this project, and pipeline replacement activities will occur along existing roads there would be no impact related to endangering people and structures associated with this project Therefore, the project would have a less-than-significant impact (California Department of Conservation, 2021).

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impact would be *less than significant*.

Impact #3.4.7a(ii) – Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving – strong seismic ground shaking?

See response to Impact #3.4.6a(i).

Historically, earthquake activity in Tuolumne County is significantly below the California state average. Tuolumne County has one of the lowest earthquake risks in the State. A total of 5 historical earthquake events with recorded magnitudes of 3.5 or greater occurred in or near (50 miles) Tuolumne County this past century (Tuolumne County, 2018d).

The proposed project does not propose to construct permanent, habitable structures. Project activities will take place along existing roadways. The proposed project area is located in an area that is sufficiently far from known faults and consists primarily of a stable geological formation. Project-specific hazards due to ground shaking would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.7a(iii) – Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving – seismic-related ground failure, including liquefaction?

See discussion of Impacts #3.4.7a(i) and a(ii), above.

Liquefaction is the process by which saturated, unconsolidated soil and sand is converted into quicksand like suspension during an earthquake. Since liquefaction most likely would occur during or following an earthquake and severe earthquake risk is deemed to be low in the Tuolumne County, the risk and danger of liquefaction and subsidence occurring within the County of Tuolumne is also considered to be minimal (Tuolumne County, 2018b)

The proposed project would be replacing existing pipeline along existing roadways and utility easements located in private property. No new buildings or habitable structures are proposed. The project would comply with all local and State regulations regarding the design and installation of the pipeline. Therefore, impacts from liquefaction are considered less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.7a(iv) – Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving – landslides?

See discussion of Impacts #3.4.7a(i) and a(iii), above.

The California Department of Conservation's CGS Information Warehouse indicates that the planning area is not located in an area prone to landslides (California Department of Conservation, 2021).

Although some portions of the project area's topography can be considered steep to very steep; the underlying rock formation is very stable, and the soil found on these slopes is shallow and held in place by deep rooted vegetation. These slopes do not typically fail unless disturbed by grading or development (Tuolumne County, 2018d). The proposed project

activities will be conducted on flat areas, not on slopes or hillsides. No new grading or additional ground disturbance beyond the existing project footprint is anticipated since pipeline replacement activities will be along the current pipeline route and existing roads within the project area. Therefore, the proposed project would have a less-than-significant impact on exposing people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving landslides.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.7b – Would the project result in substantial soil erosion or the loss of topsoil?

The proposed project will install replacement sewer pipelines that would be constructed within existing road rights of way that typically collect stormwater runoff from the roadways or within existing utility easements along private undeveloped property.

The preparation and implementation of a Type 1 Linear Underground/Overhead Projects (LUPs) SWPPP is required for construction activities where greater than 30 percent of construction activities occur within the nonpaved shoulders or land immediately adjacent to paved surfaces, or where construction occurs on unpaved improved roads, including their shoulders or land immediately adjacent to them (California Water Board, 2018). A LUP SWPPP must identify potential sources of erosion or sedimentation as well as identify and implement best management practices (BMPs) that ensure reduce erosion. If a SWPPP was not required, the project would implement the standard BMPs. Typical BMPs intended to control erosion include sandbags, silt fencing, street sweeping, etc. Mitigation Measure GEO-1 requires the approval of a LUP SWPPP to comply with the NPDES General Construction Permit, if appropriate. Compliance with local grading and erosion control ordinances would also help minimize adverse effects associated with erosion and sedimentation. Any stockpiled soils would be watered and/or covered to prevent loss due to wind erosion as part of the SWPPP during construction. Once constructed, the project would not result in a loss of topsoil or soil erosion.

The proposed project will not expand or increase the amount of impermeable and permeable surfaces. Overall, development of the project would not result in conditions where substantial surface soils would be exposed to wind and water erosion. Therefore, impact would be less than significant.

MITIGATION MEASURE(S)

MM GEO-1: Prior to issuing of grading or building permits, if required, (a) the project developer shall prepare and implement a Type 1 Linear Underground/Overhead Projects SWPPP (LUP SWPPP), if applicable. The LUP SWPPP shall comply with the General National

Pollutant Discharge Elimination System (NPDES) from the Central Valley Regional Water Quality Control Board. The requirements of the SWPPP and NPDES shall be incorporated into design specifications and construction contracts.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

Impact #3.4.7c – Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?

As previously discussed, although portions of the project area's topography can be considered steep to very steep; the underlying rock formation is very stable, and the soil found on these sloped is shallow and held in place by deep rooted vegetation. Therefore, the proposed project area is considered stable with minimal to no potential of on or offsite landslide, lateral spreading, subsidence, or collapse. Additionally, no structures are being proposed as part of the proposed project. Therefore, impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.7d – Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

Expansive clay soils are subject to shrinking and swelling due to changes in moisture content over the seasons. These changes can cause damage or failure of foundations, utilities, and pavements. During periods of high moisture content, expansive soils under foundations can heave and result in structures lifting. The project does not propose to construct habitable structures or buildings. No structures are being proposed as part of the proposed project, and therefore impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.7e – Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?

The proposed project will not include septic tank installation or alternative wastewater disposal systems. Additionally, there are not proposed buildings or habitable structures so there would no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

The would be ***no impact***.

Impact #3.4.7f – Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The activity within the project area would be within the existing rights of way and a currently developed parcel. Based on geologic mapping, the majority of Tuolumne County is not considered sensitive for paleontological resources. A pocket of Plio-Pleistocene and Pliocene loose consolidated deposits also occurs along SR 108 to southwest of Jamestown and northwest of Chinese Camp. This area may contain evidence of Pleistocene era large mammals (Tuolumne County, 2018b). However, the project is not in the vicinity of this potential area. Additionally, the depth of the trench for the pipeline would not exceed six feet, which makes the discovery of paleontological resources highly unlikely.

As noted previously, the pipeline would be installed within existing road rights of way and utility easements. However, there is a possibility that unknown subsurface paleontological resources could be uncovered during project-related activities. In such an event, potentially significant impacts to previously unknown subsurface resources may occur. Therefore, with implementation of MM GEO-1, the project would have a less-than-significant impact.

MITIGATION MEASURE(S)

MM GEO-2: The project shall avoid and minimize impacts to paleontological resources. If a potentially significant paleontological resource is encountered during ground disturbance activities, all construction within a 100-foot radius of the find shall immediately cease until a qualified paleontologist determines whether the resources require further study. The owner shall include a standard inadvertent discovery clause in every construction contract to inform contractors of this requirement. The paleontologist shall notify the Lead Agency and the project proponent of the procedures that must be followed before construction is allowed to resume at the location of the find.

If the find is determined to be significant and the Lead Agency determines avoidance is not feasible, the paleontologist shall design and implement a data recovery plan consistent with

the applicable standards. The plan shall be submitted to the Lead Agency for review and approval. Upon approval, the plan shall be incorporated into the project.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

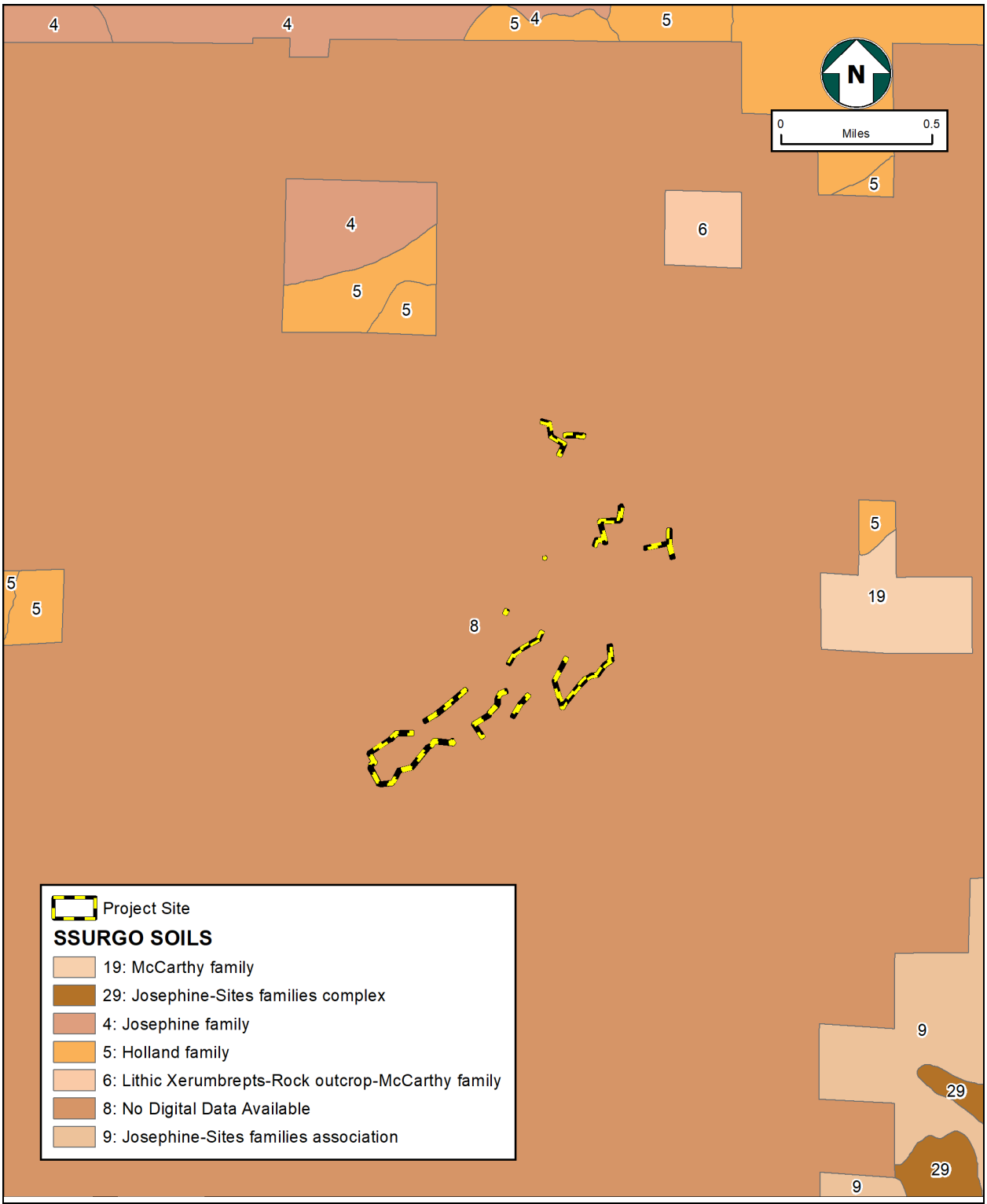


Figure 3.4.7-1
Soil Types

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact

3.4.8 - GREENHOUSE GAS EMISSIONS

Would the project:

a.	Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b.	Conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☒	☐

Discussion

The following analysis is based on the Air Quality Conformity Analysis prepared for the proposed project (Trinity Consultants, 2021) found in Appendix A of this document.

Impact #3.4.8a – Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Assembly Bill 32 (AB32), the California Global Warming Solutions Act of 2006 (the Act) was enacted by the State of California. The legislature stated, "Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California." The Act defines GHG emissions as all of the following gases: carbon dioxide (CO2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

Project construction activities will result in minimal and temporary Greenhouse Gases (GHG) emissions, as shown in Table 3.4.8-1. The proposed project as a whole is not expected to generate GHGs either directly or indirectly that may have a significant impact on the environment. The project GHG emissions will primarily be from the use of machinery used to replace the existing pipelines.

Table 3.4.8-1
Estimated Construction GHG Emissions (MT/Year)

Source	CO_2	CH_4	N_2O	CO_2e
2023 Construction Emissions	121.07	0.03	0.00	121.84

Source: (Trinity Consultants, 2021) *Note: 0.000 could represent <0.000

In order for the project to conform with the goals of AB32, the GHG emissions should not exceed 3.1 $MTCO_2e$ per service population target for 2040. Construction-related GHG

emissions would be temporary and intermittent in nature and therefore would not have a significant impact on statewide GHG goals. The project is not expected to have an increase in operational GHG emissions; therefore, the project would have less-than-significant GHG impacts. Tuolumne County, the Lead Agency for this project, has not developed specific thresholds for GHGs. However, according to the General Plan Update EIR, the Statewide service population GHG emissions threshold for 2040 is 3.1 MTCO2e per service population. The project would not result in a substantial increase in GHGs or conflict with local or State plans adopted for the purpose of reducing GHG emissions. Therefore, the proposed project is considered less than significant for GHG emission impacts.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.8b – Would the project conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

See Impact #3.4.8a, above. Construction-related activities are temporary and emissions will be minimal. The proposed project would comply with all applicable County, State and federal guidelines rules and regulations to reduce GHG emissions.

The project would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases and impacts will be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.9 - HAZARDS AND HAZARDOUS MATERIALS				
Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c. Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☒	☐
d. Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f. Impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
g. Expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?	☐	☐	☒	☐

Discussion

Impact #3.4.9a, #3.4.9b – Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Construction would involve the temporary transport and use of minor quantities of hazardous materials such as fuels, oils, lubricants, hydraulic fluids, paints and solvents. The types and quantities of hazardous materials to be used and stored onsite would not be of a significant amount to create a reasonably foreseeable upset or accident condition. The handling and transport of all hazardous materials onsite would be performed in accordance with all applicable federal, State, and local laws and regulations.

Hazardous and nonhazardous wastes would likely be transported to and from the project sites during construction activities. Pipeline replacement activities could involve the use of some hazardous materials, such as diesel fuel, hydraulic oil, grease, solvents, adhesives, paints, and other petroleum-based products, although these materials are commonly used during construction activities and would not be disposed of on the project sites. Workers would be trained to properly identify and handle all hazardous materials, if applicable during construction activities. If hazardous materials are used during construction, crews would be required to have HAZWOPER training per OSHA regulations (OSHA, 2022). Hazardous waste would be either recycled or disposed of at a permitted and licensed treatment and/or disposal facility. Any hazardous waste or debris that is generated during the proposed project would be collected and transported away from the site and disposed of at an approved offsite landfill or other such facility.

In addition, sanitary waste generated during construction would be managed through the use of portable toilets, which would be located at reasonably accessible onsite locations. Hazardous materials such as paint, bleach, water treatment chemicals, gasoline, oil, etc., may be used during construction. These materials are stored in appropriate storage locations and containers in the manner specified by the manufacturer and disposed of in accordance with local, federal, and State regulations. No significant hazard to the public or to the environment through the routine transport, use, or disposal of hazardous waste during pipeline replacement activities would occur.

Once improvements have been completed there would no storage of hazardous materials on the project site. The project would not result in a significant hazard to the public or the environment; therefore, project-specific impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.9c – Would the project emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

The Twain Harte School is in the vicinity of a small portion of the project. Emissions generated by construction equipment would be temporary in nature and is not expected that hazardous emissions would impact the school. The small amount hazardous materials are those typically found on many types of projects and are not expected to negatively impact the school. These include fuel, oils, lubricants, hydraulic fluids, paints, bleach and solvents. It is highly unlikely that the project would use acutely hazardous materials during construction activities. Once operational, the project will not involve the use of any hazardous materials in close proximity to the school. Therefore, project-specific impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.9d – Would the project be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

Literature review of available federal, State, and local database information systems was performed for the purpose of identifying known recognized environmental conditions present on the site and the nearby properties that have the potential to adversely impact the site (CalEPA, 2019). An online search was conducted of Cortese List to identify locations on or near the project site. The search indicated that there are no hazardous or toxic sites within one mile of the project site (Department of Toxic Substances Control, 2021).

The proposed project area has no sites that are included on a list of hazardous materials sites complied pursuant to Government Code Section 65962.5 and would not create a significant hazard to the public or the environment. The project area is not within the immediate vicinity of a hazardous materials site and would not impact a listed site. There is no data identifying any facilities in the vicinity that might reasonably be anticipated to emit hazardous air emissions or handle hazardous materials, substances, or wastes that might affect the proposed project. Therefore, impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.9e – For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

There are no public airports within two miles of the project area. The closest public airport is the Columbia Airport, located approximately 10 miles to west of the project area. The project is not within an identified impact area of the Tuolumne County Airport Land Use Compatibility Plan (ALUCP) (Tuolumne County, 2003).

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact*.

Impact #3.4.9f – Would the project impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan?

The 2012 Tuolumne County Emergency Services Plan ensures the most effective and economical allocation of resources for the maximum benefit and protection of the community in response to significant emergency. The County Emergency Services Plan delineates the County's procedures and policies when responding to a significant disaster (Tuolumne County, 2012). Additionally, the Tuolumne County Multi-Jurisdictional Hazard Mitigation Plan (Tuolumne County, 2018d) is a master plan that outlines the unique risks faced by the Twain Harte community, and outlines various safety strategies and mitigation measures to reduce impacts to hazards such as wildfire, water/wastewater system failure, dam failure, etc.

In addition, the District has an adopted Overflow Emergency Response Plan specifically designed to handle emergency events related to the community's sewer system (Twain Hart Community Services District, 2019). This plan ensures that District staff coordinate with other first responders during an emergency event.

The replacement of existing underground pipeline would not require long-term roadway closures, nor would it impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. The proposed project would not

inhibit the ability of local roadways to continue to accommodate emergency response and evacuation activities. The proposed project will comply with all applicable emergency plan guidelines during the replacement of existing pipelines and in the event of an emergency, disaster, or evacuation event. Therefore, the project would have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant.***

Impact #3.4.9g – Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires?

The proposed project is within a CalFire Federal Responsibility Area (FRA). Cal Fire has determined that the majority of the community of Twain Harte is categorized as Very High Fire Hazard Severity Zone in SRA (CalFire, 2021). Fire hazards in Tuolumne County range from moderate in the far western portion of the County to very high in the central portion. Communities in the very high fire hazard zone include Twain Harte (Tuolumne County, 2018b).

The Tuolumne General Plan *Natural Hazards Element* also includes policies to reduce the potential for exposure to risk associated with wildland fire. Development in high or very high fire hazard areas is addressed in Policy 17.E.1 and Implementation Programs 17.E.a and 17.E.b. Policy 17.E.2 would require maintenance of defensible space where there is a wildfire hazard on adjacent property. Policy 17.E.3 and Implementation Programs 17.E.c through 17.E.e would require new development to mitigate fire hazards and provide safe access.

Further, the General Plan Update includes policies to support federal and state fire service capabilities (Policy 9.4.A and Implementation Program 9.A.d), provide information to the public about fire hazards (Policy 9.A.5 and Implementation Program 9.A.e), and support the Strategic Fire and Resource Protection Planning Program (Policy 9.A.6) (Tuolumne County, 2018b).

The replacement of existing deteriorated pipelines along rights of way is not expected to increase the risk of wildfires. However, the project route consists mainly of semi-rural paved roads and existing utility easements within residential properties. In the unlikely event of fire, the Twain Harte Fire Department located in close proximity to the project area and would provide fire protection services. The proposed project will comply with applicable local fire codes. The proposed project would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires. Therefore, impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant.***

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.10 - HYDROLOGY AND WATER QUALITY					
Would the project:					
a.	Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface water quality?	☐	☒	☐	☐
b.	Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☒
c.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
	(i) Result in substantial erosion or siltation on or offsite?	☐	☒	☐	☐
	(ii) Substantially increase the rate of amount of surface runoff in a manner which would result flooding on- or offsite?	☐	☒	☐	☐
	(iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or	☐	☐	☒	☐
	(iv) Impede or redirect flood flows?	☐	☐	☒	☐
d.	In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☒	☐
e.	Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☒	☐

Discussion

Impact #3.4.10a – Would the project violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface water quality?

Construction

Project-related activities would involve excavation, soil stockpiling and installation of new pipeline. During site preparation and project-related activities, areas of bare soil could be exposed to erosive forces for a period of time. Project-related activities involving soil disturbance, excavation, cutting/filling, and stockpiling could result in increased erosion and sedimentation to surface waters.

As noted in Impact #3.4.7b, accidental spills or disposal of potentially harmful materials used during construction could possibly wash into and pollute surface water runoff. Materials that could potentially contaminate the construction area, or spill or leak, include diesel fuel, gasoline, lubrication oil, hydraulic fluid, antifreeze, transmission fluid, lubricating grease, and other fluids. In order to reduce potential impacts to water quality during construction activities, if required, the project LUP SWPPP and implement standard BMPs targeted at minimizing and controlling construction runoff and erosion to the maximum extent practicable.

Once replacement activities have been completed, the pipelines would not result in increased runoff. The pipelines would be constructed within the existing road rights of way that typically collect stormwater runoff from the roadways.

In order to reduce potential impacts to water quality during project construction activities, Mitigation Measure GEO-1 would be required, if applicable. With implementation of the recommended mitigation, the project is not anticipated to violate any water quality standards or result in significant impacts to the waste discharge requirements or otherwise substantially degrade surface water quality and impacts would be less than significant.

Operations

The implementation of the proposed project is intended to protect groundwater quality by eliminating the potential for sewage to leak into the water table from the existing deteriorated or damaged sewer pipes.

The District currently has an approved Sewer System Management Plan (SSMP), as required by the State Water Resources Control Board's Statewide General Waste Discharge Requirements (WDR) for sanitary sewer systems (Twain Hart Community Services District, 2019). The goals of developing and implementing this Sewer System Management Plan (SSMP) are the following:

- Maintain or improve the condition of the collection system infrastructure in order to provide reliable service now and into the future.

- Minimize infiltration/inflow (I/I) and provide adequate sewer capacity to accommodate design storm flows.
- Minimize the number and impact of sanitary sewer overflows that occur.

The SSMP outlines a number of monitoring, inspection and maintenance tasks that ensure the sewer system operates effectively. The District is developing hydraulic models of the sewer collection system to assess system capacity, identify deficiencies, and evaluate scenarios for capital project alternatives for upgrading and improving the collection system. The SSMP also includes an Overflow Emergency Response Plan that allows District staff to respond immediately if potential overflows are detected and provides the steps necessary if a spill occurs. A System Evaluation and Capacity Assurance Plan has been developed to review the effectiveness of the District's activities, and to determine whether changes in the SSMP is needed. Compliance with specific standards and requirements of the WDR is reported and audits are preformed to substantiate fulfilment.

The Project Engineering Report (PER)that was prepared for this project also outlines the current conditions of the District's sewer system and identified deficiencies and prioritized recommended upgrades and replacement of deteriorated pipelines and damaged manhole covers (Black Water Consulting Engineers, Inc., 2021). The PER can be found in Appendix D of this document.

As noted above, the proposed project will help the District meet these objectives by upgrading and replacing deteriorated portions of the sewer pipeline system to better serve the community and protect water quality. With continued implementation of the approved WDR and SSMP, impacts of ongoing operations are less than significant.

MITIGATION MEASURE(S)

Implementation of Mitigation Measure MM GEO-1.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

Impact #3.4.10b – Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

The proposed project will replace existing sewer pipelines to protect groundwater and surface water quality. The project is anticipated to use minimal water during construction for dust control.

The District treats and distributes drinking water to the community of Twain Harte - approximately 1,600 residential, commercial and public facility connections. Surface water is the primary water supply source. Groundwater serves as a secondary source of water. The District owns and operate three groundwater wells that are capable of providing about 80

percent of normal winter water use and about 35 percent of normal summer water use. Each well treats water for drinking before pumping it into the distribution system.

An Urban Water Management Plan (UWMP) for the Tuolumne Utilities District was prepared in coordination with the District, which evaluates the factors influencing water demand, outlines an action plan for a drought or catastrophic water supply shortage and specifies opportunities to reduce demand and augment supplies under such conditions (Tuolumne Utilities District , 2021b).

The District will continue to abide by the adopted UWMP requirements, and provide water to the community. However, this project does not increase or expand water demand beyond current baseline levels and therefore would not decrease groundwater levels or exceed available water supplies. Therefore, there would be no impacts from the project on the groundwater supply.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.10c(i) –Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on or offsite?

See Impacts #3.4.7b and #3.4.10a. The proposed project will install replacement sewer pipeline would not result in a change in drainage patterns or increased runoff. The pipelines would be replaced within existing road rights of way that typically collect stormwater runoff from the roadways. Following construction, the trenches would be backfilled and restored to roadways and gravel roadway shoulders. During the proposed project activities, the project may be required to prepare LUP SWPPP to minimize erosion or soil loss onsite. Mitigation Measure GEO-1 requires the preparation of a LUP SWPPP, if applicable.

The proposed project is not anticipated to substantially later the drainage pattern of the areas where project activities would be conducted, in a manner that would result in substantial erosion or siltation on or offsite. Therefore, the project would have a less-than-significant impact with the implemented mitigation measures.

MITIGATION MEASURE(S)

Implementation of Mitigation Measure MM GEO-1.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

Impact #3.4.10c(ii) – Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would substantially increase the rate of amount of surface runoff in a manner which would result flooding on- or offsite?

See Impacts #3.4.4c, #3.4.7b, #3.4.10a and #3.4.10c(i).

MITIGATION MEASURE(S)

Implementation of Mitigation Measure MM GEO-1.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

Impact #3.4.10c(iii) – Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?

See Impacts #3.4.4c, #3.4.7b, #3.4.10a and #3.4.10c(i) and (ii). The extent of erosion on a site would typically vary depending upon slope steepness and stability, vegetation, percentage of cover, concentration of runoff, and weather conditions. The proposed replacement of the existing sewer pipelines would not result in increased runoff. Replacement of the existing pipelines would be within existing road rights of way and the trenches would be backfilled and restored to roadways and gravel roadway shoulders, or along existing utility easement within undeveloped private property. Therefore, the proposed project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff. As such, impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.10c(iv) – Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through

the addition of impervious surfaces, in a manner which would impede or redirect flood flows?

See Impacts #3.4.4c, #3.4.7b, #3.4.10a and #3.4.10c(i) and (ii). The majority of the project areas are within an area identified by the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map as a minimal flood hazard; however, Twain Harte Lake is categorized as an area with a 1 percent chance of annual flooding (Figure 3.4.10-1). The pipeline route is along its perimeter and would not impact the lake itself.

The proposed project will not impede or redirect floodwaters through the addition of impervious surfaces in a manner which would impedes or redirects flood flows. Therefore, the proposed project will have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.10d – Would the project, in flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

The project is not within the FEMA Flood Insurance Rate Map of a 100-year flood zone. The majority of the project sites are located within the FEMA Flood Hazard Zone X: Area of Minimal Flood Hazard, Twain Harte Lake is categorized as an area with a 1 percent chance of annual flooding; however, the potential for flooding at the site appears to be very low.

The project site is not located near the ocean. Tsunamis are waves generated in oceans from seismic activity. Seiches are standing waves in bodies of water and are often found in large lake systems during strong winds. The winds themselves cause waves and water displacement, which can have a harmonic effect, causing the water to move sideways.

As an inland region separated from the Pacific Ocean by approximately 150 miles, Tuolumne County and the project area are at no risk from tsunamis. There are no levees located within the County. Therefore, flooding as a result of a levee failure would not occur. According to the most recent Alquist-Priolo Earthquake Fault Zoning Map, earthquake-induced seiches also do not pose a risk to Tuolumne County. There is no potential for inundation of the project site by seiche (Tuolumne County, 2018b). Therefore, the project impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.10e – Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

See Impact #3.4.10b.

The proposed project would not increase water demand or induce population growth that would negatively impact groundwater levels conflict with or obstruct the implementation of the Tuolumne County Water Quality Plan or the Tuolumne Utilities District UWMP. The District currently complies with all water quality and sustainable groundwater management requirements. The project will not expand or increase water demand beyond what is currently required; therefore, impacts are less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

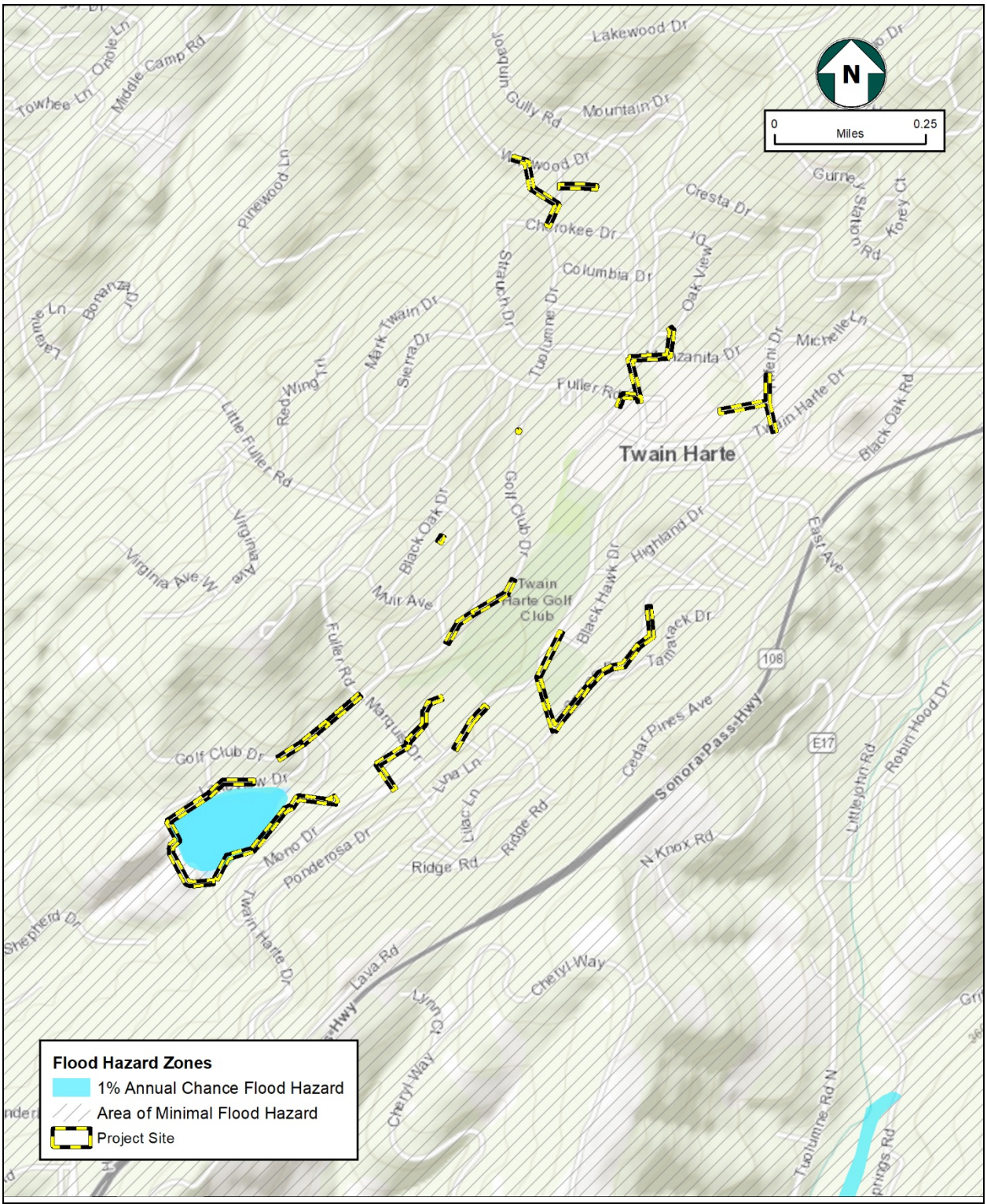


Figure 3.4.10-1
FEMA Flood Hazards

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact

3.4.11 - LAND USE AND PLANNING

Would the project:

a.	Physically divide an established community?	☐	☐	☐	☒
b.	Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒

Discussion

Impact #3.4.11a – Would the project physically divide an established community?

The proposed project would replace existing sewer pipelines, within existing right of way throughout the established community on Twain Harte. Therefore, the proposed would not divide the established Twain Harte community. The proposed project will have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.11b – Would the project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

No changes in land use designation or zoning are required, and none would result from the implementation of the proposed project. Therefore, the proposed project would not conflict with any land use plans, policies or regulations. The proposed project will have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.12 - MINERAL RESOURCES					
Would the project:					
a.	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?	☐	☐	☐	☒
b.	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

Discussion

Impact #3.4.12a – Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?

The unincorporated community of Twain Harte and surrounding area have no mapped mineral resources and regulated mine facilities (Tuolumne County, 2021). Additionally, per the California Department of Conservation- Geologic Energy Management Division (CalGEM), there are no active, inactive, or capped oil wells located within the project site, and it is not within a CalGEM-recognized oilfield (Californira Dept. of Conservation, 2021). Therefore, there would be no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.12b – Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

The proposed project is not designated for mineral and petroleum resources activities by the County of Tuolumne General Plan. The project area and surrounding lands are zones for single-family, general commercial, mixed use and general recreational uses. No mining occurs in the project area or in the nearby vicinity. There are no mineral extraction activities that will be conducted in the future as a result of the project. The project would not result in

the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan and would therefore have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact*.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.13 - NOISE					
Would the project result in:					
a.	Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?	☐	☒	☐	☐
b.	Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c.	For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Discussion

Impact #3.4.13a – Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?

Project activities would involve temporary noise sources and is expected to last for approximately five months. Construction-related temporary noise levels would be higher than existing ambient noise levels in the project area but would not occur after replacement pipeline activities are completed. Project-related activities would be restricted to daytime hours and would be of short duration. Once replacement activities have been completed, noise would be similar in character to existing noise in the area resulting from existing uses in the vicinity of the project area.

Tuolumne County General Plan Policy 5.A.5 require that construction activity and temporary construction impacts do not expose existing noise-sensitive land uses to excessive noise levels, and that developers implement all feasible noise-reducing measures as necessary to limit construction noise exposure at receiving occupied land uses to within acceptable County noise levels (Tuolumne County, 2018a). Specific techniques may include, but are not limited to, restrictions on construction timing, use of sound blankets on construction

equipment, and the use of temporary walls and noise barriers to block and deflect noise the impacts would be less than significant.

Table 3.4.13-1 illustrates various types of construction equipment measured under a wide variety of construction activities with an average of source levels. Although the table gives one level for each piece of equipment, it should be noted that there is a considerable variation in reported ground vibration levels from construction activities. The data provide a reasonable estimate for a wide range of soil conditions (Federal Transit Administration , 2006).

Table 3.4.13-1
Typical Construction Noise Emission Levels
Typical Vibration Levels for Construction Equipment

Equipment	Typical Noise Level (dBA) 50 ft from Source
Truck	88
Compactor	82
Roller	72
Loader	85
Backhoe	80

Notes:
1 – Federal Transit Administration, Transit Noise and Vibration Impact Assessment Guidelines, May 2006. Table 12-1.
D = the distance from the equipment to the receiver

Portions of the project route are in areas have few to no residences, however some portions are in close proximity to houses or near the Twain Harte School. The area is generally considered quiet, although there is noise generated by daily residential traffic along the roadways where the majority of the project is located. The project will not require piledriving or the use of jackhammers, which generate extremely loud noise. To reduce potential temporary noise impacts to nearby residence, implementation of the Mitigation Measure MM NSE-1 requires construction equipment be located as far from residences as possible, as well as the use of mufflers, baffles and sound blankets on equipment to the extent feasible. Compliance with MM NSE-1 will reduce the temporary noise impacts from construction-related activities to levels that will be less than significant.

MITIGATION MEASURE(S)

MM NSE-1: During construction, the project developer shall implement the following measures:

a. All stationary construction equipment on the project site shall be located so that noise emitting objects or equipment faces away from any potential sensitive receptors.

b. The construction contractor shall ensure that all construction equipment is equipped with manufacturer-approved mufflers and baffles and cover equipment with sound

blankets, to the extent feasible. During construction, stationary construction equipment shall be placed such that emitted noise is directed away from sensitive noise receivers.

c. Construction activities shall take place during daylight hours, when feasible.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.13b – Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

The proposed project is expected to create temporary groundborne vibration as a result of replacement activities. According to the U.S. Department of Transportation, Federal Railroad Administration, vibration is sound radiated through the ground. The rumbling sound caused by the vibration is called groundborne noise. The ground motion caused by vibration is measured as particle velocity in inches per second and is referenced as vibration decibels (VdB). The background vibration velocity level in residential areas is usually around 50 VdB. A list of typical vibration-generating equipment is shown in Table 3.4.13-2.

Table 3.4.13-2
Different Levels of Groundborne Vibration

Vibration Velocity Level	Equipment Type
94 VdB	Vibratory roller
87 VdB	Large bulldozer
87 VdB	Caisson drilling
86 VdB	Loaded trucks
58 VdB	Small bulldozer

Source: (Federal Transit Administration , 2006)
Note: 25 feet from the corresponding equipment

The vibration velocity level threshold of perception for humans is approximately 65 VdB. A vibration velocity level of 75 VdB is the approximate dividing line between barely perceptible and distinctly perceptible levels for many people.

Typical outdoor sources of perceptible groundborne vibration are construction equipment and traffic on rough roads. For example, if a roadway is smooth, the groundborne vibration from traffic is rarely perceptible.

Typically, groundborne vibration generated by construction activity attenuates rapidly with distance from the source of the vibration. Therefore, vibration issues are generally confined to distances of less than 500 feet (U.S. Department of Transportation, 2005).

The proposed project would not use equipment such as piledrives, caisson drilling, or jackhammers, all of which produce substantial vibrations. Project construction equipment

will include a backhoe, bobcat, trencher, generator, grader, dump truck, concrete truck, and three pickup trucks. These types of equipment tend to generate less vibration during operation.

Therefore, potential sources of temporary vibration during construction of the proposed project would be considered minimal and not exceed appliable standards.

Construction activities would include exposing of the existing pipelines for replacement. These activities would not involve the use of equipment that would cause high groundborne vibration levels such as pile-driving or blasting.

Once constructed, the proposed project would not generate high vibration levels. Thus, construction and ongoing operation of the proposed project would not result in any vibration and impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

Impact #3.4.13c – For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

See Impact #3.4.9e.

The closest public airport is the Columbia Airport, located approximately 10 miles to west of the project area. The project is not within an identified impact area of the Tuolumne County Airport Land Use Compatibility Plan (ALUCP) (Tuolumne County, 2003).

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would *no impact*.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.14 - POPULATION AND HOUSING				
Would the project				
a. Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b. Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Discussion

Impact #3.4.14a – Would the project induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

The intent of the proposed project is to upgrade and replace its existing deteriorating sewer pipeline system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality. The proposed project will not cause Twain Harte's population growth or economic development beyond what has been anticipated and analyzed in the Tuolumne General Plan. No roadways or infrastructure in the project area will be extended. The proposed project would not provide additional capacity that could accommodate a substantial amount of future development.

Therefore, the proposed project would not induce substantial population growth in the area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure). Therefore, the proposed project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.14b – Would the project displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

The proposed project would replace existing pipelines and would not add any additional pipelines into the system to support any additional capacity. The project would not displace housing or require replacement housing, since the proposed replacement activities would occur along existing rights of way. Therefore, the project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.15 - PUBLIC SERVICES				
Would the project:				
a. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or to other performance objectives for any of the public services:				
(i) Fire protection?	☐	☐	☐	☒
(ii) Police protection?	☐	☐	☐	☒
(iii) Schools?	☐	☐	☐	☒
(iv) Parks?	☐	☐	☐	☒
(v) Other public facilities?	☐	☐	☐	☒

Discussion

Impact #3.4.15a(i) – Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or to other performance objectives for any of the public services - Fire Protection?

There are two fire stations located with the community of Twain Harte: Twain Harte CSD Fire Division, also known as the Twain Harte Fire Department (THFD), located at 18781 Cedar Drive and the California Department of Forestry and Fire Protection (Cal Fire), located at 22978 Meadow Drive.

The THFD provides emergency response and fire-protection services to all residents and structures in the District. While THFD firefighters are trained to firefighters are trained to fight wildfire, providing structure fire-protection is the Department's primary responsibility. Cal Fire is a regional State Responsibility Areas (SRA) station strategically located in Twain

Harte and staffed to fight wildfire with the SRA in Twain Harte's region (Twain Harte Community Services District, 2021).

Construction the proposed project would not be expected to result in an increase in demand of fire protection services leading to the construction of new or physically altered facilities. The project consists of replacing existing deteriorated pipelines along rights of way and public easements. Additionally, the project does not include construction of new dwelling units and would not increase the demand for fire protection services.

Therefore, the project will not result in significant environmental impacts related to acceptable service ratios, response times, or to other performance objectives fire protection services. The proposed project will comply with all local, State and federal building codes, development standards and regulations where applicable. The project is not anticipated to result in substantial or adverse impacts to fire protection services. Therefore, the Project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.15a(ii) – Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or to other performance objectives for any of the public services – Police Protection?

The County of Tuolumne Sheriff's Office located at 28 Lower Sunset Drive, Sonora, California, approximately 12 miles southwest of Twain Harte, provides police protection services to the project area. The project will not increase the local population and it is not expected that the project will result in significant environmental impacts related to acceptable service ratios, response times, or to other performance objectives police protection services. Police service response is, and would remain, adequate to the project and surrounding areas. The proposed project is not anticipated to require active police protection. Therefore, the proposed project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.15a(iii) – Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or to other performance objectives for any of the public services – Schools?

The Twain Harte School District operates the Twain Harte School. The proposed project would not result in the creation of new residences or other facilities that could result in an increase in student population or need for new or expanded school facilities. Therefore, the proposed project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.15a(iv) – Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or to other performance objectives for any of the public services – Parks?

See Impacts #3.4.15a(i) through (iii). The Eproson Park located downtown of Twain Harte at Meadow Lane, within the project area. The proposed project does not include dwelling units and would not induce population growth in the area. Therefore, the project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.15a(v) – Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or to other performance objectives for any of the public services – Other Public Facilities?

See Impacts #3.4.15a(i) through (iv). The proposed project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.16 - RECREATION				
Would the project:				
a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b. Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☒

Discussion

Impact #3.4.16a – Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Implementation of the proposed project would allow the District to maintain, replace, and upgrade its collection system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality.

The proposed project is intended to serve the same number of residents and public facilities within the Community of Twain Harte. These improvements are not intended to provide additional capacity for substantial amounts of future development. Typically, the increased use of parks and recreational facilities result from the addition of new housing and the corresponding population increase. No new housing is proposed as part of the proposed project. Therefore, the proposed project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

Impact #3.4.16b – Would the project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?

See Impact #3.4.15a(iv)-(v), above. The project does not require the construction of any new recreational facilities. Therefore, it would not generate an adverse physical effect on the environment. The proposed project would have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be ***no impact***.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.17 - TRANSPORTATION					
Would the project:					
a.	Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☒	☐
b.	Conflict or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)?	☐	☐	☒	☐
c.	Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☒	☐
d.	Result in inadequate emergency access?	☐	☐	☒	☐

Discussion

Impact #3.4.17a – Would the project conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

The project will not construct any new circulation (transit) systems, roadways, bicycle or pedestrian facilities. The proposed project may result in short-term, temporary traffic impacts during the installation phase of the new pipelines along existing roadways, but because the route is along the shoulder of the road, these impacts would be minimal and of short duration. Following completion, the proposed project would not generate vehicle trips, beyond the routine maintenance-related trips already conducted by District staff. There is no increase in staff or increase the traffic in the area.

Therefore, the proposed project would not conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and nonmotorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit. Therefore, impacts of the proposed project would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.17b – Would the project conflict or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b)?

See Impact #3.4.17a, above.

The State of California Governor's Office of Planning and Research document entitled *Technical Advisory on Evaluating Transportation Impacts in CEQA* (Technical Advisory) provides guidance for determining a project's transportation impacts based on Vehicle Miles Traveled (VMT). VMT per capita is calculated as the total annual miles of vehicle travel divided by the total population in a state or in an urbanized area. This analysis relates to residential, commercial and industrial uses. It does not include an analysis of construction-related travel.

The proposed project does not include the construction of residential, commercial and industrial uses. Trips made to the proposed project site during construction-related activities will be temporary in nature and will include workers and equipment from the local areas. Therefore, impacts of the proposed project will be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.17c – Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

The proposed project does not consist of any elements that would substantially increase hazards as a result of a design feature (e.g., sharp curves or dangerous intersections) or have incompatible uses (e.g., farm equipment). The majority of the project (replacement of pipelines) will be on the existing roadway system; no new roads will be constructed. All construction will occur on the proposed project site and will not create dangerous intersections or curves. Once complete, the excavated roadway shoulders will be backfilled and returned to their existing conditions. Therefore, impacts of the proposed project will be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.17d – Would the project result in inadequate emergency access?

See Impact #3.4.9f.

Construction-related activities associated with the proposed project could temporarily interrupt access along the affected local roadways. The replacement of existing underground pipeline would not require long-term roadway closures, nor would it impair implementation of or physically interfere with an adopted emergency response or emergency access. The proposed project would not inhibit the ability of local roadways to continue to accommodate emergency response activities. The proposed project will comply with all applicable emergency plan guidelines and the Tuolumne County Municipal Code. Therefore, the project would have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant*.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact

3.4.18 - TRIBAL CULTURAL RESOURCES

Would the project:

a. Cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
(i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k), or	☐	☒	☐	☐
(ii) A resource determined by the Lead Agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the Lead Agency shall consider the significance of the resource to a California Native American tribe.	☐	☒	☐	☐

Discussion

Impact #3.4.18a(i) – Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is – listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code Section 5020.1(k)?

These questions were addressed in the discussion presented in Section 3.4.5 - *Cultural Resources* see discussion for Impacts #3.4.5a through #3.4.5c.

MITIGATION MEASURE(S)

Implementation of Mitigation Measures CUL-1 through CUL-6.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

Impact #3.4.18a(ii) – Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is – a resource determined by the Lead Agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the Lead Agency shall consider the significance of the resource to a California Native American tribe?

See discussion for Impacts #3.4.5a through#3.4.5c and Impact #3.4.18a(i), above.

MITIGATION MEASURE(S)

Implementation of Mitigation Measures CUL-1 through CUL-6.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant with mitigation incorporated*.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.19 - UTILITIES AND SERVICE SYSTEMS				
Would the project:				
a. Require or result in the relocation or construction of new or expanded water, wastewater treatment, or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☒
b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☐	☒
c. Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
d. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☒	☐
e. Comply with federal, State, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☒	☐

Discussion

Impact #3.4.19a – Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment, or stormwater drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

The proposed project includes the replacement and upgrade to existing, deteriorated sewer lines and manhole covers. No new lines or connections of service are proposed. As such, the project would not require the expansion of sewer or wastewater facility capacity or increase water demand. Electrical power, natural gas, or telecommunication facilities would be unaffected by the project. Therefore, the project will have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.19b – Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

See Impacts #3.4.10b and #3.4.10e.

The proposed project will not increase water demand or induce population growth that would negatively impact available water supplies to serve the project during normal, dry and multiple dry years. Therefore, there would be no impacts from the project on the groundwater supply.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact.*

Impact #3.4.19c – Would the project result in a determination by the wastewater treatment provider that serves or may serve thep that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

See Impacts #3.4.19a.

The project would not require the expansion of the wastewater facility service or increase demand. Therefore, there would be no impacts from the project on the wastewater capacity.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact.*

Impact #3.4.19d – Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

This project would generate minimal solid waste from replacement activities related to site preparation and construction. There is one landfill within proximity of Twain Harte where solid waste can be disposed of. All solid waste will be collected and removed from the site and be disposed at the Cal Sierra Transfer Station, located at 19309 Industrial Drive, approximately eight miles southeast of Twain Harte (CalRecycle, 2021).

The proposed project will comply with State and local standards by properly disposing of any project-related solid waste. The proposed project is not expected to result in excessive amounts of solid waste that would be in excess of State or local standards or be in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals. Therefore, the proposed project will have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant.***

Impact #3.4.19e – Would the project comply with federal, State, and local management and reduction statutes and regulations related to solid waste?

See discussion for Impact #3.4.19d, above.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be ***less than significant.***

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.20 - WILDFIRE				
If located in or near State responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
a. Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentration from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☒	☐
c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☒	☐

Discussion

Impact #3.4.20a – If located in or near State responsibility areas or lands classified as very high fire hazard severity zones, would the project substantially impair an adopted emergency response plan or emergency evacuation plan?

See Impact 3.4.9f.

The replacement of existing underground pipeline would not require long-term roadway closures, nor would it impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. Impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.20b – If located in or near State responsibility areas or lands classified as very high fire hazard severity zones, would the project, due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentration from a wildfire or the uncontrolled spread of a wildfire?

See Impact #3.4.9g.

The proposed project is within a CalFire Federal Responsibility Area (FRA). Cal Fire has determined that the majority of the community of Twain Harte is categorized as Very High Fire Hazard Severity Zone in SRA (CalFire, 2021).

However, the replacement of existing pipeline along the roadway is not expected to increase the risk of wildfires. The project route consists mainly of semi-rural paved roads and existing road rights of way and existing utility easements within residential properties. In the unlikely event of fire, the Twain Harte Fire Department located within the project area, would provide fire protection services to the proposed project area. The proposed project will comply with applicable State and local building standards as required by local fire codes. The proposed project would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires. Therefore, impacts would be less than significant.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

Impact #3.4.20c – If located in or near State responsibility areas or lands classified as very high fire hazard severity zones, would the project require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

See Impacts #3.4.20a-b, above. The project area consists mainly of paved roads, existing road rights of way and utility easement within undeveloped property. The project would not require the installation or maintenance of associated infrastructure (roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment. Therefore, the project will have no impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

There would be *no impact*.

Impact #3.4.20d – If located in or near State responsibility areas or lands classified as very high fire hazard severity zones, would the project expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

See Impacts #3.4.20a-c above. The proposed project includes the replacement and upgrade to existing, deteriorated sewer lines. No new lines or connections of service are proposed. It is not expected that such activities would result in a fire hazard or expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage change. Therefore, the project would have a less-than-significant impact.

MITIGATION MEASURE(S)

No mitigation is required.

LEVEL OF SIGNIFICANCE

Impacts would be *less than significant.*

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
3.4.21 - MANDATORY FINDINGS OF SIGNIFICANCE					
a.	Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b.	Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☒	☐	☐
c.	Does the project have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

Discussion

Impact #3.4.21a – Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?

As evaluated in this IS/MND, the proposed project is not expected to result in or substantially degrade the quality of the environment; substantially reduce the habitat of a fish or wildlife species; cause a fish or wildlife population to drop below self-sustaining levels; threaten to eliminate a plant or animal community; reduce the number or restrict the range of an endangered, rare, or threatened species; or eliminate important examples of the major periods of California history or prehistory. With recommended mitigation, MM BIO-1

through MM BIO-5, the proposed project would reduce or eliminated potential impacts to sensitive plant and species, nesting birds and raptors, by implementing avoidance and minimization measures. Therefore, the project does not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory. Therefore, the project would have a less-than-significant impact with mitigation incorporated.

MITIGATION MEASURE(S)

Implementation of Mitigation Measures MM BIO-1 through MM BIO-5.

LEVEL OF SIGNIFICANCE

The project would have a ***less-than-significant impact with mitigation incorporated***.

Impact #3.4.21b - Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)?

As described in the impact analyses in Sections 3.4.1 through 3.4.20 of this IS/MND, any potentially significant impacts of the proposed project would be reduced to a less-than-significant level following incorporation of the mitigation measures listed in *Section 4*, *Mitigation, Monitoring and Reporting Plan*. Projects completed in the past have also implemented mitigation as necessary. Accordingly, the proposed project would not otherwise combine with impacts of related development to add considerably to any cumulative impacts in the region. With implementation of the recommended mitigation measure, the proposed project would not have impacts that are individually limited, but cumulatively considerable. Therefore, the project would have a less than cumulatively considerable impact with mitigation incorporated.

MITIGATION MEASURE(S)

Implementation of Mitigation Measures MM BIO-1 through MM BIO-5, MM CUL-1 through MM CUL-6, MM GEO-1, MM GEO-2 and MM NSE-1.

LEVEL OF SIGNIFICANCE

The project would have a ***less-than-significant impact with mitigation incorporated***.

Impact #3.4.21c - Does the project have environmental effects that would cause substantial adverse effects on human beings, either directly or indirectly?

All of the project's impacts, both direct and indirect, that are attributable to the project were identified and mitigated. As shown in *Section 4*, *Mitigation, Monitoring and Reporting Plan*, the Lead Agency has agreed to implement mitigation, substantially reducing or eliminating impacts from the project. Therefore, the proposed project would not either directly or indirectly cause substantial adverse effects on human beings because all potentially adverse direct impacts of the proposed project are identified as having no impact, less-than-significant impact, or less-than-significant impact with mitigation.

MITIGATION MEASURE(S)

Implementation of Mitigation Measures MM BIO-1 through MM BIO-5, MM CUL-1 through MM CUL-6, MM GEO-1, MM GEO-2 and MM NSE-1.

LEVEL OF SIGNIFICANCE

The project would have a *less-than-significant impact with mitigation incorporated*.

SECTION 4 - MITIGATION, MONITORING AND REPORTING PLAN

Impact	Mitigation Measures	Implementation	Monitoring
Biological Resources			
3.4.4a	**MM BIO-1:** If project construction activities will be initiated during the nesting season (February 1 to September 15), a pre-activity nesting bird survey shall be conducted within 14 days prior to the start of project activities. The surveys shall encompass the proposed project footprint and accessible areas or land visible from accessible areas within a 250-foot buffer for songbirds and a 500-foot buffer for raptors. If no active nests are found, no further action is required. However, existing nests may become active and new nests may be built at any time prior to and throughout the nesting season, including when construction activities are in progress. If active nests are found during the survey or at any time during construction of the proposed project, an avoidance buffer ranging from 50 feet to 500 feet may be required, with the avoidance buffer from any specific nest being determined by a qualified biologist. The avoidance buffer will remain in place until the biologist has determined that the young are no longer reliant on the adults or the nest, or if breeding attempts have otherwise been unsuccessful. Work may occur within the avoidance buffer under the approval and guidance of the biologist, but full-time monitoring may be required. The biologist shall have the ability to stop construction if nesting adults show any sign of distress.	Contractor/ Qualified Biologist	THCSD
3.4.4a	**MM BIO-2:** Prior to the initiation of construction activities, all construction personnel shall attend a Worker Environmental Awareness Training program developed by a qualified biologist. Any personnel associated with construction that did not attend the	Contractor/ Qualified Biologist	THCSD

Impact	Mitigation Measures	Implementation	Monitoring
	initial training shall be trained by the authorized biologist prior to working on the project area. Any employee responsible for the operations and maintenance or decommissioning of the project facilities shall also attend the Worker Environmental Awareness Training program prior to starting work on the project and on an annual basis. The Program shall be developed and presented by the project qualified biologist(s) or designee approved by the qualified biologist(s). The program shall include information on the life histories of special-status species with potential to occur on the proposed project, their legal status, course of action shall these species be encountered onsite, and avoidance and minimization measures to protect these species. It shall include the components described below: a. Information on the life history and identification of special-status species that may occur or that may be affected by project activities. The program shall also discuss the legal protection status of each such species, the definition of "take" under the Federal Endangered Species Act and California Endangered Species Act, measures the project proponent/operator shall implement to protect the species, reporting requirements, specific measures for workers to avoid take of special-status plant and wildlife species, and penalties for violation of the requirements outlined in the California Environmental Quality Act mitigation measures and agency permit requirements. b. An acknowledgement form signed by each worker indicating that the Worker Environmental Awareness Training and Education Program has been completed shall be kept on file at the construction site.		

Impact	Mitigation Measures	Implementation	Monitoring
	c. A copy of the training transcript and/or training video, as well as a list of the names of all personnel who attended the Worker Environmental Awareness Training and Education Program, and signed acknowledgement forms shall be submitted to the Tuolumne County Planning Department. d. A copy of the training transcript, training video or informational binder for specific procedures shall be kept available for all personnel to review and be familiar with as necessary. e. A sticker shall be placed on hard hats indicating that the worker has completed the Worker Environmental Awareness Training and Education Program. Construction workers shall not be permitted to operate equipment within the construction areas unless they have attended the Worker Environmental Awareness Training and Education Program and are wearing hard hats with the required sticker.		
3.4.4b	**MM BIO-3:** If the proposed project is expected to occur during the blooming period, as listed in Table 3.4.4-1, positive plant identification may occur. If these species are observed, they shall be avoided to maximum extent possible. If project activities cannot avoid those areas, a qualified botanist or biologist may have opportunity to salvage and relocate the plants that will be impacted.	Contractor/ Qualified Biologist	THCSD

<table>
<tr><th>Impact</th><th>Mitigation Measures</th><th>Implementation</th><th>Monitoring</th></tr>
<tr><td></td><td>
Table 3.4.4-1
Blooming Period of Special-status Plants with Potential to Occur
<table>
<tr><th>Special-Status Plant Species</th><th>Optimal Blooming Period</th></tr>
<tr><td>Clarkia australis
Small's southern clarkia</td><td>May - August</td></tr>
<tr><td>Clarkia biloba ssp. australis
Mariposa clarkia</td><td>April - July</td></tr>
<tr><td>Diplacus pulchellus
yellow-lip pansy monkeyflower</td><td>April - July</td></tr>
<tr><td>Erythronium tuolumnense
Tuolumne fawn lily</td><td>March - June</td></tr>
<tr><td>Iris hartwegii ssp. columbiana
Tuolumne iris</td><td>May - June</td></tr>
<tr><td>Navarretia miwukensis
Mi-Wuk navarretia</td><td>May - August</td></tr>
<tr><td>Rhynchospora capitellata
brownish beaked-rush</td><td>July - August</td></tr>
</table>
</td><td></td><td></td></tr>
<tr><td>3.4.4b</td><td>MM BIO-4: The introduction and spread of invasive and non-native plant species shall be avoided and controlled wherever possible during construction, on both the project and surrounding areas. This may be achieved through measures such as cleaning vehicles and equipment before they enter construction areas, removing invasive species that exist on the site and disposing of the removed debris in a manner that prohibits their spread on- and off- site.</td><td>Contractor/
Qualified Biologist</td><td>THCSD</td></tr>
<tr><td>3.4.4b</td><td>MM BIO-5: To reduce any indirect impacts to special-status plants that may be in the vicinity of the proposed project, best management practices (BMPs) shall be implemented to control dust pollution, prevent discharge of potentially harmful chemicals,</td><td>Contractor/
Qualified Biologist</td><td>THCSD</td></tr>
</table>

Impact	Mitigation Measures	Implementation	Monitoring
	and prevent changes in hydrology. BMPs may include the installation of erosion and sedimentation control devices, applying water to control dust, placing drip pans under equipment when not in use, refueling in designated areas, and containing concrete washout properly, among other practices.		
Cultural Resources			
3.4.5a-b	**MM CUL-1:** Prior to any ground disturbance, the project developer/contractor shall retain a qualified archaeologist, defined as an archaeologist meeting the Secretary of the Interior's Standards for professional archaeology (U.S. Department of the Interior, 2011), to carry out all mitigation measures related to archaeological and historical resources. a. Prior to the start of any ground-disturbing or construction activities, Cultural Resources Sensitivity Training shall be conducted. This includes an overview of potential cultural resources that could be encountered during ground disturbing activities to facilitate worker recognition, avoidance, and subsequent immediate notification of the qualified archaeologist and/or Native American monitor for further evaluation and action, as appropriate; and penalties for unauthorized artifact collecting or intentional disturbance of archaeological resources. b. The project operator shall ensure all new employees who have not participated in earlier Cultural Resources Sensitivity Trainings shall: • Participate in Cultural Resources Sensitivity Training as described above.	Qualified Archaeologist	THCSD

Impact	Mitigation Measures	Implementation	Monitoring
	• Shall be provided a Cultural Resources Sensitivity Training guide for all personnel that is approved by the Lead archaeologist and. • The Cultural Resources Sensitivity Training guide shall be kept available for all personnel to review and be familiar with as necessary.		
3.4.5a-b	**MM CUL-2:** Prior to any ground disturbance, the developer/contractor shall enter into an agreement with the Chicken Ranch Rancheria of Me-Wuk Indians of California. If requested, the developer shall: a. Retain a qualified native American monitor to be onsite during initial ground disturbance activities. b. Retain a qualified tribal member to conduct a Cultural Resources Sensitivity training session with the construction crew prior to ground disturbance activities. Evidence of the agreement with the Chicken Ranch Rancheria of Me-Wuk Indians of California tribe shall be submitted to the lead agency as evidence of compliance.	Qualified Archaeologist	THCSD
3.4.5a-b	**MM CUL-3**: The Wildwood Ditch (**P-55-006544)** shall be substantially flagged as an Environmentally Sensitive Area (ESA) prior to construction as determined by the Lead Archaeologist in consultation with the Native American monitor and carefully monitored to ensure avoidance.	Qualified Archaeologist	THCSD
3.4.5a-b	**MM CUL-4:** Prior to any excavation in Marquis Drive (Sections 3A and 3B), a Phase II test excavation program shall be implemented to determine whether significant artifacts or features occur in the	Qualified Paleontologist	THCSD

Impact	Mitigation Measures	Implementation	Monitoring
	proposed locations for sewer line improvements. Significant features would include, but not limited to, house and round house floors and other structural remains, human burials, cooking hearths, other stone features, storage pits, food processing areas and tool manufacturing loci.		
3.4.5a-b	**MM CUL-5:** If prehistoric or historic-era cultural materials are encountered during construction activities, all work in the immediate vicinity of the find shall halt until a qualified archaeologist can evaluate the find and make recommendations. Cultural resource materials may include prehistoric resources such as flaked and ground stone tools and debris, shell, bone, ceramics, and fire-affected rock as well as historic resources such as glass, metal, wood, brick, or structural remnants. If the qualified archaeologist determines that the discovery represents a potentially significant cultural resource, additional investigations may be required to mitigate adverse impacts from project implementation. These additional studies may include avoidance, testing, and evaluation or data recovery excavation.	Qualified Paleontologist	THCSD
3.4.5c	**MM CUL-6:** If human remains are discovered during construction or operational activities, further excavation or disturbance shall be prohibited pursuant to Section 7050.5 of the California Health and Safety Code. The specific protocol, guidelines, and channels of communication outlined by the NAHC, in accordance with Section 7050.5 of the Health and Safety Code, Section 5097.98 of the Public Resources Code (Chapter 1492, Statutes of 1982, Senate Bill 297), and Senate Bill 447 (Chapter 44, Statutes of 1987), shall be followed. Section 7050.5(c) shall guide the potential Native American involvement, in the event of discovery of human remains, at the direction of the county coroner.	Qualified Paleontologist	THCSD

Impact	Mitigation Measures	Implementation	Monitoring
Geology and Soils			
3.4.7b	**MM GEO-1:** Prior to issuing of grading or building permits, if required, (a) the project developer shall prepare and implement a Type 1 Linear Underground/Overhead Projects SWPPP (LUP SWPPP), if applicable. The LUP SWPPP shall comply with the General National Pollutant Discharge Elimination System (NPDES) from the Central Valley Regional Water Quality Control Board. The requirements of the SWPPP and NPDES shall be incorporated into design specifications and construction contracts.	Contractor	THCSD
3.4.7f	**MM GEO-2:** The project shall avoid and minimize impacts to paleontological resources. If a potentially significant paleontological resource is encountered during ground disturbance activities, all construction within a 100-foot radius of the find shall immediately cease until a qualified paleontologist determines whether the resources require further study. The owner shall include a standard inadvertent discovery clause in every construction contract to inform contractors of this requirement. The paleontologist shall notify the Lead Agency and the project proponent of the procedures that must be followed before construction is allowed to resume at the location of the find. If the find is determined to be significant and the Lead Agency determines avoidance is not feasible, the paleontologist shall design and implement a data recovery plan consistent with the applicable standards. The plan shall be submitted to the Lead Agency for review and approval. Upon approval, the plan shall be incorporated into the project.	Contractor	THCSD
Noise			

Impact	Mitigation Measures	Implementation	Monitoring
3.4.13a	**MM NSE-1:** During construction, the project developer shall implement the following measures: a. All stationary construction equipment on the project site shall be located so that noise emitting objects or equipment faces away from any potential sensitive receptors. b. The construction contractor shall ensure that all construction equipment is equipped with manufacturer-approved mufflers and baffles and cover equipment with sound blankets, to the extent feasible. During construction, stationary construction equipment shall be placed such that emitted noise is directed away from sensitive noise receivers. c. Construction activities shall take place during daylight hours, when feasible.	Contractor	THCSD
Mandatory Findings of Significance			
3.4.21a-c	Implementation of Mitigation Measures MM BIO-1 through MM BIO-5, MM CUL-1 through MM CUL-6, MM GEO-1, MM GEO-2 and MM NSE-1.	Contractor	THCSD

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SECTION 6 - REFERENCES

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APPENDIX A

AIR QUALITY

AIR QUALITY COMFORMITY ANALYSIS

Twain Harte Sewer Pipeline Improvement Project
Twain Harte, Tuolumne County, CA

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1. EXECUTIVE SUMMARY

Trinity Consultants has completed an Air Quality Conformity Study (AQCS) for the replacement of existing pipelines in the unincorporated community of Twain Harte in Tuolumne County, CA. The Twain Harte Sewer Pipeline Improvement Project (Project) would be located within the boundaries of the Twain Harte Community Service District (THCSD). The Project will replace existing pipelines to allow the THCSD to maintain, replace, and upgrade its collection system to comply with regulations, avoid sanitary sewer overflows, provide adequate capacity, and protect groundwater and surface water quality.

The proposed Project's construction would include the following criteria pollutant emissions: reactive organic gases (ROG), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and suspended particulate matter (PM_{10} and $PM_{2.5}$). There is no expected change in Project operations; therefore, operational emissions were not quantified for the Project. Project construction activities would also generate greenhouse gas (GHG) emissions. Criteria and GHG emissions were estimated using the California Emissions Estimator Model (CalEEMod) version 2020.4.0 (California Air Pollution Control Officers Association (CAPCOA) 2021), which is the most current version of the model approved for use by the Tuolumne County Air Pollution Control District (TCAPCD).

Tables 4-3 and 4-4 present the Project's construction emissions and provide substantial evidence to support a *less than significant* air quality impact on the Mountain Counties Air Basin. The Project is not expected to increase operational emissions; therefore, the Project is considered to have a *less than significant* air quality impact on the Mountain Counties Air Basin. The Project's construction GHG emissions are short-term and intermittent in nature and therefore are not expected to have a significant impact on statewide GHG goals. The Project is not expected to have an increase in operational GHG emissions. Based on the foregoing conclusions, the Project is considered to have *less than significant* air quality impacts on the Mountain Counties Air Basin.

Cumulative impacts were also evaluated. The Tuolumne County public search for building permit applications indicates that there are no projects within a one-mile radius of the proposed Project. Owing to the inherently cumulative nature of air quality impacts, the threshold for whether a project would make a cumulatively considerable contribution to a significant cumulative impact is simply whether the project would exceed project-level thresholds. As such, a qualitative evaluation of the cumulative projects supports a finding that the Project's contribution would not be cumulatively considerable because the proposed Project's incremental emissions would be *less than significant*.

2. INTRODUCTION

2.1 Purpose

This AQCS was prepared pursuant to the TCAPCD CEQA Significance Thresholds, the California Environmental Quality Act (CEQA) Statute and Guidelines (CEQA 2021), and the National Environmental Policy Act (NEPA).

2.2 General Project Description

The Twain Harte Sewer Pipeline Improvement Project (Project) will replace existing pipelines to allow the THCSD to maintain, replace, and upgrade its collection system to comply with regulations, avoid sanitary sewer overflows, provide adequate capacity, and protect groundwater and surface water quality. The Project would be located within the boundaries of the Twain Harte Community Service District.

A 5-month construction schedule starting in Quarter 2 of 2023 is estimated; therefore, most of the defaults in the CalEEMod emissions model were applied to estimate a construction schedule. **Figure 2-1** depicts the regional location and **Figure 2-2** depicts an aerial view of the Project location.

Figure 2-1. Regional Location

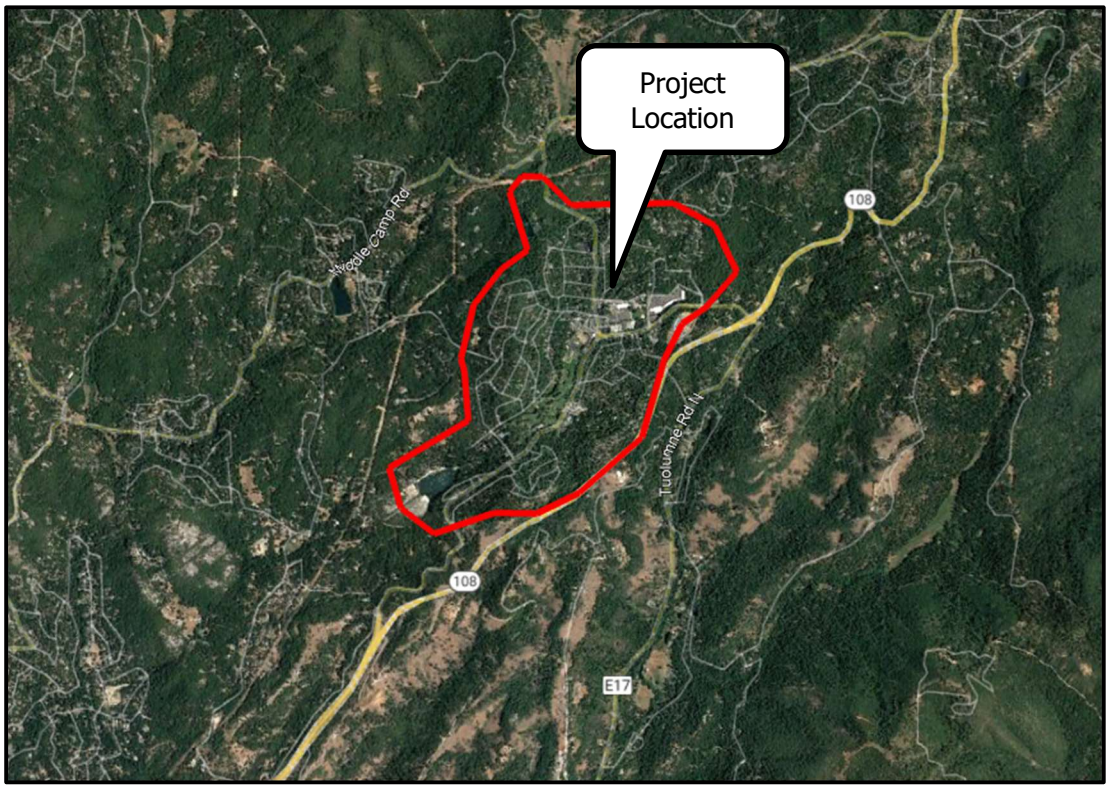


Figure 2-2. Project Location

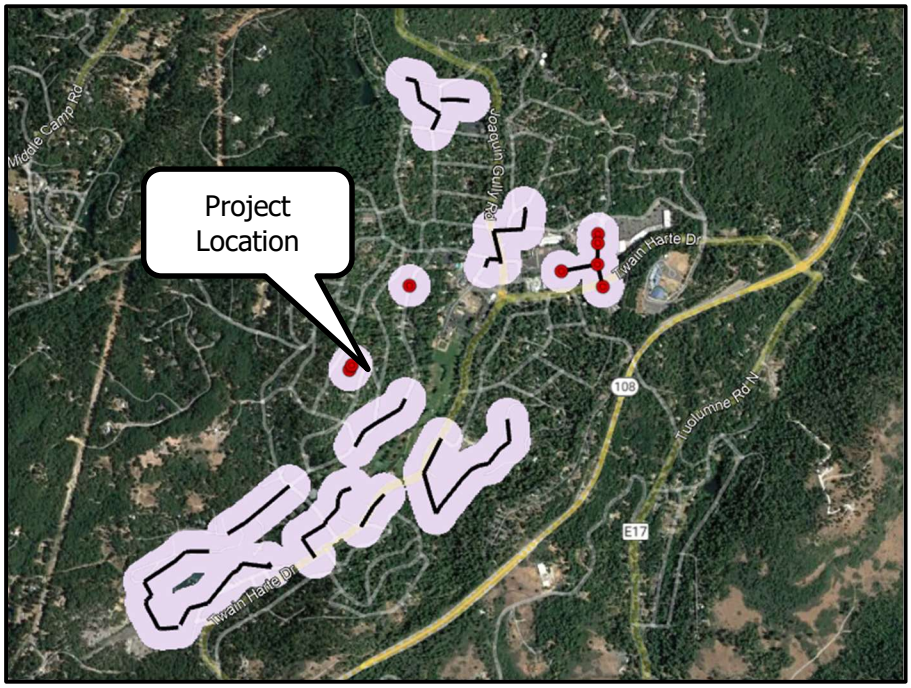
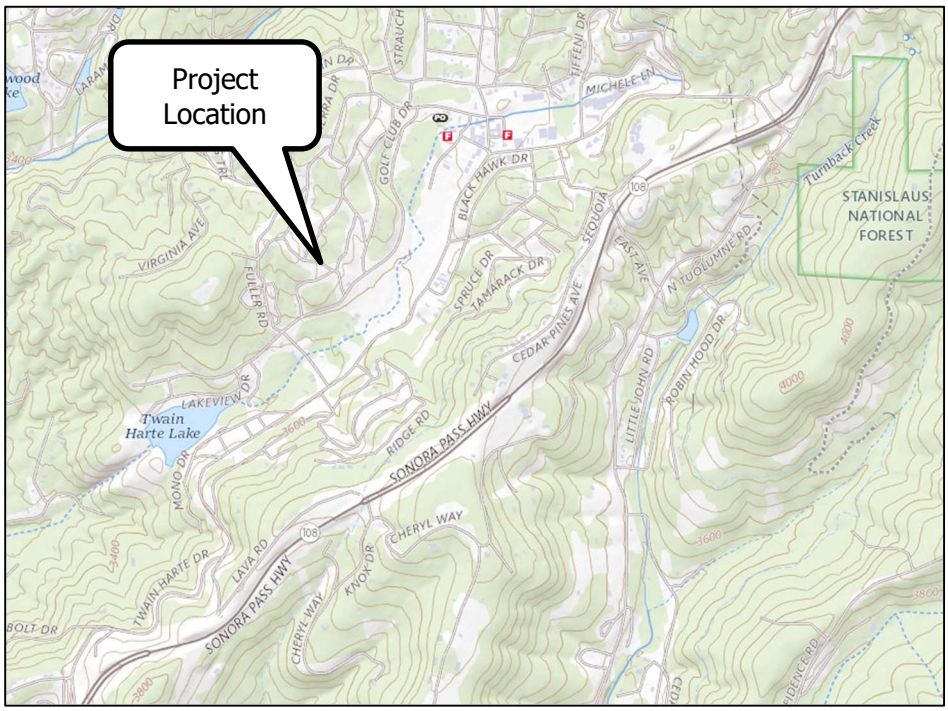


Figure 2-3 depicts the Project site's topography based on United States Geological Survey's (USGS) National Map (USGS 2019). The Project site is located at elevations of approximately 3,400 to 4,000 feet above mean sea level and is surrounded by various residential and retail land uses as well as open land.

Figure 2-3. Project Site Topography



3. SETTING

Protection of the public health is maintained through the attainment and maintenance of ambient air quality standards for various atmospheric compounds and the enforcement of emissions limits for individual stationary sources. The Federal Clean Air Act requires that the U.S. Environmental Protection Agency (EPA) establish National Ambient Air Quality Standards (NAAQS) to protect the health, safety, and welfare of the public. NAAQS have been established for ozone (O_3), CO, NO_2, SO_2, PM_{10} and $PM_{2.5}$, and lead (Pb). California has also adopted ambient air quality standards (CAAQS) for these "criteria" air pollutants. CAAQS are more stringent than the corresponding NAAQS and include standards for hydrogen sulfide (H_2S), vinyl chloride (chloroethene), and visibility reducing particles. The U.S. Clean Air Act Amendments of 1977 required each state to identify areas that were in non-attainment of the NAAQS and to develop State Implementation Plans (SIP's) containing strategies to bring these non-attainment areas into compliance. NAAQS and CAAQS designation/classification for Tuolumne County are presented in **Section 3.1** below.

Responsibility for regulation of air quality in California lies with the California Air Resources Board (CARB) and the 35 local air districts with oversight responsibility held by the EPA. CARB is responsible for regulating mobile source emissions, establishing CAAQS, conducting research, managing regulation development, and providing oversight and coordination of the activities of the 35 air districts. The air districts are primarily responsible for regulating stationary source emissions and monitoring ambient pollutant concentrations. CARB also determines whether air basins, or portions thereof, are "unclassified," in "attainment" or in "non-attainment" for the NAAQS and CAAQS relying on statewide air quality monitoring data.

3.1 Air Quality Standards

The Project area is located within Tuolumne County's portion of the Mountain Counties Air Basin (MCAB or Basin). Tuolumne County is included among the nine counties that comprise the MCAB; the other countries include Amador, Calaveras, El Dorado, Nevada, Placer, Plumas, Sierra, and Mariposa, each having their respective Air Pollution Control District. The TCAPCD acts as the regulatory agency for air pollution control in Tuolumne County and is the local agency empowered to regulate air pollutant emissions for the Project area. **Table 3-1** provides the NAAQS and CAAQS.

Table 3-1. Federal & California Air Quality Standards

Pollutant	Averaging Time	NAAQS	CAAQS
		Concentration	
O_3	8-hour	0.070 ppm (137 µg/m^3)[a]	0.070 ppm (137 µg/m^3)
	1-hour		0.09 ppm (180 µg/m^3)
CO	8-hour	9 ppm (10 µg/m^3)	9 ppm (10 µg/m^3)
	1-hour	35 ppm (40 µg/m^3)	20 ppm (23 µg/m^3)
NO_2	Annual Average	53 ppb (100 µg/m^3)	0.030 ppm (57 µg/m^3)
	1-Hour	100 ppb (188.68 µg/m^3)	0.18 ppm (339 µg/m^3)
SO_2	3-Hour	0.5 ppm (1,300 µg/m^3)	
	24 Hour	0.14 ppm (365 µg/m^3)	0.04 ppm (105 µg/m^3)
	1-Hour	75 ppb (196 µg/m^3)	0.25 ppm (655 µg/m^3)
Particulate Matter (PM_{10})	Annual Arithmetic Mean		20 µg/m^3
	24-Hour	150 µg/m^3	50 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	12 µg/m^3
	24-Hour	35 µg/m^3	
Sulfates	24-Hour		25 µg/m^3
Pb[d]	Rolling Three-Month Average	0.15 µg/m^3	
	30 Day Average		1.5 µg/m^3
H_2S	1-Hour		0.03 ppm (42 µg/m^3)
Vinyl Chloride (chloroethene)	24-Hour		0.010 ppm (26 µg/m^3)
Visibility Reducing particles	8 Hour (1000 to 1800 PST)		[b]

ppm = parts per million
ppb = parts per billion
mg/m^3 = milligrams per cubic meter
µg/m^3 = micrograms per cubic meter

Source: CARB 2016
a. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm
b. In 1989, CARB converted both the general statewide 10-mile visibility standards and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

Under the provisions of the U.S. Clean Air Act, the Tuolumne County portion of the MCAB has been classified as nonattainment/extreme, nonattainment/severe, nonattainment, attainment/unclassified, attainment, or unclassified under the established NAAQS and CAAQS for various criteria pollutants. **Table 3-2** provides the MCAB designation and classification based on the various criteria pollutants under both NAAQS and CAAQS.

Table 3-2. Mountain Counties Attainment Status

Pollutant	NAAQS[a]	CAAQS[b]
O_3, 1-hour	No Federal Standard[f]	Nonattainment
O_3, 8-hour	Nonattainment/Marginal[e]	Nonattainment
PM_{10}	Attainment[c]	Attainment/Unclassified
$PM_{2.5}$	Attainment[d]	Attainment/Unclassified
CO	Attainment/Unclassified	Attainment
NO_2	Attainment/Unclassified	Attainment
SO_2	Attainment/Unclassified	Attainment
Pb (Particulate)	No Designation/Classification	Attainment
H_2S	No Federal Standard	Unclassified
Sulfates	No Federal Standard	Attainment
Visibility Reducing Particulates	No Federal Standard	Unclassified
Vinyl Chloride	No Federal Standard	Attainment

Source: CARB 2020a
Note: Where CAAQS or NAAQS attainment status was further differentiated by County, the status of Tuolumne County is shown.

TCAPCD does not operate its own air quality monitoring network and instead relies on the air quality monitoring networks of CARB and other surrounding air districts within the MCAB to provide information on average concentrations of those pollutants for which Federal or State agencies have established NAAQS and CAAQS, respectively. The monitoring station in the MCAB are listed in **Table 3-3.**

Table 3-3. Mountain Counties Air Basin Monitoring Network

Site Name	County	Agency	Pollutants
Jackson-Clinton Road	Amador	CARB	O_3
San Andreas-Gold Strike Road	Calaveras	CARB	O_3, PM_{10}, $PM_{2.5}$
Placerville-Gold Nugget Way	El Dorado	CARB	O_3
Cool (seasonal)	El Dorado	CARB	O_3
Echo Summit (seasonal)	El Dorado	CARB	O_3
Yosemite Village-Visitor Center	Mariposa	CARB	PM_{10}, $PM_{2.5}$
Jerseydale Mariposa	Mariposa	CARB	O_3
Yosemite Natl Park-Turtleback	Mariposa	National Park Service (NPS)	O_3
Truckee-Fire Station	Nevada	Northern Sierra AQMD	$PM_{2.5}$
Grass Valley-Litton Building	Nevada	Northern Sierra AQMD	O_3, $PM_{2.5}$
Colfax-City Hall	Placer	Placer County APCD	O_3, $PM_{2.5}$
Quincy-N Church Street	Plumas	Northern Sierra AQMD	$PM_{2.5}$
Chester	Plumas	Northern Sierra AQMD	$PM_{2.5}$
Sonora-Barretta Street	Tuolumne	CARB	O_3
Portola-Gulling Street	Plumas	Northern Sierra AQMD	$PM_{2.5}$

Source: CARB 2020b

3.2 Existing Air Quality

For the purposes of background data and this air quality analysis, this analysis relied on data collected in the last three years for the CARB monitoring stations that are located in the closest proximity to the project site. **Table 3-3** provides the background concentrations for O_3, particulate matter of 10 microns (PM_{10}), particulate matter of less than 2.5 microns ($PM_{2.5}$), CO, NO_2, SO_2, and Pb. Information is provided for the Sonora – Baretta Street and San Andreas – Gold Strike Road, and Jerseydale monitoring stations for 2018 through 2020. No data is available for H_2S, Vinyl Chloride or other toxic air contaminants in Tuolumne County.

Table 3-4. Existing Air Quality Monitoring Data in Project Area

Pollutant and Monitoring Station Location	Maximum Concentration			Days Exceeding Standard		
	2018	2019	2020	2018	2019	2020
O_3 – 1-hour CAAQS (0.09 ppm)						
Sonora – Barretta Street	0.101	0.087	0.093	4	0	0
San Andreas – Gold Strike Road	0.105	0.082	0.095	2	0	2
Jerseydale	0.127	0.082	0.111	2	0	4
O_3 – 8-hour CAAQS (0.07 ppm)						
Sonora – Barretta Street	0.087	0.074	0.083	22	2	5
San Andreas – Gold Strike Road	0.086	0.074	0.097	10	2	5
Jerseydale	0.088	0.074	0.101	15	5	26
O_3 – 8-hour NAAQS (0.070 ppm)						
Sonora – Barretta Street	0.087	0.073	0.083	21	2	5
San Andreas – Gold Strike Road	0.086	0.073	0.097	10	1	5
Jerseydale	0.084	0.074	0.100	11	5	24
PM_{10} – 24-hour CAAQS (50 µg/m^3)						
San Andreas – Gold Strike Road	66.8	48.5	205.7	5	0	30
PM_{10} – 24-hour NAAQS (150 µg/m^3)						
San Andreas – Gold Strike Road	69.4	47.6	217.3	0	0	4
$PM_{2.5}$ - 24-hour NAAQS (35 µg/m^3)						
San Andreas – Gold Strike Road	67.7	24.8	134.2	16	0	23
CO - 8-Hour CAAQS & NAAQS (9.0 ppm)						
No data collected	*	*	*	*	*	*
NO_2 - 1-Hour CAAQS (0.18 ppm)						
No data collected	*	*	*	*	*	*
NO_2 - 1-Hour NAAQS (0.10 ppm)						
No data collected	*	*	*	*	*	*
SO_2 – 24-hour Concentration - CAAQS (0.04 ppm) & NAAQS (0.14 ppm)						
No data collected	*	*	*	*	*	*
Pb - Maximum 30-Day Concentration CAAQS (1500 ng/m^3)						
No data collected	*	*	*	*	*	*

Source: CARB 2021
Notes: ppm= parts per million
* There was insufficient (or no) data available to determine the value.

The following is a description of criteria air pollutants, typical sources and health effects and the recently documented pollutant levels in the project vicinity.

3.2.1 Ozone (O_3)

The most severe air quality problem in the Mountain Counties is high concentrations of O_3. High levels of O_3 cause eye irritation and can impair respiratory functions. High levels of O_3 can also affect plants and materials. Grapes, lettuce, spinach and many types of garden flowers and shrubs are particularly vulnerable to O_3 damage. O_3 is not emitted directly into the atmosphere but is a secondary pollutant produced through photochemical reactions involving hydrocarbons and nitrogen oxides (NOx). Significant O_3 generation requires about one to three hours in a stable atmosphere with strong sunlight. For this reason, the months of April through October comprise the "ozone season." O_3 is a regional pollutant because O_3 precursors are transported and diffused by wind concurrently with the reaction process. The data contained in **Table 3-3** shows that the Tuolumne area exceeded the 1-hour average ambient O_3 CAAQS and the 8-hour average ambient O_3 NAAQS and CAAQS for the 2018 through 2020 period.

3.2.2 Suspended Particulate Matter (PM_{10} and $PM_{2.5}$)

Both State and Federal particulate standards now apply to particulates under 10 microns (PM_{10}) rather than to total suspended particulate (TSP), which includes particulates up to 30 microns in diameter. Continuing studies have shown that the smaller-diameter fraction of TSP represents the greatest health hazard posed by the pollutant; therefore, EPA has recently established NAAQS for $PM_{2.5}$. The project area is classified as attainment or unclassifiable for PM_{10} and $PM_{2.5}$ for NAAQS and CAAQS.

Particulate matter consists of particles in the atmosphere resulting from many kinds of dust and fume-producing industrial and agricultural operations, from combustion, and from atmospheric photochemical reactions. Natural activities also increase the level of particulates in the atmosphere; wind-raised dust and ocean spray are two sources of naturally occurring particulates. The largest sources of PM_{10} and $PM_{2.5}$ in the MCAB are motor vehicle emissions and forest fires. PM_{10} and $PM_{2.5}$ are considered regional pollutants with elevated levels typically occurring over a wide geographic area. Concentrations tend to be highest in the winter, during periods of high atmospheric stability and low wind speed. In the respiratory tract, very small particles of certain substances may produce injury by themselves or may contain absorbed gases that are injurious. Particulates of aerosol size suspended in the air can both scatter and absorb sunlight, producing haze and reducing visibility. They can also cause a wide range of damage to materials.

Table 3-3 shows that PM_{10} levels exceeded the CAAQS and the NAAQS at the monitoring station in 2020 and the CAAQS in 2018. **Table 3-3** shows that $PM_{2.5}$ NAAQS were exceeded in 2018 and 2020. Similar levels can be expected to occur in the vicinity of the Project site.

3.2.3 Carbon Monoxide (CO)

Ambient CO concentrations normally correspond closely to the spatial and temporal distributions of vehicular traffic. Relatively high concentrations of CO would be expected along heavily traveled roads and near busy intersections. Wind speed and atmospheric mixing also influence CO concentrations; however, under inversion conditions, CO concentrations may be more uniformly distributed over a broad area.

Internal combustion engines, principally in vehicles, produce CO due to incomplete fuel combustion. Various industrial processes also produce CO emissions through incomplete combustion. Gasoline-powered motor vehicles are typically the major source of this contaminant. CO does not irritate the respiratory tract but passes through the lungs directly into the blood stream, and by interfering with the transfer of fresh oxygen to the blood, deprives sensitive tissues of oxygen, thereby aggravate cardiovascular disease, causing fatigue, headaches, and dizziness. CO is not known to have adverse effects on vegetation, visibility, or materials.

Table 3-3 reports no CO data is available for the three-year period from 2018 through 2020; historically Tuolumne area data for CO has been below the CAAQS and NAAQS.

3.2.4 Nitrogen Dioxide (NO_2) and Hydrocarbons

Tuolumne County has been designated as an attainment area for the NAAQS for NO_2. NO_2 is the "whiskey brown" colored gas readily visible during periods of heavy air pollution. Mobile sources and oil and gas production account for nearly all of the County's NOx emissions, most of which is emitted as NO_2. Combustion in motor vehicle engines, power plants, refineries and other industrial operations are the primary sources in the region. Railroads and aircraft are other potentially significant sources of combustion air contaminants. Oxides of nitrogen are direct participants in photochemical smog reactions. The emitted compound, nitric oxide, combines with oxygen in the atmosphere in the presence of hydrocarbons and sunlight to form NO_2 and O_3. NO_2, the most significant of these pollutants, can color the atmosphere at concentrations as low as 0.5 ppm on days of 10-mile visibility. NOx is an important air pollutant in the region because it is a primary receptor of ultraviolet light, which initiates the reactions producing photochemical smog. It also reacts in the air to form nitrate particulates.

Motor vehicles are the major source of reactive hydrocarbons in the basin. Other sources include evaporation of organic solvents and petroleum production and refining operations. Certain hydrocarbons can damage plants by inhibiting growth and by causing flowers and leaves to fall. Levels of hydrocarbons currently measured in urban areas are not known to cause adverse effects in humans. However, certain members of this contaminant group are important components in the reactions, which produce photochemical oxidants.

Table 3-3 shows that the Federal and State NO_2 standards have not been measured at any MCAB-monitoring stations over the three-year period of 2018 through 2020. Hydrocarbons are not currently monitored.

3.2.5 Sulfur Dioxide (SO_2)

Tuolumne County has been designated as an attainment area for the NAAQS for SO_2. SO_2 is the primary combustion product of sulfur, or sulfur containing fuels. Fuel combustion is the major source of this pollutant, while chemical plants, sulfur recovery plants, and metal processing facilities are minor contributors. Gaseous fuels (natural gas, propane, etc.) typically have lower percentages of sulfur containing compounds than liquid fuels such as diesel or crude oil. SO_2 levels are generally higher in the winter months. Decreasing levels of SO_2 in the atmosphere reflect the use of natural gas in power plants and boilers.

At high concentrations, SO_2 irritates the upper respiratory tract. At lower concentrations, when respirated in combination with particulates, SO_2 can result in greater harm by injuring lung tissues. Sulfur oxides (SOx), in combination with moisture and oxygen, results in the formation of sulfuric acid, which can yellow the leaves of plants, dissolve marble, and oxidize iron and steel. SOx can also react to produce sulfates that reduce visibility and sunlight.

Table 3-3 shows no data has been reported over the three-year period in Tuolumne County.

3.2.6 Lead (Pb) and Suspended Sulfate

Ambient Pb levels have dropped dramatically due to the increase in the percentage of motor vehicles that run exclusively on unleaded fuel. Ambient Pb levels in Tuolumne are well below the ambient standard and are expected to continue to decline; the data reported in **Table 3-3** only shows the highest concentration as the number of days exceeding standards are not reported. Suspended sulfate levels have stabilized to the point where no excesses of the State standard are expected in any given year.

3.3 Climate

Tuolumne County is located in the Mountain Counties Air Basin (MCAB). The MCAB consists of a variety of geography and topography, which affects the region's climate. Tuolumne County is located in central California bridging from the San Joaquin Valley to the west, to the Sierra Nevada foothills, to the Sierra Nevada Mountains on the east. The MCAB includes Plumas, Sierra, Nevada, Placer (middle portion), El Dorado (western portion), Amador, Calaveras, Mariposa, and Mariposa Counties. Tuolumne County is bordered by Calaveras County on the north, Stanislaus County on the west, Mariposa County on the south, and Alpine and Mono Counties to the east. The basin lies along the northern Sierra Nevada Mountain Range, close to or contiguous with the Nevada border, and covers an area of roughly 11,000 square miles. The population of the entire air basin is less than 500,000. The western slope of El Dorado County, from Lake Tahoe on the east to the Sacramento County boundary on the west, lies within the MCAB. Elevations range from over 10,000 feet at the Sierra crest down to several hundred feet above sea level at the Sacramento County boundary. Throughout the basin, the topography is highly variable, and includes rugged mountain peaks and valleys with extreme slopes and differences in elevation in the Sierras, as well as rolling foothills to the west. The western half of the County consists of gently sloping foothills with generally thin soils and hard underlying metamorphic bedrock. The eastern half of the County consists of steep to extremely steep foothills and mountains that generally ramp upwards to the northeast to the crest of the Sierra Nevada range. The general climate of the MCAB varies considerably with elevation and proximity to the Sierra ridge. The terrain features of the basin make it possible for various climates to exist in relatively close proximity. The Sierra Nevada receives large amounts of precipitation in the winter, with lighter amounts in the summer. Precipitation levels are high in the highest mountain elevations but decline rapidly toward the western portion of the basin. Winter temperatures in the mountains can be below freezing for weeks at a time, and substantial depths of snow can accumulate, but in the western foothills, winter temperatures usually dip below freezing only at night and precipitation is mixed as rain or light snow. In the summer, temperatures in the mountains are mild, with daytime peaks in the 70s to low 80s, but the western end of the basin can routinely exceed 100 degrees.

Meteorological data for various monitoring stations is maintained by the Western Regional Climate Center. Meteorological data for the Project site is expected to be similar to the data recorded at the Sonora monitoring station. This data is provided in **Table 3-4**, which contains average precipitation data recorded at the Sonora monitoring station. Over the 113-year period from December of 1903 through June of 2016 (the most recent data available), the average annual precipitation was 32.14 inches.

Table 3-5. Sonora Weather Data

Period of Record Monthly Climate Summary for the Period 12/01/1903 to 6/10/2016													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Maximum Temp (F)	54.5	58.0	62.4	68.5	77.1	86.1	94.5	93.0	86.7	76.0	63.5	55.6	73.0
Avg. Minimum Temp (F)	33.4	35.5	38.0	41.7	46.7	52.7	58.7	57.4	52.7	45.2	38.1	33.8	44.5
Average Total Precipitation (in.)	6.13	5.55	5.10	2.77	1.27	0.33	0.04	0.08	0.39	1.62	3.46	5.39	32.14
Average Snowfall (in.)	2.3	1.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	4.7
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0
Percent of possible observations for period of record: Max. Temp.: 90.2% Min. Temp.: 90% Precipitation: 94.8% Snowfall: 92.6% Snow Depth: 91.8%													
Source: Western Regional Climate Center, 2021.													

3.4 Climate Change and Greenhouse Gases

3.4.1 Global Climate Change

"Global climate change" refers to change in average meteorological conditions on the earth with respect to temperature, precipitation, and storms, lasting for decades or longer. The term "global climate change" is often used interchangeably with the term "global warming," but "global climate change" is preferred by some scientists and policy makers to "global warming" because it helps convey the notion that in addition to rising temperatures, other changes in global climate may occur. Climate change may result from the following influences:

- Natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- Natural processes within the climate system (e.g., changes in ocean circulation); and/or
- Human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, and desertification).

As determined from worldwide meteorological measurements between 1990 and 2005, the primary observed effect of global climate change has been a rise in the average global tropospheric temperature of 0.36 degree Fahrenheit (°F) per decade. Climate change modeling shows that further warming could occur, which could induce additional changes in the global climate system during the current century. Changes to the global climate system, ecosystems, and the environment of California could include higher sea levels, drier or wetter weather, changes in ocean salinity, changes in wind patterns or more energetic aspects of extreme weather (e.g., droughts, heavy precipitation, heat waves, extreme cold, and increased intensity of tropical cyclones). Specific effects from climate change in California may include a decline in the Sierra Nevada snowpack, erosion of California's coastline, and seawater intrusion in the Sacramento-San Joaquin River Delta.

Human activities, including fossil fuel combustion and land use changes, release carbon dioxide (CO_2) and other compounds cumulatively termed greenhouse gases (GHGs). GHGs are effective at trapping radiation that would otherwise escape the atmosphere. This trapped radiation warms the atmosphere, the oceans, and the earth's surface (USGCRP, 2014). Many scientists believe "most of the warming observed over the last 50 years is attributable to human activities" (IPCC, 2017). The increased amount of CO_2 and other GHGs in the atmosphere is the alleged primary result of human-induced warming.

GHGs are present in the atmosphere naturally, released by natural sources, or formed from secondary reactions taking place in the atmosphere. They include CO_2, methane (CH_4), nitrous oxide (N_2O), and O_3. In the last 200 years, substantial quantities of GHGs have been released into the atmosphere, primarily from fossil fuel combustion. These human-induced emissions are increasing GHG concentrations in the atmosphere, therefore enhancing the natural greenhouse effect. The GHGs resulting from human activity are believed to be causing global climate change. While human-made GHGs include CO_2, CH_4, and N_2O, some (like chlorofluorocarbons [CFCs]) are completely new to the atmosphere. GHGs vary considerably in terms of Global Warming Potential (GWP), the comparative ability of each GHG to trap heat in the atmosphere. The GWP is based on several factors, including the relative effectiveness of a gas to absorb infrared radiation and the length of time that the gas remains in the atmosphere ("atmospheric lifetime"). The GWP of each gas is measured relative to CO_2, the most abundant GHG. The definition of GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to the ratio of heat trapped by one unit mass of CO_2 over a specified time period. GHG emissions are typically measured in terms of pounds or tons of "CO_2 equivalents" (CO_2e).

Natural sources of CO_2 include the respiration (breathing) of humans and animals and evaporation from the oceans. Together, these natural sources release approximately 150 billion metric tons of CO_2 each year, far

outweighing the 7 billion metric tons of GHG emissions from fossil fuel burning, waste incineration, deforestation, cement manufacturing, and other human activity. Nevertheless, natural GHG removal processes such as photosynthesis cannot keep pace with the additional output of CO_2 from human activities. Consequently, GHGs are building up in the atmosphere (Enviropedia, 2017).

Methane is produced when organic matter decomposes in environments lacking sufficient oxygen. Natural sources of CH_4 production include wetlands, termites, and oceans. Human activity accounts for the majority of the approximately 500 million metric tons of CH_4 emitted annually. These anthropogenic sources include the mining and burning of fossil fuels; digestive processes in ruminant livestock such as cattle; rice cultivation; and the decomposition of waste in landfills. The major removal process for atmospheric CH_4, the chemical breakdown in the atmosphere, cannot keep pace with source emissions; therefore, CH_4 concentrations in the atmosphere are rising.

Worldwide emissions of GHGs in 2008 were 30.1 billion metric tons of CO_2e and have increased considerably since that time (United Nations, 2011). It is important to note that the global emissions inventory data are not all from the same year and may vary depending on the source of the data (U.S. EPA, 2019). Emissions from the top five emitting countries and the European Union accounted for approximately 70% of total global GHG emissions in 2014. The United States was the number two producer of GHG emissions behind China. The primary GHG emitted by human activities was CO_2, representing approximately 76% of total global GHG emissions (U.S. EPA, 2019).

In 2017, the United States emitted approximately 6.5 million metric tons of CO_2e. Of the six major sectors nationwide (electric power industry, transportation, industry, agriculture, commercial, and residential), the electric power industry and transportation sectors combined account for approximately 57% of the GHG emissions; the majority of the electrical power industry and all of the transportation emissions are generated from direct fossil fuel combustion. Between 1990 and 2017, total United States GHG emissions rose approximately 1.3% (U.S. EPA, 2019).

Worldwide, energy-related CO_2 emissions are expected to increase at an average rate of 0.6% annually between 2018 and 2050, compared with the average growth rate of 1.8% per year from 1990 to 2018. Much of the increase in these emissions is expected to occur in the developing world where emerging economies, such as China and India, fuel economic development with fossil fuel energy. Developing countries' emissions are expected to grow above the world average at a rate of approximately 1% annually between 2018 and 2050 and surpass emissions of industrialized countries by 2025 (U.S. EIA, 2019).

CARB is responsible for developing and maintaining the California GHG emissions inventory. This inventory estimates the amount of GHGs emitted into and removed from the atmosphere by human activities within the state of California and supports the Assembly Bill (AB) 32 Climate Change Program. CARB's current GHG emission inventory covers the years 2000 through 2017 and is based on fuel use, equipment activity, industrial processes, and other relevant data (e.g., housing, landfill activity, and agricultural lands).

In 2017, emissions from statewide emitting activities were 424 million metric tons of CO_2 equivalent (MMT CO_2e), which is 5 MMT CO_2e lower than 2016 levels. 2017 emissions have decreased by 14% since peak levels in 2004 and are 7 MMT CO_2e below the 1990 emissions level and the State's 2020 GHG limit. Per capita GHG emissions in California have dropped from a 2001 peak of 14.1 tonnes per person to 10.7 tonnes per person in 2017, a 24% decrease (CARB 2019).

CARB estimates that transportation was the source of approximately 40% of California's GHG emissions in 2017, followed by electricity generation at 15%. Other sources of GHG emissions were industrial sources at 21%, residential plus commercial activities at 10%, and agriculture at 8% (CARB 2019).

CARB has projected the estimated statewide GHG emissions for the year 2020, which represent the emissions that would be expected to occur with reductions anticipated from Pavley I and the Renewables Electricity Standard (30 MMT CO_2e total), will be 509 MMT of CO_2e (CARB, 2014). GHG emissions from the transportation and electricity sectors as a whole are expected to increase at approximately 36% and 20% of total CO_2e emissions, respectively, as compared to 2009. The industrial sector consists of large stationary sources of GHG emissions and the percentage of the total 2020 emissions is projected to be 18% of total CO_2e emissions. The remaining sources of GHG emissions in 2020 are high global warming potential gases at 6%, residential and commercial activities at 10%, agriculture at 7%, and recycling and waste at 2%.

3.4.2 Effects of Global Climate Change

Changes in the global climate are assessed using historical records of temperature changes that have occurred in the past. Climate change scientists use this temperature data to extrapolate a level of statistical significance specifically focusing on temperature records from the last 150 years (the Industrial Age) that differ from past climate changes in rate and magnitude.

The Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of GHGs needed to stabilize global temperatures and climate change impacts. In its Fifth Assessment Report, the IPCC predicted that the global mean temperature change from 1990 to 2100 could range from 1.1 degree Celsius (°C) to 6.4 °C (8 to 10.4 °Fahrenheit) (IPCC, 2013). Global average temperatures and sea levels are expected to rise under all scenarios (IPCC, 2014). The IPCC concluded that global climate change was largely the result of human activity, mainly the burning of fossil fuels. However, the scientific literature is not consistent regarding many of the aspects of climate change, the actual temperature changes during the 20th century, and contributions from human versus non-human activities.

Effects from global climate change may arise from temperature increases, climate sensitive diseases, extreme weather events, and degradation of air quality. There may be direct temperature effects through increases in average temperature leading to more extreme heat waves and less extreme cold spells. Those living in warmer climates are likely to experience more stress and heat-related problems. Heat-related problems include heat rash and heat stroke, drought, etc. In addition, climate-sensitive diseases may increase, such as those spread by mosquitoes and other disease-carrying insects. Such diseases include malaria, dengue fever, yellow fever, and encephalitis. Extreme events such as flooding and hurricanes can displace people and agriculture. Global warming may also contribute to air quality problems from increased frequency of smog and particulate air pollution.

According to the 2006 California Climate Action Team (CAT) Report, several climate change effects can be expected in California over the course of the next century (CalEPA, 2006). These are based on trends established by the IPCC and are summarized below.

- A diminishing Sierra snowpack declining by 70% to 90%, threatening the state's water supply.
- A rise in sea levels, resulting in the displacement of coastal businesses and residences. During the past century, sea levels along California's coast have risen about seven inches. If emissions continue unabated and temperatures rise into the higher anticipated warming range, sea level is expected to rise an additional 22 to 35 inches by the end of the century. Sea level rises of this magnitude would inundate coastal areas with salt water, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats. (Note: This condition would not affect the Proposed Project area, as it is a significant distance away from coastal areas.)
- An increase in temperature and extreme weather events. Climate change is expected to lead to increases in the frequency, intensity, and duration of extreme heat events and heat waves in California. More heat waves can exacerbate chronic disease or heat-related illness.

- Increased risk of large wildfires if rain increases as temperatures rise. Wildfires in the grasslands and chaparral ecosystems of southern California are estimated to increase by approximately 30% toward the end of the 21st century because more winter rain will stimulate the growth of more plant fuel available to burn in the fall. In contrast, a hotter, drier climate could promote up to 90% more northern California fires by the end of the century by drying out and increasing the flammability of forest vegetation.
- Increasing temperatures from 8 to 10.4 °F under the higher emission scenarios, leading to a 25% to 35% increase in the number of days that ozone pollution levels are exceeded in most urban areas (see below).
- Increased vulnerability of forests due to forest fires, pest infestation, and increased temperatures.
- Reductions in the quality and quantity of certain agricultural products. The crops and products likely to be adversely affected include wine grapes, fruit, nuts, and milk.
- Exacerbation of air quality problems. If temperatures rise to the medium warming range, there could be 75 to 85% more days with weather conducive to ozone formation in Los Angeles and the San Joaquin Valley, relative to today's conditions. This is more than twice the increase expected if rising temperatures remain in the lower warming range. This increase in air quality problems could result in an increase in asthma and other health-related problems.
- A decrease in the health and productivity of California's forests. Climate change can cause an increase in wildfires, an enhanced insect population, and establishment of non-native species.
- Increased electricity demand, particularly in the hot summer months.
- Increased ground-level ozone formation due to higher reaction rates of ozone precursors.

3.4.3 Global Climate Change Regulatory Issues

In 1988, the United Nations established the Intergovernmental Panel on Climate Change to evaluate the impacts of global warming and to develop strategies that nations could implement to curtail global climate change. In 1992, the United Nations Framework Convention on Climate Change established an agreement with the goal of controlling GHG emissions, including methane. As a result, the Climate Change Action Plan was developed to address the reduction of GHGs in the United States. The plan consists of more than 50 voluntary programs. Additionally, the Montreal Protocol was originally signed in 1987 and substantially amended in 1990 and 1992. The Montreal Protocol stipulates that the production and consumption of compounds that deplete O_3 in the stratosphere (chlorofluorocarbons [CFCs], halons, carbon tetrachloride, and methyl chloroform) were phased out by 2000 (methyl chloroform was phased out by 2005).

On September 27, 2006, Assembly Bill 32 (AB32), the California Global Warming Solutions Act of 2006 (the Act) was enacted by the State of California. The legislature stated, "Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California." The Act caps California's GHG emissions at 1990 levels by 2020. The Act defines GHG emissions as all of the following gases: carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. This agreement represents the first enforceable statewide program in the U.S. to cap all GHG emissions from major industries that includes penalties for non-compliance. While acknowledging that national and international actions will be necessary to fully address the issue of global warming, AB32 lays out a program to inventory and reduce GHG emissions in California and from power generation facilities located outside the state that serve California residents and businesses.

AB32 charges CARB with responsibility to monitor and regulate sources of GHG emissions in order to reduce those emissions. CARB has adopted a list of discrete early action measures that can be implemented to reduce GHG emissions. CARB has defined the 1990 baseline emissions for California and has adopted that baseline as the 2020 statewide emissions cap. CARB is conducting rulemaking for reducing GHG emissions to achieve the emissions cap by 2020. In designing emission reduction measures, CARB must aim to minimize costs, maximize benefits, improve and modernize California's energy infrastructure, maintain electric system

reliability, maximize additional environmental and economic co-benefits for California, and complement the state's efforts to improve air quality.

Subsequent legislation by the California legislature has included Senate Bill (SB) 32, which expanded upon AB32 to reduce GHG emissions to 40% below the 1990 levels by 2030; AB197 which increased the legislative oversight of the CARB by adding two legislatively appointed non-voting members to the CARB Board and provided additional protection to disadvantaged communities; SB350, which increased California's renewable energy electricity procurement goal and SB100, which established a landmark policy requiring renewable energy and zero-carbon resources to supply 100 percent of electrical retail sales to end use customers and 100 percent of electricity procured to serve state agencies by 2045.

Global warming and climate change have received substantial public attention for more than 20 years. For example, the United States Global Change Research Program was established by the Global Change Research Act of 1990 to enhance the understanding of natural and human-induced changes in the Earth's global environmental system, to monitor, understand, and predict global change, and to provide a sound scientific basis for national and international decision-making. Even so, the analytical tools have not been developed to determine the effect on worldwide global warming from a particular increase in GHG emissions, or the resulting effects on climate change in a particular locale. The scientific tools needed to evaluate the impacts that a specific project may have on the environment are even farther in the future.

The California Supreme Court's most recent CEQA decision on the Newhall Ranch development case, Center for Biological v. California Department of Fish and Wildlife (November 30, 2015, Case No. 217763), determined that the project's Environmental Impact Report (EIR) did not substantiate the conclusion that the GHG cumulative impacts would be less than significant. The EIR determined that the Newhall Ranch development project would reduce GHG emissions by 31 percent from business as usual (BAU). This reduction was compared to the California's target of reducing GHG emissions statewide by 29 percent from business as usual. The Court determined that "the EIR's deficiency stems from taking a quantitative comparison method developed by the Scoping Plan as a measure of the greenhouse gas reduction effort required by the state as a whole, and attempting to use that method, without adjustments, for a purpose very different from its original design." In the Court's final ruling it offered suggestions that were deemed appropriate use of the BAU methodology:

1. Lead agencies can use the comparison to BAU methodology if they determine what reduction a particular project must achieve in order to comply with statewide goals,
2. Project design features that comply with regulations to reduce emissions may demonstrate that those components of emissions are less that significant, and
3. Lead agencies could also demonstrate compliance with locally adopted climate plans or could apply specific numerical thresholds developed by some local agencies.

Tuolumne County, the Lead CEQA agency for this Project, has not developed specific thresholds for GHGs. However, according to the General Plan Update EIR, the statewide service population GHG emissions threshold for 2040 is 3.1 MTCO2e per service population. The 3.1 MTCO2e per service population would not result in a substantial increase in GHGs or conflict with local or state plans adopted for the purpose of reducing GHG emissions.

3.5 Regulatory Setting

3.5.1 Federal

3.5.1.1 U.S. Environmental Protection Agency

The 1977 federal CAA and 1990 revisions require EPA to identify National Ambient Air Quality Standards (NAAQS) to protect the public health and welfare. In January of 2013, EPA adopted new PM_{10} and $PM_{2.5}$ federal standards, 150 $\mu g/m^3$ and 35 $\mu g/m^3$ respectively.

In October 2015, EPA implemented a new 8-hour standard for ozone. The new primary 8-hour standard is 0.070 ppm, and the new secondary standard is set at a form and level identical to the primary standard. The previous primary and secondary standards were an identical 8-hour standard, set at 0.075 ppm. On April 12, 2010, EPA implemented a new 1-hour standard for NO_2 of 100 parts per billion (ppb).

Pursuant to the 1990 CAA Amendments (CAAA), EPA classified air basins (or portions thereof) as either attainment or nonattainment areas for each criteria air pollutant based on whether or not the NAAQS have been achieved. The CAA also required each state to prepare an air quality control plan (State Implementation Plan [SIP]). The 1990 amendments additionally required states containing areas that violate NAAQS to revise their SIPs to incorporate additional control measures to reduce air pollution. EPA has the responsibility to review all SIPs to determine if they conform to the mandates of the CAAA and will achieve air quality goals when implemented.

Regulation of TACs (HAPs under federal regulations) is achieved through federal and state controls on individual sources. Federal law defines HAPs as non-criteria air pollutants with short-term (acute) and/or long-term (chronic or carcinogenic) adverse human health effects. The 1977 CAA required EPA to identify National Emission Standards for Hazardous Air Pollutants (NESHAPs) to protect public health and welfare.

The 1990 CAAA offer a technology-based approach to reducing air toxics. Since the CAAA were approved, 188 chemicals have been designated as HAPs and are regulated under a two-phase strategy. The first phase involves requiring facilities to install Maximum Achievable Control Technology (MACT), which includes measures, methods, and techniques, such as material substitutions, work practices, and operational improvements, aimed at reducing toxic air emissions. MACT is the lowest emission rate, or highest level of control demonstrated, on average by the top performing companies (top 12%) in the source category. MACT standards already exist for the 174 source categories: 166 major sources and 8 area sources. Under the air toxics program, facilities having similar operating processes are grouped into categories. These MACTs were promulgated in four "bins" of years: 1992, 1994 (39 categories), 1997 (62 categories), and 2000 (67 categories). As of August 2003, MACT standards have been made for 174 source categories and their sub-categories.

Title V of the CAA, as amended in 1990, creates an operating permits program for certain defined sources. In general, owner/operators of defined stationary sources that emit more than 25 tons per year (tpy) of NOx and VOC must possess a Title V permit. Title V is a federally enforceable state operating permit that is required under 40 CFR, Part 70. The Title V programs are developed at the state or local level, as outlined in 40 CFR 70.

Under the extreme definition, the definition of a major source subject to Title V permitting changes from 25 tpy to 10 tpy, which results in more businesses having to comply with Title V permitting requirements under the extreme nonattainment designation.

Title V does not impose any new air pollution standards, require installation of any new controls on the affected facilities, or require reductions in emissions. Title V does enhance public and EPA participation in the permitting process and requires additional recordkeeping and reporting by businesses, which results in significant administrative requirements. As this Project is not considered a stationary source under SJVAPCD or CAA regulations, it will not be subject to Title V requirements.

3.5.2 State

3.5.2.1 California Air Resources Board (CARB)

CARB, a department of the California Environmental Protection Agency (Cal/EPA), oversees air quality planning and control throughout California by administering the SIP. Its primary responsibility lies in ensuring implementation of the 1989 amendments to the CCAA as well as responding to the federal CAA requirements and regulating emissions from motor vehicles sold in California. It also sets fuel specifications to reduce vehicular emissions further.

The amendments to the CCAA establish the CAAQS and a legal mandate to achieve these standards by the earliest practical date. These standards apply to the same criteria pollutants as the federal CAA; they also include sulfate, Visibility Reducing Particles (VRPs), H_2S, and vinyl chloride. They are also more stringent than the federal standards. The San Joaquin Valley Air Basin (SJVAB) is designated as a nonattainment area for the state ozone, PM_{10}, and $PM_{2.5}$ standards. Concentrations of all other pollutants meet state standards.

CARB is also responsible for regulations pertaining to TACs. AB 2588 was enacted in 1987 as a means to establish a formal air toxics emission inventory risk quantification program. AB 2588, as amended, establishes a process that requires stationary sources to report information regarding the types and quantities of certain substances that their facilities routinely release into the SJVAB. Each air pollution control district ranks the data into high, intermediate, and low priority categories. When considering the ranking, the potency, toxicity, quantity, volume, and proximity of the facility to receptors are given consideration by an air district.

CARB also has on- and off-road engine emission-reduction programs that would indirectly affect the proposed project's emissions through the phasing in of cleaner on- and off-road engines. In addition, CARB has a Portable Equipment Registration Program that allows owners or operators of portable engines and associated equipment to register their units under a statewide program, with specified emission requirements, without having to obtain individual permits from local air districts.

The state has also enacted a regulation for the reduction of diesel particulate matter and criteria pollutant emissions from in-use off-road diesel-fueled vehicles (13 CCR Article 4.8, Chapter 9, Section 2449). This regulation provides target emission rates for particulate matter and NOx emissions for owners of fleets of diesel-fueled off-road vehicles. It applies to equipment fleets of three specific sizes, and the target emission rates are reduced over time.

3.5.3 Local

3.5.3.1 Tuolumne County General Plan

The policies, goals, and implementation measures in the Tuolumne County General Plan applicable to air quality as related to the proposed project are provided below. The Tuolumne County General Plan contains additional policies, goals, and implementation measures that are more general in nature and not specific to development such as the proposed project. Therefore, they are not listed below.

3.5.3.2 Tuolumne County Air Pollution Control District (TCAPCD)

The policies, rules, and Air Quality Attainment Plan (AQAP) prepared and maintained by the TCAPCD govern efforts to get into and maintain compliance with federally established Ambient Air Quality Standards. The following discussion details the development and rules associated with the TCAPCD's AQAP efforts.

3.5.3.2.1 Ozone Air Quality Attainment Plan

Tuolumne County is in nonattainment for the state standards of ozone. CARB has determined that the ozone levels in Tuolumne County are caused by "overwhelming transport" of emissions into the air district. Therefore, TCAPCD is relieved from preparing an ozone attainment plan (CAPCOA 2015).

3.5.3.2.2 TCAPCD Rules and Regulations

The Project is an improvement project that will primarily be subject to SJVAPCD rules governing construction emissions, dust control, and nuisance issues.

3.5.4 General Conformity for Federal Actions Under NEPA

Section 176(c) of the Clean Air Act prohibits Federal entities from taking actions in nonattainment or maintenance areas which do not conform to the State Implementation Plan (SIP) for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). The purpose of "conformity" is to 1) ensure that Federal activities do not interfere with emissions budgets within the affected SIP; 2) ensure such actions do not cause or contribute to new violations; and 3) ensure attainment and maintenance of the NAAQS. In November of 1993 the U. S. Environmental Protection Agency (EPA) promulgated two sets of regulations to implement Section 176(c). On November 24, 1993, the EPA promulgated the Transportation Conformity Regulations, applicable to highway and mass transit actions, to establish the criteria and procedures for determining that transportation plans, programs, and projects which are funded under Title 23 U.S.C. or the Federal Transit Act, conform with the SIP (58 FR 62188). On November 30, 1993, the EPA promulgated the General Conformity Regulations which applies to all other Federal actions to ensure that such actions also conform to applicable SIPs (58 FR 63214).

Under General Conformity, all Federal actions are covered unless exempted (i.e. actions covered by transportation conformity, actions with de minimus emissions, exempt actions listed by rule, or actions covered by a Presumed to Conform listing. Conformance can be demonstrated in any one of five ways:

1. Showing that proposed emissions increases are included in the SIP;
2. Provision that the State will agree to include the proposed emission increases in the SIP;
3. Demonstrating that there will be new violations of NAAQS and/or increase in frequency/severity of violations;
4. Identification and provision of emissions offsets; or
5. Avoidance, Minimization and/or Mitigation Measures.

Some emissions are excluded from conformity determination, such as those already subject to new source review (stationary sources); those covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) or compliance with other environmental laws, actions not reasonably foreseeable, and those for which the Agency has no continuing program responsibility.

At issue for the Project is the potential for an increase in total NOx emissions in excess of de minimis levels during project construction. The project will result in no change to the current operational (long-term)

emissions of all criteria pollutants; thus, no consideration of these emissions is required. General Conformity de minimus levels are presented below in **Table 3-6**.

Table 3-6. General Conformity De Minimus Levels

Pollutant	Attainment Status[1]	Tons Per Year
Ozone (VOC)	Non-Attainment Area Inside an Ozone Transport Region	50
Ozone (NOx)	Non-Attainment Area Inside an Ozone Transport Region	100

1. 40 CFR Part 93.153(b)(1) – Federal (NAAQS)

If the planned Federal action for the Project can be demonstrated to pose emissions impacts less than those listed above in **Table 3-6**, the project can be said to be in conformity with the CAA and NEPA and no further demonstration is required. This fact is demonstrated in Chapter 4 of this analysis.

4. IMPACT ASSESSMENT

4.1 Significance Criteria

To determine whether a proposed Project could create a potential CEQA impact, local, State, and Federal agencies have developed various means by which a project's impacts may be measured and evaluated. Such means can generally be categorized as follows:

- Thresholds of significance adopted by air quality agencies to guide lead agencies in their evaluation of air quality impacts under the CEQA.
- Regulations established by air districts, CARB and EPA for the evaluation of stationary sources when applying for Authorities to Construct, Permits to Operate and other permit program requirements (e.g., New Source Review).
- Thresholds utilized to determine if a project would cause or contribute significantly to violations of the ambient air quality standards or other concentration-based limits.
- Regulations applied in areas where severe air quality problems exist.

Summary tables of these emission-based and concentration-based thresholds of significance for each pollutant are provided below along with a discussion of their applicability.

4.1.1 Thresholds Adopted for the Evaluation of Air Quality Impacts under CEQA

In order to maintain consistency with CEQA, the TCAPCD adopted evaluation criteria from CEQA Guidelines Appendix G with points of significance for air quality to assist applicants with complying with the various requirements. According to these criteria, a project would have potentially significant air quality impacts when the project:

- Violate any air quality standard or contribute substantially to an existing or projected air quality violation.
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or State ambient air quality standard, including releasing emissions which exceed quantitative thresholds for ozone precursors.
- Expose sensitive receptors to substantial pollutant concentrations.
- Create objectionable odors affecting a substantial number of people.

The TCAPCD thresholds are designed to implement the general criteria for air quality emissions as required in the CEQA Guidelines, Appendix G, Paragraph III (Title 14 of the California Code of Regulations §15064.7) and CEQA (California Public Resources Code Sections 21000 et. al). TCAPCD's specific CEQA air quality thresholds are presented in **Table 4-1**.

Table 4-1. TCAPCD CEQA Thresholds of Significance

Criteria Pollutant	Significance Level	
	Daily	Annual
CO	1,000 lbs/day	100 tons/yr
NOx	1,000 lbs/day	100 tons/yr
ROG	1,000 lbs/day	100 tons/yr
SOx	-	-
PM_{10}	1,000 lbs/day	100 tons/yr
$PM_{2.5}$	-	-

Source: TCAPCD 2017

4.1.2 Thresholds for Ambient Air Quality Impacts

CEQA Guidelines – Appendix G (Environmental Checklist) states that a project that would "violate any air quality standard or contribute substantially to an existing or projected air quality violation" would be considered to create significant impacts on air quality. Therefore, an AQIA should determine whether the emissions from a project would cause or contribute significantly to violations of the NAAQS or CAAQS (presented above in **Table 3-1**) when added to existing ambient concentrations.

The EPA has established the Federal New Source Review (NSR), which is divided into three types of NSR permitting requirements:

1. Prevention of Significant Deterioration (PSD) permits, where federal regulations are applied to new major sources, or existing major sources making a major modification, that are located in areas that have been designated as federal *attainment* for the NAAQS. The purpose of PSD is to ensure that areas with good ambient air quality will continue to maintain good air quality.

2. Nonattainment NSR permits, where federal regulations are applied to new major sources, or existing major sources making a major modification, that are located in areas designated as federal *nonattainment* for the NAAQS. The purpose of federal NSR is to ensure that ambient air quality does not deteriorate any further in nonattainment areas.

3. Minor NSR permits apply to stationary sources that do not require PSD or Nonattainment NSR permits. The purpose of Minor NSR permits is to prevent the construction of sources that would interfere with attainment or maintenance of a NAAQS or violate the control strategy in nonattainment areas. Also, Minor NSR permits often contain permit conditions to limit the sources emissions to avoid PSD or Nonattainment NSR.

The EPA has established pollutant specific "significant impact levels" (SIL) to be used in the PSD program to determine whether proposed construction would impact the NAAQS in attainment areas. The PSD SIL thresholds are used with ambient air quality modeling for a CEQA project to address whether the project would "*violate any air quality standard or contribute substantially to an existing or projected air quality violation*." A project's impacts are considered less than significant if emissions are below the PSD SIL for a particular pollutant. Ambient air quality emissions estimates below the PSD SIL thresholds would result in less than significant ambient air quality impacts on both a project and cumulative CEQA impact analysis. When a SIL is exceeded, an additional "increment analysis" is required. PSD SILs and increments are more stringent than the CAAQS or NAAQS and represent the most stringent thresholds of significance. (CARB 2020c; U.S. EPA 2016)

TCAPCD's Air Rules and Regulations define a "major source" as a stationary source which has the potential to emit a regulated air pollutant or Hazardous Air Pollutant (HAP) in quantities equal to or exceeding the lesser of any of the following thresholds:

1. 100 tons per year (tpy) of any regulated air pollutant;
2. 10 tpy of one HAP or 25 tpy of two or more HAPs; or
3. Any lesser quantity threshold promulgated by the U.S. EPA. (MCAPCD 2020)

As the Project would not include any new major sources or major modifications to existing stationary sources under NSR, it would not be subject to either PSD or NSR review. The MCAB is classified as nonattainment for the O_3 NAAQS and as attainment or unclassifiable for the PM, CO, NOx, SOx, and Lead NAAQS.

TCAPCD's Rule 408 (Attainment Pollutant Air Quality Analysis) states, "The [air quality simulation model designated in Rule 407] shall consider air quality impacts projected for the area as a result of general commercial, residential, industrial, and other growth associated with the facility if such facility or modification is proposed to employ more than 2,000 new residents" (TCAPCD 2020). The proposed Project will not house any new residents; therefore, air quality simulation modeling for MCAB attainment pollutants is not required.

TCAPCD's Rule 419 (Nonattainment Pollutant Air Quality Analysis) states, "Where a facility or modification is constructed in phases which individually do not emit more than 100 tons per year of a nonattainment pollutant or precursor, the allowable emissions from all such phases granted an Authority to Construct after December 21, 1976, shall be added together and this Rule shall be applicable when a proposed phase would cause the sum of the allowable emissions to exceed 100 tons per year of such nonattainment pollutant or precursor" (TCAPCD 2020). The proposed Project is not anticipated to increase operational emissions and will not exceed a combined total of less than 100 tons per year of O_3 precursor pollutants (ROG, NOx, and CO); therefore, air quality simulation modeling for MCAB nonattainment pollutants is not required.

4.1.3 Thresholds for Hazardous Air Pollutants

Table 4-2 presents the thresholds of significance used with toxic air contaminants when evaluating hazardous air pollutants (HAPs).

Table 4-2. Measures of Significance - Toxic Air Contaminants

Agency	Level	Description
Significance Thresholds Adopted for the Evaluation of Impacts Under CEQA		
TCAPCD	Carcinogens	Maximally Exposed Individual risk **equals or exceeds** 10 in one million.
	Non-Carcinogens	**Acute**: Hazard Index **equals or exceeds** 1 for the Maximally Exposed Individual.
		Chronic: Hazard Index **equals or exceeds** 1 for the Maximally Exposed Individual.

4.1.4 Global Climate Change Thresholds of Significance

CEQA Guidelines Appendix G includes the following criteria to determine if projects would have potentially significant air quality impacts. These criteria ask if the project would:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment, or
- Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

TCAPCD does not have specific thresholds for project GHG emissions. However, according to the General Plan Update EIR, the statewide service population GHG emissions threshold for 2040 is 3.1 MTCO2e per service population. The 3.1 MTCO2e per service population threshold was used for this analysis.

4.2 Project Related Emissions

This document was prepared pursuant to the TCAPCD's thresholds of significance. There are separate thresholds for a project's short-term (construction) and long-term (operational) emissions.

Project emissions were estimated for the following project development stages:

- Short-term (Construction and Demolition) – Construction emissions of the proposed Project were estimated in CalEEMod using a 5-month construction schedule and the following construction equipment for the replacement of existing pipeline.
  - Backhoe
  - Bobcat
  - Trencher
  - Generator
  - Grader
  - Dump Truck
  - Concrete Truck
- Long-term (Operations) – Long term emissions are not expected from this Project since there is no change to the operation of the pipelines. Therefore, operational emissions were not quantified.

4.2.1 Short-Term Emissions

The Project applicant provided a list of specific construction equipment; the construction emissions were therefore based on this list. Applying model defaults as well as a conservative analysis approach, construction emissions were estimated as if construction started in April of 2023. Based on the Project applicant, the Project construction is estimated to last 5 months. The dates entered into the CalEEMod program may not represent the actual dates the equipment will operate; however, the total construction time is accurate, and therefore, all estimated emission totals are conservative and reflect a reasonable and legally sufficient estimate of potential impacts. All construction equipment activity levels were assumed based on the specified CalEEMod default values for type and number of equipment, hours per day and horsepower.

Table 4-3 and **4-4** present the Project's short-term emissions based on the anticipated construction period.

Table 4-3. Short-Term Project Emissions – Annual

Year	Pollutant (tons/year)					
	ROG	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
2023	0.09	0.80	0.74	0.00	0.04	0.04
Significance Threshold	100	100	100	NA	100	NA
Is Threshold Exceeded for a Single Year After Mitigation?	**No**	**No**	**No**	**NA**	**No**	**NA**
Source: Trinity Consultants 2021						

Table 4-4. Short-Term Project Emissions – Daily

Season	Pollutant (tons/year)					
	ROG	NOx	CO	SO_2	PM_{10}	$PM_{2.5}$
Summer	1.56	14.57	13.60	0.03	0.82	0.68
Winter	1.56	14.58	13.54	0.03	0.82	0.68
Max	1.56	14.58	13.60	0.03	0.82	0.68
Significance Threshold	*1,000*	*1,000*	*1,000*	*NA*	*1,000*	*NA*
Is Threshold Exceeded for a Single Year After Mitigation?	**No**	**No**	**No**	**NA**	**No**	**NA**
Source: Trinity Consultants 2021						

As calculated with CalEEMod, the estimated short-term construction-related emissions would not exceed TCAPCD significance threshold levels during any given year and would therefore be *less than significant* under CEQA and is in compliance with the requirements of NEPA.

4.2.2 Long-Term Operations Emissions

Long-term emissions are caused by operational mobile, area, and energy sources. Long term emissions are not expected from this Project since there is no change to the operation of the pipelines. Therefore, operational emissions were not quantified.

4.3 Potential Impact on Sensitive Receptors

Sensitive receptors are defined as locations where young children, chronically ill individuals, the elderly, or people who are more sensitive than the general population reside, such as schools, hospitals, nursing homes, and daycare centers. The nearest residential sensitive receptor to the proposed Project site is 0.01 miles east of the Project. The three known non-residential sensitive receptors within 2 miles of the Project site are listed below in **Table 4-5**.

Table 4-5. Sensitive Receptors Located < 2 Miles from Project

Receptor	Type of Facility	Distance from Project in Miles	Direction from Project
Twain Harte School	PK-8 Public	0.1	E, W
Crystal Falls Family Care Home	Nursing Home	0.83	W
Belleview Elementary School	K-6 Public	1.43	W

4.4 Potential Impacts to Visibility to Nearby Areas

Visibility impact analyses are intended for stationary sources of emissions which are subject to the Prevention of Significant Deterioration (PSD) requirements in 40 CFR Part 60; they are not usually conducted for area sources. Because the Project's PM_{10} emissions increase is predicted to be less than the PSD threshold levels, an impact at any Class 1 area or military/airspace operation within 100 kilometers of the Project (including Mokelumne Wilderness, Emigrant Wilderness, Hoover Wilderness, Yosemite National Park, Ansel Adams Wilderness, Kaiser Wilderness, John Muir Wilderness, and Kings Canyon National Park) is extremely unlikely. Therefore, based on the Project's predicted less-than significant PM_{10} emissions, the Project would be expected to have a less than significant impact to visibility at any Class 1 area or military/airspace operation.

4.5 Potential Impacts from Carbon Monoxide

Ambient CO concentrations normally correspond closely to the spatial and temporal distributions of vehicular traffic. Relatively high concentrations of CO would be expected along heavily traveled roads and near busy intersections. CO concentrations are also influenced by wind speed and atmospheric mixing. CO concentrations may be more uniformly distributed when inversion conditions are prevalent in the valley. Under certain meteorological conditions, CO concentrations along a congested roadway or intersection may reach unhealthful levels for sensitive receptors, e.g. children, the elderly, hospital patients, etc. This localized impact can result in elevated levels of CO, or "hotspots" even though concentrations at the closest air quality monitoring station may be below NAAQS and CAAQS.

The localized Project impacts depend on whether ambient CO levels in the Project vicinity would be above or below NAAQS. If ambient levels are below the standards, a project is considered to have significant impacts if a project's emissions would exceed of one or more of these standards.

The Project is not expected to have any change in traffic. Therefore, CO "Hotspot" Modeling was not conducted for this Project and no concentrated excessive CO emissions are expected to be caused once the proposed Project is completed.

4.6 Predicted Health Risk Impacts

The proposed Project would result in emissions of Hazardous Air Pollutants (HAPs) and would be located near existing residents and workers. The only HAP expected to be emitted is Diesel Particulate Matter (DPM) from construction equipment and diesel trucks. There is currently no acute risk associated with DPM emissions. Chronic non-cancer and cancer risk are expected from long-term exposure, typically over one year of exposure. The Project construction is expected to only last for 5 months; therefore, there would be no chronic non-cancer or cancer risk associated with exposure to the Project's DPM construction emissions.

4.7 Potential Impacts from Asbestos

Naturally occurring asbestos can be released from serpentinite and ultramafic rocks when the rock is broken or crushed. At the point of release, the asbestos fibers may become airborne, causing air quality and human health hazards. These rocks have been commonly used for unpaved gravel roads, landscaping, fill projects, and other improvement projects in some localities. Asbestos may be released to the atmosphere due to vehicular traffic on unpaved roads, during grading of development projects, and at mining operations.

Serpentinite and/or ultramafic rock are known to be present in 44 of California's 58 counties. These rocks are particularly abundant in the counties associated with the Sierra Nevada foothills, the Klamath Mountains, and Coast Ranges. However, according to information provided by the Department of Conservation Division of Mines and Geology, the project site is not located in an area where naturally occurring asbestos is likely to be present (CDCDMG, 2000). Therefore, impacts associated with exposure of construction workers and nearby sensitive receptors to asbestos would be less than significant.

4.8 Odor Impacts and Mitigation

The General Plan EIR evaluates project odor impacts as measured by if the project will "create objectionable odors affecting a substantial number of people". The County relies on the TCAPCD's Rule 205 ("Nuisance") to control nuisance impacts and deal with odor complaints (TCAPCD 2018). According to the General Plan EIR, "Rule 205 prohibits the emission of any material that may cause a nuisance to a person or the public".

The Project is not expected to have an increase in operational emissions; therefore, it is not expected to be a source of objectionable odors.

4.9 Impacts to Ambient Air Quality

The TCAPCD has not established specific quantitative thresholds for determining whether a project will cause or contribute to a violation of state or federal Ambient Air Quality Standards (AAQS). In lieu of specific thresholds from TCAPCD, Appendix G of the CEQA Guidelines will be used to determine a project's potential impact on ambient air quality. The Project is not expected to increase operational emissions; therefore, the Project is not expected to cause or contribute to a violation of any AAQS, and an AAQA is not required for this Project

4.10 Impacts to Greenhouse Gases and Climate Change

The proposed Project's construction GHG emissions were estimated using the CalEEMod program (version 2020.4.0). These emissions are summarized in **Table 4-6**. In order for the Project to conform with the goals of AB32, the GHG emissions should not exceed 3.1 MTCO2e per service population target for 2040. Construction-related GHG emissions would be temporary and intermittent in nature and therefore would not have a significant impact on statewide GHG goals. The Project is not expected to have an increase in operational GHG emissions; therefore, the Project would have *less than significant* GHG impacts.

Table 4-6. Estimated Construction GHG Emissions (MT/Year)

Source	CO_2	CH_4	N_2O	CO_2e
2023 Construction Emissions	121.07	0.03	0.00	121.84
*Note: 0.000 could represent <0.000				

The Project will not result in the emissions of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), or sulfur hexafluoride (SF_6), the other gases identified as GHG in AB32. The proposed Project will be subject to any regulations developed under AB32 as determined by CARB.

4.10.1 Feasible and Reasonable Mitigation Relative to Global Warming

CEQA requires that all feasible and reasonable mitigation be applied to the project to reduce the impacts from construction and operations on air quality. These measures include using controls that limit the exhaust from construction equipment and using alternatives to diesel when possible. Additional reductions would be achieved through the regulatory process of the air district and CARB as required changes to diesel engines are implemented which would affect the product delivery trucks and limits on idling.

While it is not possible to determine whether the Project individually would have a significant impact on global warming or climate change, the Project would potentially contribute to cumulative GHG emissions in California as well as related health effects. The Project emissions would only be a very small fraction of the statewide GHG emissions. However, without the necessary science and analytical tools, it is not possible to assess, with certainty, whether the Project's contribution would be cumulatively considerable, within the meaning of CEQA Guidelines Sections 15065(a)(3) and 15130. CEQA, however, does note that the more severe environmental problems the lower the thresholds for treating a project's contribution to cumulative impacts as significant. Given the position of the legislature in AB32 which states that global warming poses serious detrimental effects, and the requirements of CEQA for the lead agency to determine that a project not have a cumulatively considerable contribution, the effect of the Project's CO_2 contribution may be considered cumulatively considerable. This determination is "speculative," given the lack of clear scientific evidence or other criteria for determining the significance of the Project's contribution of GHG to the air quality in the SJVAB.

The strategies currently being implemented by CARB may help in reducing the Project's GHG emissions and are summarized in the table below.

Table 4-7. Select CARB GHG Emission Reduction Strategies

Strategy	Description of Strategy
Vehicle Climate Change Standards	AB 1493 (Pavley) required the state to develop and adopt regulations that achieve the maximum feasible and cost-effective reduction of climate change emissions emitted by passenger vehicles and light duty trucks. Regulations were adopted by CARB in Sept. 2004.
Diesel Anti-Idling	In July 2004, CARB adopted a measure to limit diesel-fueled retail motor vehicle idling.
Other Light-Duty Vehicle Technology	New standards would be adopted to phase in beginning in the 2017 model year.
Alternative Fuels: Biodiesel Blends	CARB would develop regulations to require the use of 1% to 4% Biodiesel displacement of California diesel fuel.
Alternative Fuels: Ethanol	Increased use of ethanol fuel.
Heavy-Duty Vehicle Emission Reduction Measures	Increased efficiency in the design of heavy-duty vehicles and an educational program for the heavy-duty vehicle sector.

Not all of these measures are currently appropriate or applicable to the proposed Project. While future legislation could further reduce the Project's GHG footprint, the analysis of this is speculative and in accordance with CEQA Guidelines Section 15145, will not be further evaluated in this AQIA.

CEQA Guidelines Section 15130 notes that sometimes the only feasible mitigation for cumulative impacts may involve the adoption of ordinances or regulations rather than the imposition of conditions on a project-by-project basis. Global climate change is this type of issue. The causes and effects may not be just regional or statewide, they may also be worldwide. Given the uncertainties in identifying, let alone quantifying the impact of any single project on global warming and climate change, and the efforts made to reduce emissions of GHGs from the Project through design, in accordance with CEQA Section 15130, any further feasible emissions reductions would be accomplished through CARB regulations adopted pursuant to AB32. The Project will not result in a significant impact on GHG emissions. Therefore, the Project's contribution to cumulative global climate change impacts would *not be cumulatively considerable*.

5. CUMULATIVE IMPACTS

By its very nature, air pollution has a cumulative impact. Tuolumne County is classified as either "attainment" or "unclassified" for the state and federal ambient air quality standards for CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and Lead. The County is classified as "nonattainment" for the state and federal standards for ozone (O_3) due to transport issues beyond the control of the TCAPCD.

Furthermore, attainment of ambient air quality standards can be jeopardized by increasing emissions-generating activities in the region. No single project would be sufficient in size, by itself, to result in nonattainment of the regional air quality standards. Instead, a project's emissions may be individually limited, but cumulatively considerable when taken in combination with past, present, and future development within the MCAB. When assessing whether there is a new significant cumulative effect, the Lead Agency shall consider whether the incremental effects of the project are cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects [CCR §15064(h)(1)]. Per CEQA Guidelines §15064(h)(3) a Lead Agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program, including, but not limited to an air quality attainment or maintenance plan that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located.

The Project would comply with the requirements of the General Plan and air pollution control measures. Additionally, the Project's less-than-significant impacts would also support the conclusion that the Project is not cumulatively considerable. Based on the analysis conducted for this Project, it is individually *less than significant*.

5.1 Cumulative Regional Air Quality Impacts

The most recent, certified MCAB Emission Inventory data available from the CARB is based on data gathered for the 2020 annual inventory[1]. **Table 5-1** provides a comparative look at the impacts proposed by the proposed Project to the MCAB Emissions Inventory.

[1] SJVAPCD Emissions for Aggregated Stationary, Area-Wide, Mobile, and Natural Sources

Table 5-1. Comparative Analysis Based on MCAB 2020 Inventory - Tons per Year

	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Tuolumne County - 2020	22,484	20,842	33,872	511	13,688	3,833
MCAB - 2020	112,931	96,105	199,509	2,738	95,667	21,681
Proposed Project	0.00	0.00	0.00	0.00	0.00	0.00
Proposed Project's % of Tuolumne	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Proposed Project's % of MCAB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Note: This is the latest inventory available as of November 2021 Source: CARB 2021b						

As shown in **Table 5-1** the proposed Project does not pose a substantial increase to basin emissions, as such basin emissions would be essentially the same if the Project is approved.

Table 5-1, **5-2**, and **5-3** provide CARB Emissions Inventory projections for the year 2025 for both the MCAB and the Tuolumne County portion of the air basin. Looking at the MCAB Emissions predicted by the CARB year 2025 emissions inventory, the Tuolumne County portion of the air basin is a moderate source of the emissions. The proposed Project produces a small portion of the total emissions in both Tuolumne County and the entire MCAB.

Table 5-2. Emission Inventory MCAB 2025 Projection - Tons per Year

	ROG	NOx	CO	SOx	PM10	PM2.5
Total Emissions	13,870.0	7,774.5	73,109.5	657.0	21,024.0	6,497.0
Percent Stationary Sources	15.53%	34.27%	16.38%	72.22%	14.24%	20.79%
Percent Area-Wide Sources	55.26%	7.51%	44.33%	27.78%	83.16%	74.72%
Percent Mobile Sources	29.21%	58.22%	39.24%	5.56%	2.43%	4.49%
Total Stationary Source Emissions	2,153.5	2,664.5	11,972.0	474.5	2,993.0	1,350.5
Total Area-Wide Source Emissions	7,665.0	584.0	32,412.0	182.5	17,483.5	4,854.5
Total Mobile Source Emissions	4,051.5	4,526.0	28,689.0	36.5	511.0	292.0
Source: CARB 2021b Note: Total may not add due to rounding						

Table 5-3. Emission Inventory MCAB - Tuolumne County Portion 2025 Projection - Tons per Year

	ROG	NOx	CO	SOx	PM10	PM2.5
Total Emissions	2,336.0	1,058.5	13,030.5	219.0	2,664.5	1,022.0
Percent Stationary Sources	9.38%	48.28%	2.52%	83.33%	27.40%	21.43%
Percent Area-Wide Sources	54.69%	6.90%	52.66%	16.67%	71.23%	71.43%
Percent Mobile Sources	35.94%	44.83%	44.82%	0.00%	2.74%	3.57%
Total Stationary Source Emissions	219.0	511.0	328.5	182.5	730.0	219.0
Total Area-Wide Source Emissions	1,277.5	73.0	6,862.0	36.5	1,898.0	730.0
Total Mobile Source Emissions	839.5	474.5	5,840.0	0.0	73.0	36.5
Source: CARB 2021b Note: Total may not add due to rounding						

Table 5-4. 2025 Emissions Projections - Proposed Project, Tuolumne County, and SJVAB

	ROG	NOx	PM_{10}
Proposed Project	0.00	0.00	0.00
Tuolumne County	21,535	15,878	13,651
MCAB	108,113	74,205	96,652
Proposed Project Percent of Tuolumne County	0.00%	0.00%	0.00%
Proposed Project Percent of MCAB	0.00%	0.00%	0.00%
Tuolumne County Percent of MCAB	19.92%	21.40%	16.83%
Source: CARB 2021b			

As shown above, the proposed Project would not increase operational emissions; therefore, would pose no impact on regional O_3 and PM_{10} formation. Because there would be no regional contribution to these cumulative impacts, the Project would not be considered cumulatively considerable in its contribution to regional O_3 and PM_{10} impacts.

5.2 Cumulative Local Air Quality Impacts

Tuolumne County has a public search for building permit applications. Per the public search, there are no active applications within a 1-mile radius of the proposed Project area. Therefore, since the proposed Project would generate less-than-significant impacts to criteria air pollutants, the Project's incremental contribution to cumulative air quality impacts would not be cumulatively considerable (CEQA Guidelines Section 15064(h)(3).

5.3 Cumulative Hazardous Air Pollutants

Because the Project would not be a significant source of HAPs, the proposed Project would also not be expected to pose a significant cumulative HAPs impact.

5.4 Cumulative Carbon Monoxide (CO) – Mobile Sources

The Project is not expected to have any change in traffic. Therefore, CO "Hotspot" Modeling was not conducted for this Project and no concentrated excessive CO emissions are expected to be caused once the proposed Project is completed.

6. CONSISTENCY WITH THE AIR QUALITY ATTAINMENT PLAN

CARB has determined that the ozone levels in Tuolumne County are caused by "overwhelming transport" of emissions into the air district and is relieved from preparing an attainment plan. At this time, TCAPCD does not have an air quality attainment plant (AQAP). Therefore, consistency will be based on air quality guidelines, rules, and regulations set forth by TCAPCD.

Air quality impacts from proposed projects within Tuolumne County are controlled through policies and provisions of the TCAPCD and the General Plan. In order to demonstrate that a proposed project would not cause further air quality degradation in either the TCAPCD's plan to improve air quality within the air basin or the federal requirements to meet certain air quality compliance goals, each project should also demonstrate consistency with TCAPCD's adopted air quality guidelines, rules, and regulations.

The Project would comply with the requirements of the General Plan air quality guidelines and air pollution control measures and mitigating policies. Additionally, air pollution associated with stationary sources are regulated through the permitting authority of the TCAPCD under Regulations IV and V (Authority to Construct and Permit to Operate Regulations). Owners of any new or modified equipment that emits, reduces, or controls air contaminants, except those specifically exempted by TCAPCD, are required to apply for an Authority to Construct and Permit to Operate. Through this mechanism, the TCAPCD would ensure that all stationary sources within the Project area would be subject to the standards of the TCAPCD to ensure that new developments do not result in net increases in stationary sources of criteria air pollutants.

6.1 Required Evaluation Guidelines

State CEQA Guidelines and the Federal Clean Air Act (Sections 176 and 316) contain specific references on the need to evaluate consistencies between the proposed project and the applicable AQAP for the project site. To accomplish this, CARB has developed a three-step approach to determine project conformity with the applicable AQAP:

1. *Determination that an AQAP is being implemented in the area where the project is being proposed*. TCAPCD does not have an AQAP. However, TCAPCD has implemented air quality guidelines, rules, and regulations for all projects.
2. *The proposed project must be consistent with the growth assumptions of the applicable AQAP*. TCAPCD does not have an AQAP. However, the proposed Project land use type was anticipated in the current growth assumptions.
3. *The project must contain in its design all reasonably available and feasible air quality control measures*. The proposed project incorporates various policy and rule-required implementation measures that will reduce related emissions.

The CCAA and Tuolumne County identify transportation control measures as methods to further reduce emissions from mobile sources. Strategies identified to reduce vehicular emissions such as reductions in vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, and traffic congestion, in order to reduce vehicular emissions, can be implemented as control measures under the CCAA as well. Additional measures may also be implemented through the building process such as providing electrical outlets on exterior walls of structures to encourage use of electrical landscape maintenance equipment or measures such as electrical outlets for electrical systems on diesel trucks to reduce or eliminate idling time.

As the growth represented by the proposed Project will be updated in the General Plan, conclusions may be drawn from the following criteria:

1. That, by definition, the proposed emissions from the Project are below the TCAPCD's established emissions impact thresholds;
2. That the primary source of emissions from the Project will be motor vehicles that are licensed through the State of California and whose emissions are already incorporated into CARB's MCAB Emissions Inventory.

Based on these factors, the Project is *consistent with the air quality guidelines, rules, and regulations set forth by the TCAPCD, which serve in place of an AQAP for Tuolumne County*.

6.2 Consistency with the Tuolumne County Regional Transportation Plan and General Plan Zoning

The 2016 Tuolumne County Final Regional Transportation Plan (RTP) has been developed by the Tuolumne County Transportation Council (TCTC) to document the transportation policy, actions, and funding recommendations that will meet the short- and long-term access and mobility needs of Tuolumne County over the next twenty-five years (2016-2041). The Tuolumne County RTP serves as the planning blueprint to guide future transportation investments in Tuolumne County involving local, state, and federal funding over the next twenty-five years.

The 2016 RTP establishes regional transportation goals, objectives, and rural sustainable strategies. The RTP identifies present and future needs, deficiencies and constraints, analyzes potential solutions, estimates available funding, and proposes investments for short- and long-term projections (TCTC 2016).

The proposed Project will not result in a change of operations and therefore will not impact any projected growth in the RTP or General Plan zoning.

7. MITIGATION AND OTHER RECOMMENDED MEASURES

As the estimated construction and operational emissions from the proposed Project would be less than significant, no specific mitigation measures would be required. However, to ensure that Project is in compliance with all applicable TCAPCD rules and regulations and emissions are further reduced, the applicant should implement and comply with a number of measures that are either recommended as a "good operating practice" for environmental stewardship or they are required by regulation. Some of the listed measures are regulatory requirements or construction requirements that would result in further emission reductions through their inclusion in Project construction and long-term design. The following measures either have been applied to the Project through the CalEEMod model and would be incorporated into the Project by design or would be implemented in conjunction with SJVAPCD rules as conditions of approval.

7.1 Tuolumne County Measures to Reduce Equipment Exhaust and Fugitive PM_{10}

The General Plan Air Quality guidelines provide a variety of feasible mitigation measures which can be applied to construction activities. In general, mitigation measures that address larger sources of PM_{10} during construction (e.g., grading, excavation, entrained dust from unpaved roads) have the greatest potential to substantially reduce fugitive dust.

Per Policy 15.A.4, construction emissions can be reduced by a number of techniques, including:

- Exposed soils shall be watered as needed to control wind borne dust.
- Exposed piles of dirt, sand, gravel, or other construction debris shall be enclosed, covered and/or watered as needed to control wind borne dust.
- Vehicle trackout shall be minimized through the use of rumble strips and wheel washers for all trucks and equipment leaving the site.
- Sweep streets once a day if visible soil materials are carried to adjacent streets (recommend water sweepers with reclaimed water).
- On-site vehicle speed shall be limited to 15 miles per hour on unpaved surfaces.
- Loads on all haul/dump trucks shall be covered securely or at least two feet of freeboard shall be maintained on trucks hauling loads.
- Construction equipment shall be maintained and tuned at the interval recommended by the manufacturers to minimize exhaust emissions.
- Equipment idling shall be kept to a minimum when equipment is not in use.
- Construction equipment shall be in compliance with the California Air Resources Board off-road and portable equipment diesel particulate matter regulations

The use of the above emissions control measures, or others as appropriate, during construction can be expected to reduce emissions to a level of less than significant.

8. LEVEL OF SIGNIFICANCE AFTER MITIGATION

The proposed Project would have short-term air quality impacts due to facility construction activities as well as vehicular emissions. Both of these impacts would be mitigated and *were found to be less than significant before and after mitigation* under CEQA and is in compliance with the requirements of NEPA.

The proposed Project would not result long-term air quality impacts since there will not be an increase in operational and related mobile source emissions. Therefore, these impacts *were found to be less than significant* under CEQA and is in compliance with the requirements of NEPA.

The proposed Project, in conjunction with other past, present, and foreseeable future projects, would result in cumulative short-term impacts to air quality. The proposed Project's incremental contribution to these impacts would be mitigated, are below thresholds of significance, and would not be considered cumulatively considerable. Therefore, the Project's contribution to cumulative impacts *were found to be less than significant* under CEQA and is in compliance with the requirements of NEPA.

The proposed Project, in conjunction with other past, present, and foreseeable future projects, would result in cumulative long-term impacts to global climate change. The proposed Project's incremental contribution to these impacts will be mitigated to the extent feasible and are considered *less than significant* under CEQA and is in compliance with the requirements of NEPA.

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APPENDIX A. EXISTING AIR QUALITY MONITORING DATA

Top 4 Summary: Highest 4 Daily Maximum Hourly Ozone Measurements

at San Andreas-Gold Strike Road

iADAM

	2018		2019		2020	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Aug 2	0.105	Aug 26	0.085	Aug 20	0.109
Second High:	Jul 31	0.096	Jun 18	0.082	Aug 23	0.095
Third High:	Jul 30	0.094	Aug 15	0.081	Sep 30	0.091
Fourth High:	Aug 5	0.092	Jun 12	0.080	Sep 8	0.086
California:						
# Days Above the Standard:		2		0		2
California Designation Value:		0.10		0.09		0.09
Expected Peak Day Concentration:		0.095		0.092		0.093
National:						
# Days Above the Standard:		*0*		*0*		*0*
3-Year Estimated Expected Number of Exceedance Days:		*0.0*		*0.0*		*0.0*
1-Year Estimated Expected Number of Exceedance Days:		*0.0*		*0.0*		*0.0*
Nat'l Standard Design Value:		*0.094*		*0.094*		*0.095*
Year Coverage:		100		96		100

Notes:

- Hourly ozone measurements and related statistics are available at San Andreas-Gold Strike Road between 1994 and 2020. Some years in this range may not be represented.
- All concentrations expressed in parts per million.
- The national 1-hour ozone standard was revoked in June 2005. Statistics related to the national 1-hour ozone standard are shown in or .
- An exceedance of a standard is not necessarily related to a violation of the standard.
- Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.
- * means there was insufficient data available to determine the value.

Top 4 Summary: Highest 4 Daily Maximum Hourly Ozone Measurements

at Sonora-Barretta Street

iADAM

	2018		2019		2020	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Jul 18	0.101	Jun 12	0.087	Aug 21	0.093
Second High:	Jul 19	0.100	Aug 26	0.084	Aug 20	0.092
Third High:	Aug 5	0.099	Aug 14	0.080	Aug 22	0.090
Fourth High:	Aug 2	0.097	Aug 15	0.080	Aug 24	0.086
California:						
# Days Above the Standard:		4		0		0
California Designation Value:		0.10		0.10		0.09
Expected Peak Day Concentration:		0.097		0.095		0.094
National:						
# Days Above the Standard:		*0*		*0*		*0*
3-Year Estimated Expected Number of Exceedance Days:		*0.0*		*0.0*		*0.0*
1-Year Estimated Expected Number of Exceedance Days:		*0.0*		*0.0*		*0.0*
Nat'l Standard Design Value:		*0.099*		*0.097*		*0.097*
Year Coverage:		100		100		99

Notes:

- Hourly ozone measurements and related statistics are available at Sonora-Barretta Street between 1992 and 2020. Some years in this range may not be represented.
- All concentrations expressed in parts per million.
- The national 1-hour ozone standard was revoked in June 2005. Statistics related to the national 1-hour ozone standard are shown in or .
- An exceedance of a standard is not necessarily related to a violation of the standard.
- Year Coverage indicates the extent to which available monitoring data represent the time of the year when concentrations are expected to be highest. 0 means that data represent none of the high period; 100 means that data represent the entire high period. A high Year Coverage does not mean that there was sufficient data for annual statistics to be considered valid.
- * means there was insufficient data available to determine the value.

Top 4 Summary: Highest 4 Daily Maximum 8-Hour Ozone Averages

at San Andreas-Gold Strike Road

iADAM

	2018		2019		2020	
	Date	8-Hr Average	Date	8-Hr Average	Date	8-Hr Average
National 2015 Std (0.070 ppm):						
First High:	Jul 31	0.086	Aug 15	0.073	Aug 20	0.097
Second High:	Aug 9	0.081	Aug 14	0.070	Aug 23	0.078
Third High:	Aug 5	0.078	Aug 16	0.067	Sep 30	0.075
Fourth High:	Jul 30	0.077	Jun 12	0.066	Aug 31	0.073
California Std (0.070 ppm):						
First High:	Jul 31	0.086	Aug 15	0.074	Aug 20	0.097
Second High:	Aug 9	0.081	Aug 14	0.071	Aug 23	0.079
Third High:	Aug 5	0.079	Aug 16	0.068	Sep 30	0.075
Fourth High:	Jul 30	0.077	Jun 12	0.067	Aug 31	0.074
National 2015 Std (0.070 ppm):						
# Days Above the Standard:		10		1		5
Nat'l Standard Design Value:		0.077		0.073		0.072
National Year Coverage:		100		96		99
California Std (0.070 ppm):						
# Days Above the Standard:		10		2		5
California Designation Value:		0.086		0.083		0.081
Expected Peak Day Concentration:		0.086		0.083		0.082
California Year Coverage:		100		95		98

Notes:

- Eight-hour ozone averages and related statistics are available at San Andreas-Gold Strike Road between 1994 and 2020. Some years in this range may not be represented.
- All averages expressed in parts per million.
- An exceedance of a standard is not necessarily related to a violation of the standard.
- State and national statistics may differ for the following reasons:
  - National 8-hour averages are truncated to three decimal places; State 8-hour averages are rounded to three decimal places.
  - State criteria for ensuring that data are sufficiently complete for calculating 8-hour averages are more stringent than the national criteria.
- Daily maximum 8-hour averages associated with the National 0.070 ppm standard exclude those 8-hour averages that have first hours between midnight and 6:00 am, Pacific Standard Time.

Top 4 Summary: Highest 4 Daily Maximum 8-Hour Ozone Averages

at Sonora-Barretta Street

iADAM

	2018		2019		2020	
	Date	8-Hr Average	Date	8-Hr Average	Date	8-Hr Average
National 2015 Std (0.070 ppm):						
First High:	Aug 8	0.087	Jun 12	0.073	Aug 21	0.083
Second High:	Jul 18	0.084	Aug 15	0.072	Aug 20	0.081
Third High:	Jul 19	0.084	Jun 19	0.069	Aug 22	0.081
Fourth High:	Aug 5	0.084	Sep 14	0.069	Aug 24	0.080
California Std (0.070 ppm):						
First High:	Aug 8	0.087	Jun 12	0.074	Aug 21	0.083
Second High:	Jul 18	0.084	Aug 15	0.072	Aug 20	0.081
Third High:	Jul 19	0.084	Sep 14	0.070	Aug 22	0.081
Fourth High:	Aug 5	0.084	Jun 19	0.069	Aug 24	0.081
National 2015 Std (0.070 ppm):						
# Days Above the Standard:		21		2		5
Nat'l Standard Design Value:		0.083		0.076		0.077
National Year Coverage:		100		99		99
California Std (0.070 ppm):						
# Days Above the Standard:		22		2		5
California Designation Value:		0.092		0.087		0.084
Expected Peak Day Concentration:		0.094		0.088		0.086
California Year Coverage:		100		98		99

Notes:

- Eight-hour ozone averages and related statistics are available at Sonora-Barretta Street between 1992 and 2020. Some years in this range may not be represented.
- All averages expressed in parts per million.
- An exceedance of a standard is not necessarily related to a violation of the standard.
- State and national statistics may differ for the following reasons:
  - National 8-hour averages are truncated to three decimal places; State 8-hour averages are rounded to three decimal places.
  - State criteria for ensuring that data are sufficiently complete for calculating 8-hour averages are more stringent than the national criteria.
- Daily maximum 8-hour averages associated with the National 0.070 ppm standard exclude those 8-hour averages that have first hours between midnight and 6:00 am, Pacific Standard Time.

Top 4 Summary: Highest 4 Daily Maximum 8-Hour Ozone Averages

at Jerseydale - 6440 Jerseydale

iADAM

	2018		2019		2020	
	Date	8-Hr Average	Date	8-Hr Average	Date	8-Hr Average
National 2015 Std (0.070 ppm):						
First High:	Sep 28	0.084	Aug 6	0.074	Aug 24	0.100
Second High:	Aug 8	0.081	Sep 15	0.074	Aug 22	0.098
Third High:	Jul 25	0.079	Aug 15	0.073	Aug 21	0.092
Fourth High:	Sep 27	0.077	Aug 3	0.071	Aug 20	0.091
California Std (0.070 ppm):						
First High:	Jul 26	0.088	Aug 6	0.074	Aug 24	0.101
Second High:	Sep 28	0.085	Sep 15	0.074	Aug 22	0.098
Third High:	Aug 8	0.081	Aug 15	0.073	Aug 23	0.093
Fourth High:	Jul 25	0.079	Aug 3	0.072	Aug 21	0.092

National 2015 Std (0.070 ppm):					
# Days Above the Standard:	11		5		24
Nat'l Standard Design Value:	0.076		0.074		0.079
National Year Coverage:	98		96		94
California Std (0.070 ppm):					
# Days Above the Standard:	15		5		26
California Designation Value:	0.085		0.085		0.093
Expected Peak Day Concentration:	0.086		0.085		0.093
California Year Coverage:	97		96		92

Notes:

- Eight-hour ozone averages and related statistics are available at Jerseydale - 6440 Jerseydale between 1995 and 2020. Some years in this range may not be represented.
- All averages expressed in parts per million.
- An exceedance of a standard is not necessarily related to a violation of the standard.
- State and national statistics may differ for the following reasons:
  - National 8-hour averages are truncated to three decimal places; State 8-hour averages are rounded to three decimal places.
  - State criteria for ensuring that data are sufficiently complete for calculating 8-hour averages are more stringent than the national criteria.
- Daily maximum 8-hour averages associated with the National 0.070 ppm standard exclude those 8-hour averages that have first hours between midnight and 6:00 am, Pacific Standard Time.

Top 4 Summary: Highest 4 Daily 24-Hour PM10 Averages

at San Andreas-Gold Strike Road

iADAM

	2018		2019		2020	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Aug 8	69.4	Oct 29	47.6	Sep 8	217.3
Second High:	Aug 6	62.8	Oct 30	44.5	Sep 12	163.2
Third High:	Aug 7	62.2	Nov 25	43.8	Aug 21	161.0
Fourth High:	Aug 9	60.1	Nov 26	42.8	Sep 9	156.6
California:						
First High:	Aug 8	66.8	Oct 29	48.5	Sep 8	205.7
Second High:	Aug 6	61.3	Oct 30	45.3	Sep 12	158.8
Third High:	Aug 7	60.0	Nov 25	44.7	Aug 21	156.0
Fourth High:	Aug 9	57.5	Nov 21	40.7	Sep 9	151.0

National:					
Estimated # Days > 24-Hour Std:	0.0		0.0		4.0
Measured # Days > 24-Hour Std:	0		0		4
3-Yr Avg Est # Days > 24-Hr Std:	*		*		1.0
Annual Average:	*15.0*		*13.6*		*24.4*
3-Year Average:	*14*		*14*		*18*
California:					
Estimated # Days > 24-Hour Std:	*		0.0		30.4
Measured # Days > 24-Hour Std:	5		0		30
Annual Average:	*		13.3		24.1
3-Year Maximum Annual Average:	12		13		24
Year Coverage:	0		0		0

Notes:

Daily PM10 averages and related statistics are available at San Andreas-Gold Strike Road between 1994 and 2020. Some years in this range may not be represented.

All averages expressed in micrograms per cubic meter.

Top 4 Summary: Highest 4 Daily 24-Hour PM2.5 Averages

at San Andreas-Gold Strike Road

iADAM

	2018		2019		2020	
	Date	24-Hr Average	Date	24-Hr Average	Date	24-Hr Average
National:						
First High:	Aug 8	67.7	Jan 2	24.8	Aug 21	134.2
Second High:	Aug 6	64.0	Jan 1	17.9	Aug 20	118.3
Third High:	Aug 7	61.4	Jan 30	17.0	Aug 22	117.5
Fourth High:	Aug 5	58.5	Jan 29	13.7	Aug 23	113.5
California:						
First High:	Aug 8	67.7	Jan 2	24.8	Aug 21	134.2
Second High:	Aug 6	64.0	Jan 1	17.9	Aug 20	118.3
Third High:	Aug 7	61.4	Jan 30	17.0	Aug 22	117.5
Fourth High:	Aug 5	58.5	Jan 29	13.7	Aug 23	113.5

National:			
Estimated # Days > 24-Hour Std:	16.2	0.0	24.2
Measured # Days > 24-Hour Std:	16	0	23
24-Hour Standard Design Value:	*	*	50
24-Hour Standard 98th Percentile:	40.6	12.5	96.6
2006 Annual Std Design Value:	*	*	10.9
2013 Annual Std Design Value:	*	*	10.9
Annual Average:	14.6	5.5	12.6
California:			
Annual Std Designation Value:	*	*	*
Annual Average:	*	*	*
Year Coverage:	98	87	96

Notes:

Daily PM2.5 averages and related statistics are available at San Andreas-Gold Strike Road between 1999 and 2020. Some years in this range may not be represented.

APPENDIX B. PROJECT EMISSION CALCULATIONS

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Twain Harte Pipeline

Tuolumne County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	7,924.79	1000sqft	181.93	7,924,792.60	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	66
Climate Zone	1			**Operational Year**	2023
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Total construction period is 5 months

Off-road Equipment -

Off-road Equipment - Per project applicant

Trips and VMT - 10 employees
10 trucks for hauling pipeline material

Vehicle Trips - No change in operational emissions

Consumer Products - No change in operational emissions

Area Coating - No change in operational emissions

Landscape Equipment - No change in operational emissions

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Energy Use - No change in operational emissions

Water And Wastewater - No change in operational emissions

Solid Waste - No change in operational emissions

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstructionPhase	PhaseEndDate	4/8/2039	9/15/2023
tblConstructionPhase	PhaseStartDate	6/5/2038	4/17/2023
tblConsumerProducts	ROG_EF	2.14E-05	0
tblConsumerProducts	ROG_EF_Degreaser	3.542E-07	0
tblConsumerProducts	ROG_EF_PesticidesFertilizers	5.152E-08	0
tblEnergyUse	LightingElect	1.81	0.00
tblEnergyUse	NT24E	1.85	0.00
tblEnergyUse	NT24NG	0.31	0.00
tblEnergyUse	T24E	0.56	0.00
tblEnergyUse	T24NG	3.17	0.00
tblLandscapeEquipment	NumberSummerDays	180	0
tblLandUse	LandUseSquareFeet	7,924,790.00	7,924,792.60
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.41	0.41
tblOffRoadEquipment	OffRoadEquipmentType	Air Compressors	Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentType		Graders
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Cement and Mortar Mixers
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblSolidWaste	SolidWasteGenerationRate	9,826.74	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	18.00	10.00
tblVehicleTrips	ST_TR	6.42	0.00
tblVehicleTrips	SU_TR	5.09	0.00
tblVehicleTrips	WD_TR	3.93	0.00
tblWater	IndoorWaterUseRate	1,832,607,687.50	0.00

2.0 Emissions Summary

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2023	0.0855	0.8017	0.7446	1.4000e-003	6.8300e-003	0.0378	0.0447	1.8200e-003	0.0355	0.0373	0.0000	121.0731	121.0731	0.0275	2.7000e-004	121.8418
Maximum	**0.0855**	**0.8017**	**0.7446**	**1.4000e-003**	**6.8300e-003**	**0.0378**	**0.0447**	**1.8200e-003**	**0.0355**	**0.0373**	**0.0000**	**121.0731**	**121.0731**	**0.0275**	**2.7000e-004**	**121.8418**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2023	0.0855	0.8017	0.7446	1.4000e-003	6.8300e-003	0.0378	0.0447	1.8200e-003	0.0355	0.0373	0.0000	121.0729	121.0729	0.0275	2.7000e-004	121.8416
Maximum	**0.0855**	**0.8017**	**0.7446**	**1.4000e-003**	**6.8300e-003**	**0.0378**	**0.0447**	**1.8200e-003**	**0.0355**	**0.0373**	**0.0000**	**121.0729**	**121.0729**	**0.0275**	**2.7000e-004**	**121.8416**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	4-17-2023	7-16-2023	0.5241	0.5241
2	7-17-2023	9-30-2023	0.3513	0.3513
		Highest	0.5241	0.5241

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Pipeline	Trenching	4/17/2023	9/15/2023	5	110	

Acres of Grading (Site Preparation Phase): 0

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Pipeline	Trenchers	1	8.00	78	0.50
Pipeline	Generator Sets	1	8.00	84	0.74
Pipeline	Graders	1	8.00	187	0.41
Pipeline	Dumpers/Tenders	1	8.00	16	0.38
Pipeline	Cement and Mortar Mixers	1	8.00	9	0.56

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline	7	10.00	0.00	10.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Pipeline - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0809	0.7972	0.7131	1.3300e-003		0.0378	0.0378		0.0355	0.0355	0.0000	114.9015	114.9015	0.0273	0.0000	115.5831
Total	**0.0809**	**0.7972**	**0.7131**	**1.3300e-003**		**0.0378**	**0.0378**		**0.0355**	**0.0355**	**0.0000**	**114.9015**	**114.9015**	**0.0273**	**0.0000**	**115.5831**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0000e-005	1.4100e-003	1.5000e-004	0.0000	8.0000e-005	1.0000e-005	9.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005	0.0000	0.3547	0.3547	0.0000	6.0000e-005	0.3713
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.6400e-003	3.1100e-003	0.0314	6.0000e-005	6.7500e-003	5.0000e-005	6.8000e-003	1.8000e-003	5.0000e-005	1.8400e-003	0.0000	5.8169	5.8169	2.4000e-004	2.2000e-004	5.8873
Total	**4.6600e-003**	**4.5200e-003**	**0.0315**	**6.0000e-005**	**6.8300e-003**	**6.0000e-005**	**6.8900e-003**	**1.8200e-003**	**6.0000e-005**	**1.8700e-003**	**0.0000**	**6.1716**	**6.1716**	**2.4000e-004**	**2.8000e-004**	**6.2587**

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Pipeline - 2023

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0809	0.7972	0.7131	1.3300e-003		0.0378	0.0378		0.0355	0.0355	0.0000	114.9013	114.9013	0.0273	0.0000	115.5830
Total	**0.0809**	**0.7972**	**0.7131**	**1.3300e-003**		**0.0378**	**0.0378**		**0.0355**	**0.0355**	**0.0000**	**114.9013**	**114.9013**	**0.0273**	**0.0000**	**115.5830**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	2.0000e-005	1.4100e-003	1.5000e-004	0.0000	8.0000e-005	1.0000e-005	9.0000e-005	2.0000e-005	1.0000e-005	3.0000e-005	0.0000	0.3547	0.3547	0.0000	6.0000e-005	0.3713
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.6400e-003	3.1100e-003	0.0314	6.0000e-005	6.7500e-003	5.0000e-005	6.8000e-003	1.8000e-003	5.0000e-005	1.8400e-003	0.0000	5.8169	5.8169	2.4000e-004	2.2000e-004	5.8873
Total	**4.6600e-003**	**4.5200e-003**	**0.0315**	**6.0000e-005**	**6.8300e-003**	**6.0000e-005**	**6.8900e-003**	**1.8200e-003**	**6.0000e-005**	**1.8700e-003**	**0.0000**	**6.1716**	**6.1716**	**2.4000e-004**	**2.8000e-004**	**6.2587**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	14.70	6.60	6.60	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.398947	0.076285	0.208230	0.170724	0.065991	0.011574	0.007403	0.003656	0.001142	0.000414	0.044570	0.002045	0.009017

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.0 Water Detail

7.1 Mitigation Measures Water

Twain Harte Pipeline - Tuolumne County, Annual

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
General Heavy Industry	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Twain Harte Pipeline

Tuolumne County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	7,924.79	1000sqft	181.93	7,924,792.60	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	66
Climate Zone	1			**Operational Year**	2023
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Total construction period is 5 months

Off-road Equipment -

Off-road Equipment - Per project applicant

Trips and VMT - 10 employees
10 trucks for hauling pipeline material

Vehicle Trips - No change in operational emissions

Consumer Products - No change in operational emissions

Area Coating - No change in operational emissions

Landscape Equipment - No change in operational emissions

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Energy Use - No change in operational emissions

Water And Wastewater - No change in operational emissions

Solid Waste - No change in operational emissions

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstructionPhase	PhaseEndDate	4/8/2039	9/15/2023
tblConstructionPhase	PhaseStartDate	6/5/2038	4/17/2023
tblConsumerProducts	ROG_EF	2.14E-05	0
tblConsumerProducts	ROG_EF_Degreaser	3.542E-07	0
tblConsumerProducts	ROG_EF_PesticidesFertilizers	5.152E-08	0
tblEnergyUse	LightingElect	1.81	0.00
tblEnergyUse	NT24E	1.85	0.00
tblEnergyUse	NT24NG	0.31	0.00
tblEnergyUse	T24E	0.56	0.00
tblEnergyUse	T24NG	3.17	0.00
tblLandscapeEquipment	NumberSummerDays	180	0
tblLandUse	LandUseSquareFeet	7,924,790.00	7,924,792.60
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.41	0.41
tblOffRoadEquipment	OffRoadEquipmentType	Air Compressors	Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentType		Graders
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Cement and Mortar Mixers
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblSolidWaste	SolidWasteGenerationRate	9,826.74	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	18.00	10.00
tblVehicleTrips	ST_TR	6.42	0.00
tblVehicleTrips	SU_TR	5.09	0.00
tblVehicleTrips	WD_TR	3.93	0.00
tblWater	IndoorWaterUseRate	1,832,607,687.50	0.00

2.0 Emissions Summary

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2023	1.5601	14.5665	13.5984	0.0255	0.1293	0.6877	0.8170	0.0343	0.6455	0.6798	0.0000	2,434.6956	2,434.6956	0.5511	4.9700e-003	2,449.9520
Maximum	**1.5601**	**14.5665**	**13.5984**	**0.0255**	**0.1293**	**0.6877**	**0.8170**	**0.0343**	**0.6455**	**0.6798**	**0.0000**	**2,434.6956**	**2,434.6956**	**0.5511**	**4.9700e-003**	**2,449.9520**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2023	1.5601	14.5665	13.5984	0.0255	0.1293	0.6877	0.8170	0.0343	0.6455	0.6798	0.0000	2,434.6956	2,434.6956	0.5511	4.9700e-003	2,449.9520
Maximum	**1.5601**	**14.5665**	**13.5984**	**0.0255**	**0.1293**	**0.6877**	**0.8170**	**0.0343**	**0.6455**	**0.6798**	**0.0000**	**2,434.6956**	**2,434.6956**	**0.5511**	**4.9700e-003**	**2,449.9520**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**	**0.0000**	**2.8800e-003**	**2.8800e-003**	**0.0000**	**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**	**0.0000**	**1.8481**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**	**0.0000**	**2.8800e-003**	**2.8800e-003**	**0.0000**	**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**	**0.0000**	**1.8481**

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Pipeline	Trenching	4/17/2023	9/15/2023	5	110	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Pipeline	Trenchers	1	8.00	78	0.50
Pipeline	Generator Sets	1	8.00	84	0.74
Pipeline	Graders	1	8.00	187	0.41
Pipeline	Dumpers/Tenders	1	8.00	16	0.38
Pipeline	Cement and Mortar Mixers	1	8.00	9	0.56

Trips and VMT

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline	7	10.00	0.00	10.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Pipeline - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4702	14.4948	12.9654	0.0242		0.6867	0.6867		0.6445	0.6445		2,302.8580	2,302.8580	0.5464		2,316.5189
Total	**1.4702**	**14.4948**	**12.9654**	**0.0242**		**0.6867**	**0.6867**		**0.6445**	**0.6445**		**2,302.8580**	**2,302.8580**	**0.5464**		**2,316.5189**

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Pipeline - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.0000e-004	0.0244	2.6800e-003	7.0000e-005	1.5700e-003	1.8000e-004	1.7500e-003	4.3000e-004	1.7000e-004	6.0000e-004		7.1091	7.1091	2.0000e-005	1.1200e-003	7.4423
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0895	0.0474	0.6303	1.2200e-003	0.1277	8.9000e-004	0.1286	0.0339	8.2000e-004	0.0347		124.7285	124.7285	4.5900e-003	3.8500e-003	125.9908
Total	**0.0899**	**0.0717**	**0.6330**	**1.2900e-003**	**0.1293**	**1.0700e-003**	**0.1304**	**0.0343**	**9.9000e-004**	**0.0353**		**131.8376**	**131.8376**	**4.6100e-003**	**4.9700e-003**	**133.4331**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4702	14.4948	12.9654	0.0242		0.6867	0.6867		0.6445	0.6445	0.0000	2,302.8580	2,302.8580	0.5464		2,316.5189
Total	**1.4702**	**14.4948**	**12.9654**	**0.0242**		**0.6867**	**0.6867**		**0.6445**	**0.6445**	**0.0000**	**2,302.8580**	**2,302.8580**	**0.5464**		**2,316.5189**

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Pipeline - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.0000e-004	0.0244	2.6800e-003	7.0000e-005	1.5700e-003	1.8000e-004	1.7500e-003	4.3000e-004	1.7000e-004	6.0000e-004		7.1091	7.1091	2.0000e-005	1.1200e-003	7.4423
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0895	0.0474	0.6303	1.2200e-003	0.1277	8.9000e-004	0.1286	0.0339	8.2000e-004	0.0347		124.7285	124.7285	4.5900e-003	3.8500e-003	125.9908
Total	**0.0899**	**0.0717**	**0.6330**	**1.2900e-003**	**0.1293**	**1.0700e-003**	**0.1304**	**0.0343**	**9.9000e-004**	**0.0353**		**131.8376**	**131.8376**	**4.6100e-003**	**4.9700e-003**	**133.4331**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	14.70	6.60	6.60	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.398947	0.076285	0.208230	0.170724	0.065991	0.011574	0.007403	0.003656	0.001142	0.000414	0.044570	0.002045	0.009017

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Unmitigated	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481

Twain Harte Pipeline - Tuolumne County, Summer

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**		**2.8800e-003**	**2.8800e-003**		**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**		**1.8481**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**		**2.8800e-003**	**2.8800e-003**		**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**		**1.8481**

7.0 Water Detail

7.1 Mitigation Measures Water

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Twain Harte Pipeline

Tuolumne County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
General Heavy Industry	7,924.79	1000sqft	181.93	7,924,792.60	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	66
Climate Zone	1			**Operational Year**	2023
Utility Company	Pacific Gas and Electric Company				
CO2 Intensity (lb/MWhr)	203.98	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use -

Construction Phase - Total construction period is 5 months

Off-road Equipment -

Off-road Equipment - Per project applicant

Trips and VMT - 10 employees
10 trucks for hauling pipeline material

Vehicle Trips - No change in operational emissions

Consumer Products - No change in operational emissions

Area Coating - No change in operational emissions

Landscape Equipment - No change in operational emissions

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Energy Use - No change in operational emissions

Water And Wastewater - No change in operational emissions

Solid Waste - No change in operational emissions

Table Name	Column Name	Default Value	New Value
tblAreaCoating	ReapplicationRatePercent	10	0
tblConstructionPhase	PhaseEndDate	4/8/2039	9/15/2023
tblConstructionPhase	PhaseStartDate	6/5/2038	4/17/2023
tblConsumerProducts	ROG_EF	2.14E-05	0
tblConsumerProducts	ROG_EF_Degreaser	3.542E-07	0
tblConsumerProducts	ROG_EF_PesticidesFertilizers	5.152E-08	0
tblEnergyUse	LightingElect	1.81	0.00
tblEnergyUse	NT24E	1.85	0.00
tblEnergyUse	NT24NG	0.31	0.00
tblEnergyUse	T24E	0.56	0.00
tblEnergyUse	T24NG	3.17	0.00
tblLandscapeEquipment	NumberSummerDays	180	0
tblLandUse	LandUseSquareFeet	7,924,790.00	7,924,792.60
tblOffRoadEquipment	LoadFactor	0.37	0.37
tblOffRoadEquipment	LoadFactor	0.50	0.50
tblOffRoadEquipment	LoadFactor	0.41	0.41
tblOffRoadEquipment	OffRoadEquipmentType	Air Compressors	Tractors/Loaders/Backhoes
tblOffRoadEquipment	OffRoadEquipmentType		Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Generator Sets
tblOffRoadEquipment	OffRoadEquipmentType		Graders
tblOffRoadEquipment	OffRoadEquipmentType		Dumpers/Tenders
tblOffRoadEquipment	OffRoadEquipmentType		Cement and Mortar Mixers
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblSolidWaste	SolidWasteGenerationRate	9,826.74	0.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

tblTripsAndVMT	HaulingTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	18.00	10.00
tblVehicleTrips	ST_TR	6.42	0.00
tblVehicleTrips	SU_TR	5.09	0.00
tblVehicleTrips	WD_TR	3.93	0.00
tblWater	IndoorWaterUseRate	1,832,607,687.50	0.00

2.0 Emissions Summary

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2023	1.5638	14.5828	13.5413	0.0254	0.1293	0.6877	0.8170	0.0343	0.6455	0.6798	0.0000	2,424.8046	2,424.8046	0.5514	5.7400e-003	2,440.3006
Maximum	**1.5638**	**14.5828**	**13.5413**	**0.0254**	**0.1293**	**0.6877**	**0.8170**	**0.0343**	**0.6455**	**0.6798**	**0.0000**	**2,424.8046**	**2,424.8046**	**0.5514**	**5.7400e-003**	**2,440.3006**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2023	1.5638	14.5828	13.5413	0.0254	0.1293	0.6877	0.8170	0.0343	0.6455	0.6798	0.0000	2,424.8046	2,424.8046	0.5514	5.7400e-003	2,440.3006
Maximum	**1.5638**	**14.5828**	**13.5413**	**0.0254**	**0.1293**	**0.6877**	**0.8170**	**0.0343**	**0.6455**	**0.6798**	**0.0000**	**2,424.8046**	**2,424.8046**	**0.5514**	**5.7400e-003**	**2,440.3006**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**	**0.0000**	**2.8800e-003**	**2.8800e-003**	**0.0000**	**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**	**0.0000**	**1.8481**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**	**0.0000**	**2.8800e-003**	**2.8800e-003**	**0.0000**	**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**	**0.0000**	**1.8481**

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Pipeline	Trenching	4/17/2023	9/15/2023	5	110	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Pipeline	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Pipeline	Trenchers	1	8.00	78	0.50
Pipeline	Generator Sets	1	8.00	84	0.74
Pipeline	Graders	1	8.00	187	0.41
Pipeline	Dumpers/Tenders	1	8.00	16	0.38
Pipeline	Cement and Mortar Mixers	1	8.00	9	0.56

Trips and VMT

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Pipeline	7	10.00	0.00	10.00	16.80	6.60	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Pipeline - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4702	14.4948	12.9654	0.0242		0.6867	0.6867		0.6445	0.6445		2,302.8580	2,302.8580	0.5464		2,316.5189
Total	**1.4702**	**14.4948**	**12.9654**	**0.0242**		**0.6867**	**0.6867**		**0.6445**	**0.6445**		**2,302.8580**	**2,302.8580**	**0.5464**		**2,316.5189**

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Pipeline - 2023

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.9000e-004	0.0259	2.7100e-003	7.0000e-005	1.5700e-003	1.8000e-004	1.7500e-003	4.3000e-004	1.7000e-004	6.0000e-004		7.1088	7.1088	2.0000e-005	1.1200e-003	7.4420
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0931	0.0621	0.5732	1.1200e-003	0.1277	8.9000e-004	0.1286	0.0339	8.2000e-004	0.0347		114.8378	114.8378	4.9500e-003	4.6200e-003	116.3397
Total	**0.0935**	**0.0880**	**0.5759**	**1.1900e-003**	**0.1293**	**1.0700e-003**	**0.1304**	**0.0343**	**9.9000e-004**	**0.0353**		**121.9466**	**121.9466**	**4.9700e-003**	**5.7400e-003**	**123.7817**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4702	14.4948	12.9654	0.0242		0.6867	0.6867		0.6445	0.6445	0.0000	2,302.8580	2,302.8580	0.5464		2,316.5189
Total	**1.4702**	**14.4948**	**12.9654**	**0.0242**		**0.6867**	**0.6867**		**0.6445**	**0.6445**	**0.0000**	**2,302.8580**	**2,302.8580**	**0.5464**		**2,316.5189**

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

3.2 Pipeline - 2023

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	3.9000e-004	0.0259	2.7100e-003	7.0000e-005	1.5700e-003	1.8000e-004	1.7500e-003	4.3000e-004	1.7000e-004	6.0000e-004		7.1088	7.1088	2.0000e-005	1.1200e-003	7.4420
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0931	0.0621	0.5732	1.1200e-003	0.1277	8.9000e-004	0.1286	0.0339	8.2000e-004	0.0347		114.8378	114.8378	4.9500e-003	4.6200e-003	116.3397
Total	**0.0935**	**0.0880**	**0.5759**	**1.1900e-003**	**0.1293**	**1.0700e-003**	**0.1304**	**0.0343**	**9.9000e-004**	**0.0353**		**121.9466**	**121.9466**	**4.9700e-003**	**5.7400e-003**	**123.7817**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
General Heavy Industry	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
General Heavy Industry	14.70	6.60	6.60	59.00	28.00	13.00	92	5	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
General Heavy Industry	0.398947	0.076285	0.208230	0.170724	0.065991	0.011574	0.007403	0.003656	0.001142	0.000414	0.044570	0.002045	0.009017

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
General Heavy Industry	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Unmitigated	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481

Twain Harte Pipeline - Tuolumne County, Winter

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**		**2.8800e-003**	**2.8800e-003**		**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**		**1.8481**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	0.0749	7.3600e-003	0.8090	6.0000e-005		2.8800e-003	2.8800e-003		2.8800e-003	2.8800e-003		1.7344	1.7344	4.5500e-003		1.8481
Total	**0.0749**	**7.3600e-003**	**0.8090**	**6.0000e-005**		**2.8800e-003**	**2.8800e-003**		**2.8800e-003**	**2.8800e-003**		**1.7344**	**1.7344**	**4.5500e-003**		**1.8481**

7.0 Water Detail

7.1 Mitigation Measures Water

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Applied

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX C. CARB 2020 AND 2025 ESTIMATED EMISSION INVENTORIES

2016 SIP Emission Projection Data

2020 Estimated Annual Average Emissions

TUOLUMNE COUNTY

All emissions are represented in Tons per Day and reflect the most current data provided to ARB.

See detailed information.

Start a new query.

STATIONARY SOURCES	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
FUEL COMBUSTION	0.1	0.0	0.8	1.3	0.5	0.3	0.3	0.3	0.0
WASTE DISPOSAL	-	-	-	-	-	-	-	-	0.0
CLEANING AND SURFACE COATINGS	0.5	0.4	-	-	-	-	-	-	-
PETROLEUM PRODUCTION AND MARKETING	0.1	0.1	-	-	-	-	-	-	-
INDUSTRIAL PROCESSES	0.1	0.1	0.0	0.0	0.0	3.3	1.6	0.3	-
*** TOTAL STATIONARY SOURCES**	**0.7**	**0.6**	**0.8**	**1.3**	**0.5**	**3.6**	**1.8**	**0.6**	**0.0**
AREAWIDE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
SOLVENT EVAPORATION	1.3	1.3	-	-	-	-	-	-	-
MISCELLANEOUS PROCESSES	8.3	2.1	18.7	0.2	0.1	7.8	5.1	2.0	2.2
*** TOTAL AREAWIDE SOURCES**	**9.7**	**3.4**	**18.7**	**0.2**	**0.1**	**7.8**	**5.1**	**2.0**	**2.2**
MOBILE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
ON-ROAD MOTOR VEHICLES	0.7	0.6	4.1	1.0	0.0	0.1	0.1	0.0	0.0
OTHER MOBILE SOURCES	2.7	2.3	13.8	0.8	0.0	0.2	0.1	0.1	0.0
*** TOTAL MOBILE SOURCES**	**3.3**	**2.9**	**18.0**	**1.8**	**0.0**	**0.2**	**0.2**	**0.1**	**0.0**
GRAND TOTAL FOR TUOLUMNE COUNTY	**13.7**	**6.9**	**37.5**	**3.3**	**0.6**	**11.6**	**7.2**	**2.8**	**2.2**

Start a new query.

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Gavin Newsom
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Secretary for Environmental Protection
Jared Blumenfeld
Visit his Website

2016 SIP Emission Projection Data

2020 Estimated Annual Average Emissions

MOUNTAIN COUNTIES AIR BASIN

All emissions are represented in Tons per Day and reflect the most current data provided to ARB.

See detailed information.

Start a new query.

STATIONARY SOURCES	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
FUEL COMBUSTION	1.5	1.0	29.7	6.6	0.8	1.0	0.9	0.8	0.1
WASTE DISPOSAL	5.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
CLEANING AND SURFACE COATINGS	3.0	2.3	-	-	-	0.0	0.0	0.0	-
PETROLEUM PRODUCTION AND MARKETING	13.5	0.8	-	-	-	-	-	-	-
INDUSTRIAL PROCESSES	1.7	1.5	0.2	0.3	0.4	13.1	7.0	2.7	-
*** TOTAL STATIONARY SOURCES**	**25.1**	**5.6**	**30.0**	**6.9**	**1.2**	**14.1**	**7.9**	**3.6**	**0.2**
AREAWIDE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
SOLVENT EVAPORATION	8.9	8.3	-	-	-	-	-	-	0.3
MISCELLANEOUS PROCESSES	48.2	12.1	87.8	1.7	0.5	77.4	46.9	13.1	6.5
*** TOTAL AREAWIDE SOURCES**	**57.1**	**20.3**	**87.8**	**1.7**	**0.5**	**77.4**	**46.9**	**13.1**	**6.8**
MOBILE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
ON-ROAD MOTOR VEHICLES	5.9	5.4	37.2	11.6	0.1	1.0	1.0	0.5	0.5
OTHER MOBILE SOURCES	9.9	8.6	53.9	7.1	0.0	0.6	0.6	0.5	0.0
*** TOTAL MOBILE SOURCES**	**15.8**	**14.0**	**91.1**	**18.6**	**0.1**	**1.7**	**1.6**	**0.9**	**0.5**
GRAND TOTAL FOR MOUNTAIN COUNTIES AIR BASIN	**98.0**	**39.9**	**208.9**	**27.3**	**1.8**	**93.1**	**56.4**	**17.6**	**7.5**

Start a new query.

2016 SIP Emission Projection Data

2025 Estimated Annual Average Emissions

TUOLUMNE COUNTY

All emissions are represented in Tons per Day and reflect the most current data provided to ARB.

See detailed information.

Start a new query.

STATIONARY SOURCES	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
FUEL COMBUSTION	0.1	0.0	0.8	1.4	0.5	0.3	0.3	0.3	0.0
WASTE DISPOSAL	-	-	-	-	-	-	-	-	0.0
CLEANING AND SURFACE COATINGS	0.5	0.4	-	-	-	-	-	-	-
PETROLEUM PRODUCTION AND MARKETING	0.1	0.1	-	-	-	-	-	-	-
INDUSTRIAL PROCESSES	0.1	0.1	0.0	0.0	0.0	3.4	1.6	0.3	-
*** TOTAL STATIONARY SOURCES**	**0.7**	**0.6**	**0.9**	**1.4**	**0.5**	**3.8**	**2.0**	**0.6**	**0.0**
AREAWIDE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
SOLVENT EVAPORATION	1.4	1.3	-	-	-	-	-	-	-
MISCELLANEOUS PROCESSES	8.3	2.2	18.8	0.2	0.1	7.9	5.2	2.0	2.2
*** TOTAL AREAWIDE SOURCES**	**9.8**	**3.5**	**18.8**	**0.2**	**0.1**	**7.9**	**5.2**	**2.0**	**2.2**
MOBILE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
ON-ROAD MOTOR VEHICLES	0.5	0.4	2.5	0.6	0.0	0.1	0.1	0.0	0.0
OTHER MOBILE SOURCES	2.1	1.8	13.5	0.7	0.0	0.1	0.1	0.1	0.0
*** TOTAL MOBILE SOURCES**	**2.6**	**2.3**	**16.0**	**1.3**	**0.0**	**0.2**	**0.2**	**0.1**	**0.0**
GRAND TOTAL FOR TUOLUMNE COUNTY	**13.1**	**6.4**	**35.7**	**2.9**	**0.6**	**11.9**	**7.3**	**2.8**	**2.2**

Start a new query.

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California Governor
Gavin Newsom
Visit Governor's Website

Secretary for Environmental Protection
Jared Blumenfeld
Visit his Website

2016 SIP Emission Projection Data

2025 Estimated Annual Average Emissions

MOUNTAIN COUNTIES AIR BASIN

All emissions are represented in Tons per Day and reflect the most current data provided to ARB.

See detailed information.

Start a new query.

STATIONARY SOURCES	TOG	ROG	CO	NOX	SOX	PM	PM10	PM2.5	NH3
FUEL COMBUSTION	1.6	1.1	32.6	7.0	0.9	1.1	1.0	0.9	0.1
WASTE DISPOSAL	5.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
CLEANING AND SURFACE COATINGS	3.3	2.5	-	-	-	0.0	0.0	0.0	-
PETROLEUM PRODUCTION AND MARKETING	13.4	0.7	-	-	-	-	-	-	-
INDUSTRIAL PROCESSES	1.7	1.5	0.2	0.3	0.4	13.6	7.2	2.8	-
*** TOTAL STATIONARY SOURCES**	**25.7**	**5.9**	**32.8**	**7.3**	**1.3**	**14.7**	**8.2**	**3.7**	**0.2**
AREAWIDE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
SOLVENT EVAPORATION	9.4	8.8	-	-	-	-	-	-	0.3
MISCELLANEOUS PROCESSES	48.6	12.2	88.8	1.6	0.5	79.2	47.9	13.3	6.6
*** TOTAL AREAWIDE SOURCES**	**58.1**	**21.0**	**88.8**	**1.6**	**0.5**	**79.2**	**47.9**	**13.3**	**6.9**
MOBILE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**	**NH3**
ON-ROAD MOTOR VEHICLES	4.4	4.2	24.7	6.9	0.1	1.0	1.0	0.4	0.5
OTHER MOBILE SOURCES	8.0	7.0	53.9	5.5	0.0	0.5	0.4	0.3	0.0
*** TOTAL MOBILE SOURCES**	**12.5**	**11.1**	**78.6**	**12.4**	**0.1**	**1.5**	**1.4**	**0.8**	**0.5**
GRAND TOTAL FOR MOUNTAIN COUNTIES AIR BASIN	**96.3**	**38.0**	**200.3**	**21.3**	**1.8**	**95.4**	**57.6**	**17.8**	**7.5**

Start a new query.

APPENDIX B

BIOLOGICAL ANALYSIS REPORT

BIOLOGICAL ANALYSIS REPORT

TWAIN HARTE COMMUNITY SERVICES DISTRICT

TWAIN HARTE SEWER PIPLINE IMPROVEMENTS PROJECT



NOVEMBER 2021

BIOLOGIAL ANALYSIS REPORT

TWAIN HARTE SEWER PIPELINE IMPROVEMENTS PROJECT

Prepared for:

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November 2021

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Project #210348

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Acronyms and Abbreviations

BAR	Biological Analysis Report
BIOS	Biogeography Information and Observation System
BSA	Biological Study Area
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act
MBTA	Migratory Bird Treaty Act
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
ROW	Right-of-Way
SR	State Route
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

Quad Knopf, Inc. (QK) has prepared this Biological Analysis Report (BAR) to evaluate the potential for sensitive biological resource to be impacted by the construction of the Twain Harte Sewer Pipeline Improvements Project (Project) in Tuolumne County, California.

The proposed Project is located in the unincorporated community of Twain Harte, in the lower Sierra Nevada mountain range to the east of California's Central Valley. The Twain Harte Community Services District proposes to replace 4- to 10-inch diameter sewer pipelines at 12 locations to maintain and upgrade the existing sanitary collection system. The Project is located mainly beneath asphalt-paved roadways, although a portion of the Project runs along the southern edge of the man-made Twain Harte Lake.

A database review and reconnaissance site visit were completed by QK Environmental Scientists to characterize existing conditions and determine the potential for special-status species and other sensitive biological resources that may occur and be impacted by the Project.

The database and literature review identified one sensitive natural community and 15 special-status plant species with potential to occur in the vicinity of the Project (Biological Study Area or BSA). One sensitive plant community identified in the review was determined not to be present during the site visit. Seven (7) special-status species identified in the review were determined to have the potential to occur on the BSA because they are within the known range of the species, the accepted elevation range, and suitable habitat is present. None of these species are State or federally protected but are State listed as rare.

The literature and database review identified 19 special-status wildlife species known or with potential to occur in the vicinity of the BSA (see Appendix D). Of those, only one (1) was determined to have the potential to occur within the BSA, northern goshawk (*Accipiter gentilis*). The BSA presents suitable habitat for numerous nesting birds that are covered by the Migratory Bird Treaty Act, although no bird nests were observed within the BSA during the reconnaissance site visit.

There is an unnamed creek that runs through Twain Harte near to proposed work areas for the Project. Twain Harte Lake is located at the southwestern end of the Project. These hydrological resources are likely under the jurisdiction of both the State and the U.S. Army Corps of Engineers. However, the Project would avoid any impacts to these features.

Direct and indirect impacts of the Project to potentially occurring plant and wildlife species could include injury to or mortality of individuals and loss of habitat. Avoidance and minimization measures are recommended which, when implemented, would reduce Project impacts to biological resources to less than significant levels.

SECTION 1 - INTRODUCTION

QK prepared this Biological Analysis Report (BAR) to evaluate the potential for sensitive biological resources to be impacted by the construction of the Twain Harte Sewer Pipeline Improvement Project (Project) in Tuolumne County, California.

1.1 - Project Location

The proposed Project is located in the unincorporated community of Twain Harte in Tuolumne County, California (Figures 1-1 and 1-2). Twain Harte is accessible via State Route (SR) 108 and is in the foothills of the western Sierra Nevada mountain range, approximately 50 miles northeast of Modesto, California and 8.5 miles northeast of Sonora, California. The Project is within the *Twain Harte* U.S. Geological Survey (USGS) 7.5-minute quadrangle, and within Sections 8, 9, 16, and 17 of Township 2 North, Range 16 East, Mount Diablo Base and Meridian.

1.2 - Project Description

The proposed Project consists of the replacement of existing 4- to 10- inch sewer pipelines within existing rights-of-way (ROWs) and utility easements at twelve locations, mainly buried beneath paved roads. A portion of the Project is adjacent to the man-made Twain Harte Lake and is not within an existing ROW. The Project will maintain and upgrade the existing sanitary collection system to provide adequate capacity for the community and avoid any sanitary sewer overflows into groundwater or surface waters.

1.3 - Purpose, Goals, and Objectives

The purpose of this BAR is to identify where potential special-status biological resources may occur within the Project site, determine how those resources may be impacted by the proposed Project, and recommend avoidance, minimization, and mitigation measures to reduce the potential for impact to a less than significant level. This BAR has been prepared to support an analysis of biological conditions as required by the California Environmental Quality Act (CEQA). Information contained in this BAR would, at least partially, support an analysis of project effects required by the National Environmental Policy Act (NEPA) and to support regulatory permit applications, if needed.



Figure 1-1
Regional Map
Twain Harte Sewer Pipeline Improvements Project,
Tuolumne County, California

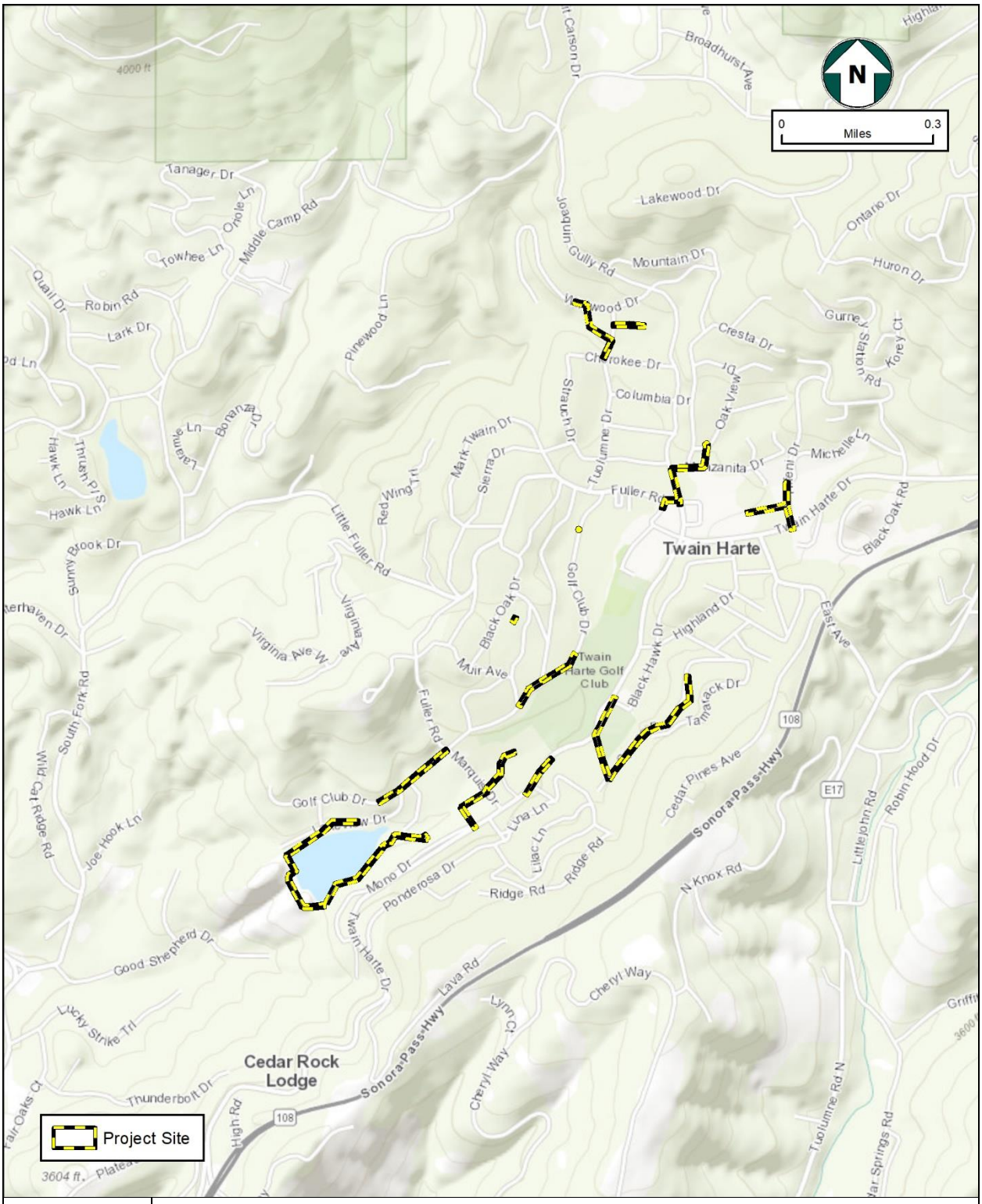


Figure 1-2
Project Location Map
Twain Harte Sewer Pipeline Improvements Project,
Tuolumne County, California

SECTION 2 - METHODS

This section discusses the methods used to obtain relevant data on the occurrence, or potential occurrence, of sensitive biological resources on or in the vicinity of the Project.

2.1 - Definition of Biological Study Area

The Biological Study Area (BSA) consists of the proposed Project and a surrounding 250-foot buffer (Figure 2-1). The Project consists of twelves (12) segments of pipeline, which are numbered for ease of reference (Figure 2-1).

2.2 - Definition of Special-Status Species

Special-status species evaluated in this BAR include:

- Species listed as threatened or endangered under the Federal Endangered Species Act (FESA). Species that are under review by the United States fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) may be included if there is a reasonable expectation of listing within the life of the Project;
- Species listed as candidate, threatened, or endangered under the California Endangered Species Act (CESA);
- Species designated as Fully Protected, Species of Special Concern, or included on a Watch List by the California Department of Fish and Wildlife (CDFW);
- Other species included on the CDFW's Special Animals List;
- Plant species with a California Rare Plant Rank (CRPR); and
- Species designated as locally important by a Local Agency and/or otherwise protected through ordinance or local policy.

The potential for each special-status species to occur in the study area was evaluated according to the following criteria:

- **No**. Habitat on and adjacent to the site is clearly unsuitable to meet the needs of the species (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime), and species would have been identifiable on-site if present (e.g., oak trees).
- **Yes**. Conditions on the site may, in some way, support a portion of the species ecology (foraging, reproduction, movement/migration). Negative survey results independent of other information does not exclude the potential for a species to occur.
- **Present**. Species was observed on the site or has been recorded (e.g., California Natural Diversity Database, California Native Plant Society) on the site recently (within the last 5 years).

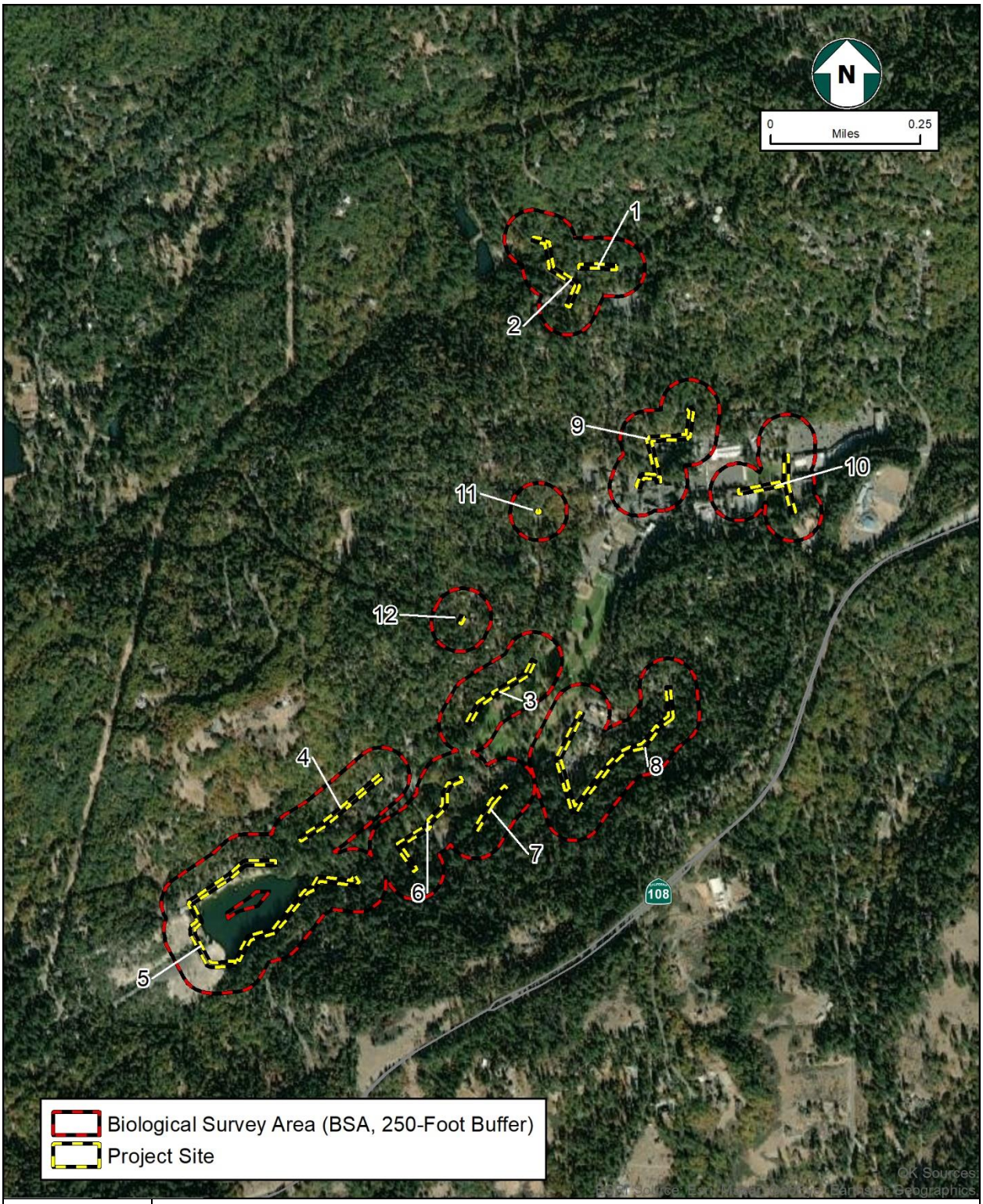


Figure 2-1
Biological Study Area
Twain Harte Sewer Pipeline Improvements Project,
Tuolumne County, California

2.3 - Literature Review and Database Analysis

The following sources were reviewed for information on sensitive biological resources in the project vicinity:

- CDFW's California Natural Diversity Database (CNDDB; CDFW 2021a)
- CDFW's Biogeographic Information and Observation System (BIOS; CDFW 2021b)
- CDFW's Special Animals List (CDFW 2021c)
- CDFW's California Wildlife Habitat Relationships (CWHR) System (Mayer and Laudenslayer 1988)
- California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants of California (CNPS 2021)
- U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation system (USFWS 2021a)
- USFWS Critical Habitat Mapper (USFWS 2021b)
- USFWS National Wetlands Inventory (USFWS 2021c)
- National Hydrography Dataset (USGS 2021)
- Federal Emergency Management Agency (FEMA) flood zone maps (FEMA 2021)
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2021)
- Current and historical aerial imagery (Google LLC 2021)

For each of these data sources, the search was focused on the *Twain Harte, California* USGS 7.5-minute quadrangle in which the Project is located, plus the surrounding eight (8) quadrangles: *Stanislaus, Crandall Peak, Strawberry, Hull Creek, Duckwall Mountain., Tuolumne, Standard,* and *Columbia SE.*

The CNDDB provides element-specific spatial information on individually documented occurrences of special-status species and sensitive natural communities. Some of the information available for review in the CNDDB is still undergoing review by the CDFW; these records are identified as unprocessed data. The CNPS database provides similar information as the CNDDB, but at a much lower spatial resolution. Much of this information in these databases is obtained opportunistically and is often focused on protected lands or on lands where development has been proposed. Neither database represents a comprehensive survey for special-status resources in the region. As such, the absence of recorded occurrences in these databases at any specific location does not preclude the possibility that a special-status resource could be present. The National Wetlands Inventory (NWI), National Hydrography Dataset (NHD), and Web Soil Survey provide comprehensive data, but at a low resolution that requires confirmation in the field. The CDFW Special Animals List and USFWS Information for Planning and Consultation system provide no spatial data on wildlife occurrences and provide only lists of species that might potentially be present.

The results of the database inquiries were reviewed to develop a comprehensive list of sensitive biological resources that may be present in the vicinity of the Project. This list was then evaluated against existing site conditions observed during the on-site biological

investigations of the BSA to determine which resources occur or have the potential to occur, and then the potential for the Project to impact those resources was evaluated.

2.4 - Reconnaissance-Level Field Surveys

A reconnaissance survey of the BSA was conducted on September 15, 2021 by QK Environmental Scientists Karissa Denney and Shannon Gleason (Table 2-1). The survey consisted of visiting each of the proposed work locations conducting pedestrian surveys. Much of the 250-foot survey buffer fell on residential property or other privately-owned lands and was inaccessible. These areas were surveyed visually with the aid of binoculars to gather a representative inventory of the plant and wildlife species present.

Table 2-1
Reconnaissance Survey Personnel and Timing
Twain Harte Sewer Pipeline Improvements Project,
Kern County, California

Date	Personnel	Time	Weather Conditions	Temperature
September 15, 2021	Karissa Denney, Shannon Gleason	0700-1500	hazy, warm	61-82°F

General tasks completed during the survey included compiling an inventory of plant and wildlife species observed, characterizing vegetation associations and habitat conditions, verifying presence of wetlands and waters within the BSA, and assessing the potential for federal- and State- listed and special-status plant and wildlife species to occur on the BSA. All locational data were recorded using ESRI Collector for ArcGIS software installed on an iPad and site conditions were documented with representative photographs.

SECTION 3 - REGULATORY SETTING

Regulated or sensitive resources that were studied and analyzed include special-status plant and animal species, nesting birds and raptors, sensitive plant communities, jurisdictional waters and wetlands, wildlife movement areas, and locally protected resources such as protected trees. Regulatory authority over biological resources is shared by federal, State, and local authorities. Primary authority for regulation of general biological resources lies within the land use control and planning authority of local jurisdictions (in this instance, Tuolumne County).

Potential impacts to biological resources were analyzed based on the following list of statutes. Summaries of these statues are provided in Appendix A.

- CEQA
- FESA
- CESA
- Federal Clean Water Act
- California Fish and Game Code
- Migratory Bird Treaty Act
- The Bald and Golden Eagle Protection Act
- Porter-Cologne Water Quality Control Act
- Tuolumne County General Plan

SECTION 4 - ENVIRONMENTAL SETTING

This section identifies the regional and local environmental setting of the Project and describes existing baseline conditions. The environmental setting of the BSA was obtained from various sources of literature, databases, and aerial photographs. Site conditions were verified and updated during the reconnaissance survey conducted by QK Environmental Scientists.

4.1 - Physical Characteristics

This section identifies the regional environmental setting of the Project and describes baseline conditions. Representative photographs of the BSA are included in Appendix B.

4.1.1 - TOPOGRAPHY

The Project is in the lower elevation of the Sierra Nevada mountain range, east of California's Central Valley. The topography of the BSA is variable, with the majority of the Project work locations located Twain Harte municipality. Hillsides slope upward away from this valley to the northwest and southeast with various changes in topography. Elevation in the BSA ranges from approximately 3,500 feet above mean sea level at the southwest end of the Project to approximately 3,760 feet above mean sea level at its northern end.

4.1.2 - CLIMATE

The Project is within the lower elevations of the Sierra Nevada Mountain range, a region consisting of warm, mostly dry summers and cold, wet winters. Average high temperatures range from 54.5°F in January to 94.5°F in July, and temperatures may occasionally exceed 100°F in the summer (WRCC 2021). Average low temperatures range from 33.4°F in January to 58.7°F in July. Precipitation occurs primarily as rain, most of which falls from November to April, with an average of 32.14 inches of rainfall per year. Precipitation in the form of snowfall can occur in winter, mainly from December to March, with an average of 4.7 inches per year.

4.1.3 - LAND USE

The Project is situated on the western side of the lower-elevation Sierra Nevada mountain range, much of is which is undeveloped forested land (Figures 1-1 and 1-2). It is within the community of Twain Harte, which was originally established during California's gold rush. Twain Harte is accessible via SR 108, which is just southeast of the Project and runs from Modesto to U.S. Route 395 through the Sonora Pass.

Almost all proposed work locations are along existing paved residential and commercial roads, and there are numerous residences immediately adjacent to and surrounding the Project. Areas between residences remain densely forested. Most Project sites are situated around the "town center" of Twain Harte, which supports a golf course, a park, Twain Harte Lake, an elementary school, a fire department, restaurants, and various shops and services.

An unnamed creek runs through Twain Harte and collects in a small artificial lake on the southwest end of the BSA. Twain Harte Lake is used for recreational swimming by community members. There are several other artificial ponds in the vicinity of the BSA.

4.1.4 - SOILS

The Web Soil Survey has not mapped the soil type(s) that underlay the BSA, so this information is not available (NRCS 2021).

4.1.5 - HYDROLOGY

The entire BSA is within the Upper Tuolumne watershed (USGS 2021). This watershed drains waters from the western Sierra Nevada mountains into the Tuolumne River, which flows westward into the Central Valley. The Tuolumne River joins the San Joaquin River west of Modesto, California, which flows north towards the San Francisco delta region.

The NWI and NHD identify two water resources within the BSA (Figure 4-1; USFWS 2021c, USGS 2021). Twain Harte Lake is at the southwest end of the BSA and is classified by the NWI as an artificially flooded pond or lake with less than 30% vegetative cover. These conditions were confirmed during the reconnaissance survey and are described further below in Section 4.2.2. Photographs of Twain Harte Lake are included in Appendix B.

An unnamed creek flows southwest through Twain Harte and feeds Twain Harte Lake (Figure 4-1). Water flow from this creek is released downstream of Twain Harte Lake from the levy as needed based on seasonal flow. Upstream and downstream of the lake, the creek is classified as "intermittent" by the NWI, meaning flows fluctuate seasonally. Immediately adjacent to the lake, both upstream and downstream, the creek is classified as "semipermanently flooded", meaning surface water persists throughout the growing system in most years, due to the regulated flow from Twain Harte Lake (NWI 2021). This creek was not surveyed in all portions of the BSA because much of it is located on private property, but some accessible areas were confirmed to support a low flow of water and/or pooled surface water (Appendix B, Photograph 16). The creek flows southwest into Phoenix Reservoir, which drains into the Don Pedro Reservoir via Sullivan Creek, eventually reaching the Tuolumne River (USGS 2021)

The majority of the BSA is within an area of minimal flood hazard as determined by FEMA (Figure 4-2; FEMA 2021). Twain Harte Lake is categorized as an area with a 1% chance of annual flooding.

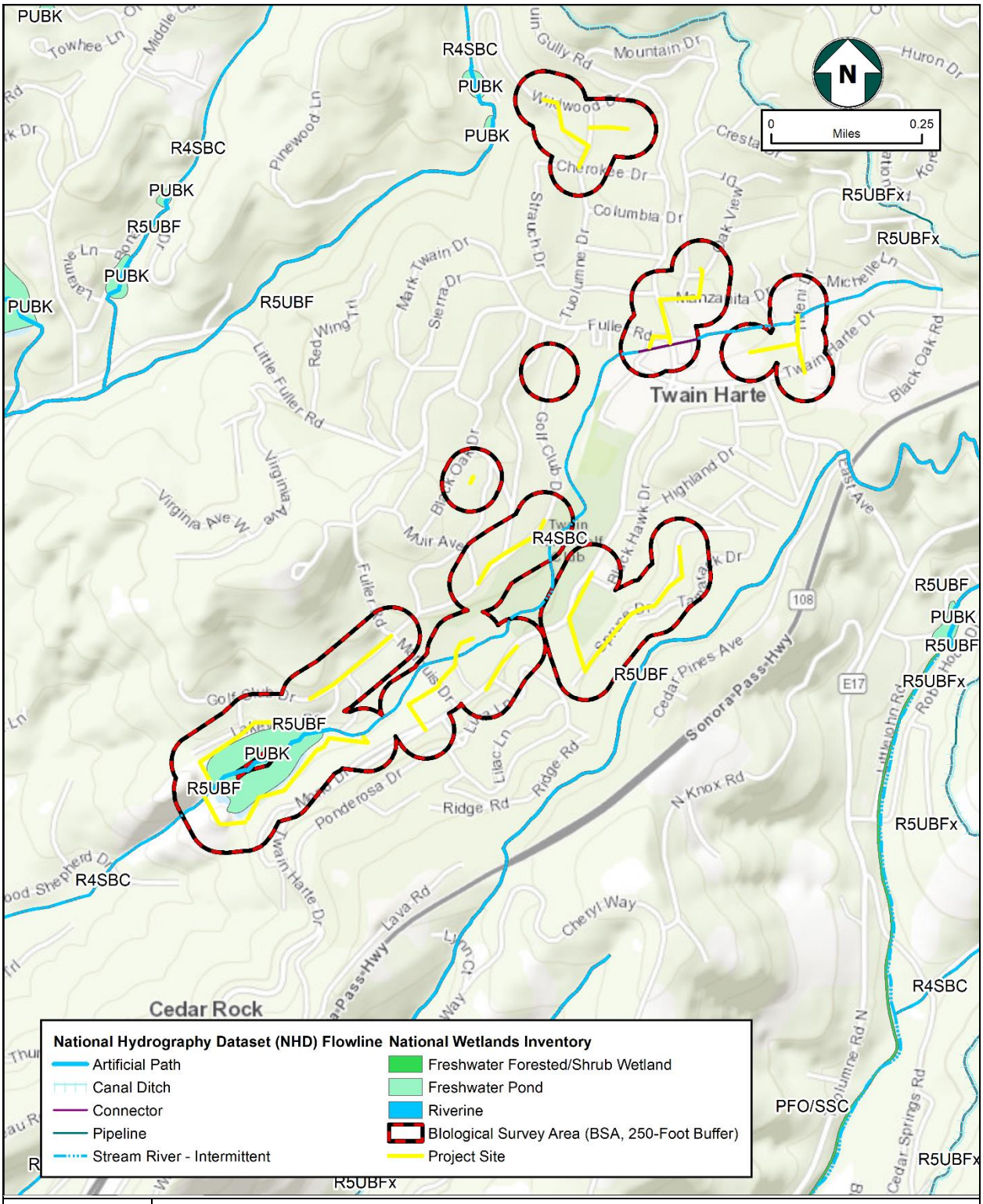


Figure 4-1
NWI and NHD Records of Aquatic Resources
Twain Harte Sewer Pipeline Improvements Project, Tuolumne County, California

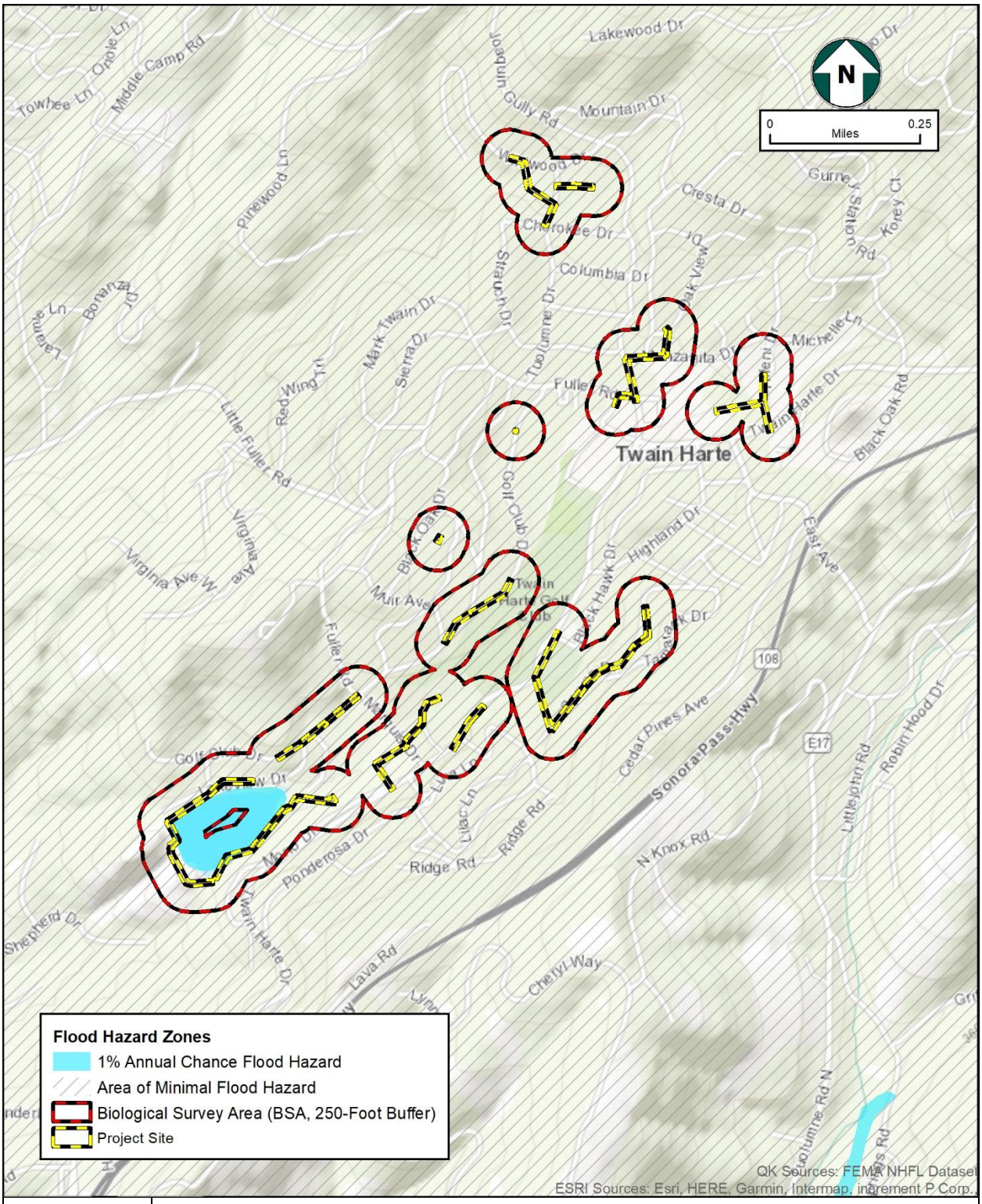


Figure 4-2
FEMA Flood Zone Map
Twain Harte Sewer Pipeline Improvements Project,
Tuolumne County, California

4.2 - Vegetation and Other Land Cover

Five habitat types were observed within the BSA: Barren, Lacustrine, Montane Conifer-Hardwood, Valley Foothill Riparian, and Urban. Habitats were characterized according to CWHR descriptions (Mayer and Laudenslayer 1988). A complete list of plant species observed during the reconnaissance survey is attached in Appendix C.

4.2.1 - BARREN

Mayer and Laudenslayer (1988) describe barren habitat as any habitat with <2% total vegetation cover by herbaceous, desert, or non-wildland species and <10% cover by tree or shrub species. Barren habitat may be found in combination with many different habitats, depending on the region of the state. Where there is little or no vegetation, structure of the non-vegetated substrate becomes a critical component of the habitat. Certain bird species nest on rock ledges and open ground covered with sand or gravel to construct scrape nests. Rocky canyon walls above open water is preferred foraging habitat for many bats. The physical settings for permanently barren habitat represent extreme environments for vegetation.

The majority of the Project consists of asphalt-paved residential and commercial roads through the town of Twain Harte, which would be categorized as Barren habitat. These roads are completely unvegetated, and the sewer lines that would be replaced or maintained during Project activities are buried beneath asphalt-paved roads. There is also Barren habitat in the Project buffer where there are asphalt-paved roads and parking lots as well as commercial buildings, as described in Section 4.1.3. There is naturally barren habitat immediately downstream of the Twain Harte Lake Levy, where there is an exposed layer of rock.

4.2.2 - LACUSTRINE

Mayer and Laudenslayer (1988) describe Lacustrine habitat as an aquatic habitat consisting of inland areas or dammed riverine channels containing standing water. Typical habitats include permanently flooded lakes, reservoirs, intermittent lakes and ponds, including vernal pools. Zonation occurs in the Lacustrine habitat from deeper water to the shore that supports a variety of life. Biodiversity is abundant in lacustrine habitats, providing resources for reproduction, cover, food, and water for numerous wildlife species. The waters of lakes and ponds offer calm conditions that contrast with that of running water. As such, oxygen occurs in gradations dependent on light and temperature in these sites influencing the diversity of life in these zones. These habitats are found throughout California at virtually all elevations, but less abundant in arid regions.

Lacustrine habitat is present at the man-made pond at the southwestern end of the BSA, Twain Harte Lake. This pond was created by constructing a levy across the unnamed creek that runs through the community. The banks of the pond are concrete-lined along its northern edge and do not support any vegetation; the southern edge of the pond meets the backyards of residential homes, and a small amount of vegetation grows near the levy. No

debris (e.g, logs, tree branches, etc.) was observed in the water or on the banks, and no wildlife was observed at the pond. The pond is fenced with chain link and locked along the northern edge of the pond and around the levy, open only to Twain Harte community members.

4.2.3 - MONTANE HARDWOOD-CONIFER

Mayer and Laudenslayer (1988) describe Montane Hardwood-Conifer often as a closed forest with a mixture of conifer and hardwood tree species. To be categorized as Montane Hardwood-Conifer habitat at least one-thirds of the trees must be conifers and one-third must be broad-leaved trees. Because the canopy is dense and typically bilayered, there is relatively little understory. Considerable ground and shrub cover can occur in ecotones or following disturbance such as fire or logging. Species composition varies substantially among different geographic areas but typically consists of ponderosa pine (Pinus ponderosa), Douglas fir (*Pseudotsuga menziesii*), incense-cedar (*Calocedrus decurrens*), California black oak (*Quercus kelloggii*), coast live oak (*Q. agrifolia*), tanoak (*Notholithiocarpus densiflorus*), and Pacific madrone (*Arbutus menziesii*). Golden chinquapin (*Chrysolepis chrysophylla*), canyon live oak (*Quercus chrysolepis*), white fir (*Abies concolor*), bigleaf maple (*Acer macrophyllum*), black cottonwood (*Populus trichocarpa*), Jeffrey pine (*Pinus jeffreyi*), giant sequoia (*Sequoiadendron giganteum*), and coastal redwood (*Sequoia sempervirens*) are common associated tree species, among others. Montane Hardwood-Conifer provides habitat for a variety of wildlife species, including cavity nesting birds, amphibians, and mammals. Montane Hardwood-Conifer occurs throughout California at elevations from 300 to 1200 m (1,000 to 4,000 ft) in the north to 605 to 1760 m (2,000 to 5,700 ft) in the south.

The majority of the BSA is vegetated with Montane Hardwood-Conifer habitat. Many of the plant species characteristic of this habitat are present, including ponderosa pine, incense cedar, Jeffrey pine, California black oak, canyon live oak, tanoak, and coast redwood. In many cases the overstory of these large trees covered the Barren and Urban (described below in Section 4.2.4) habitats that were beneath them. Understory species frequently observed during the reconnaissance survey and typical of the region include whiteleaf manzanita (*Actophylos viscida*), French broom (*Genista monspessulana*), St. John's wort (*Hypericum calycinum*), Himalayan blackberry (*Rubus armeniacus*), prostrate knotweed (*Polygonum aviculare*), perennial pea (*Lathyrus latifolius*), and various grasses. Aside from manzanita, these species are non-native.

4.2.4 - URBAN

Urban habitats include five types of vegetative structure which includes tree grove, street strip, shade tree/lawn, lawn, and shrub cover. Species composition in urban habitats varies with planting design and climate. Monoculture is commonly found in tree groves and street tree strips. Three Urban categories relevant to wildlife are classified as downtown, urban residential, and suburbia. There is a progression of decreasing development and increasing vegetative cover, species abundance, and diversity from downtown to suburbia types. Urban habitats are not limited to any particular physical setting.

Urban habitat is concentrated in the town center of Twain Harte, around which most of the Project work areas are arranged. Portions of the Project buffer consist of Urban habitat, and include the golf course, park, and baseball diamond, which feature maintained grass lawns and various ornamental plant species.

4.2.5 - VALLEY FOOTHILL RIPARIAN

Mayer and Laudenslayer (1988) describe Valley Foothill Riparian as a tree dominated community consisting of primarily winter deciduous riparian trees providing 20 to 80 percent cover, a subcanopy tree layer, an understory shrub layer, and about one percent herbaceous vegetation. The dominant species in the canopy layer are cottonwood (*Populus* sp.), California sycamore (*Platanus racemosa*), and valley oak (*Quercus lobata*). Subcanopy trees typically include white alder (*Alnus rhombifolia*), boxelder (*Acer negundo*), and Oregon ash (*Fraxinus latifolia*). Typical understory shrub and herbaceous layers consist of wild grape (*Vitis californica*), blue elderberry (*Sambucus nigra* ssp. *caerulea*), poison oak (*Toxicodendron diversilobum*), buttonbush (*Cephalanthus occidentalis*), willows (*Salix* sp.), sedges, rushes, grasses, miner's lettuce (*Claytonia perfoliata*), California mugwort (*Artemisia douglasiana*), and hoary nettle (*Urtica dioica* ssp. *holosericea*). Valley Foothill Riparian habitats provide food, water, migration and dispersal corridors, and escape, nesting, and thermal cover for an abundance of wildlife. This habitat is generally associated with low velocity flows, flood plains, and gentle topography. Valleys provide deep alluvial soils and a high-water table. The substrate is coarse, gravelly or rocky soils more or less permanently moist, but probably well aerated.

Valley Foothill Riparian habitat is present within the BSA along the unnamed creek that runs through Twain Harte. Species observed in this habitat type include red willow (*Salix laevigata*), arroyo willow (S*. lasiolepis*), cottonwood (*Populus fremontii*), Himalayan blackberry, yellow monkeyflower (*Erythranthe guttata*), watercress (*Nasturtium officinale*), floating primrose willow (*Ludwigia peploides*), American speedwell (*Veronica americana*), and tall flatsedge (*Cyperus eragrostis*). Due to the time of year of the reconnaissance survey and the low amount of precipitation during the previous wet season, water flow in the creek was very low, with little visible flowing surface water. There were some areas along the creek with pooled surface water, with a low flow of water collecting in Twain Harte Lake and continuing downstream through the levy.

4.3 - General Wildlife Observations

Wildlife species observed during the reconnaissance survey were typical for Montane Hardwood-Conifer habitat. Birds were the most common taxonomic group observed, and included mountain chickadee (*Poecile gambeli*), Anna's hummingbird (*Calypte anna*), California scrub jay (*Aphelocoma californica*), Steller's jay (*Cyanocitta stelleri*), and oak titmouse (*Baeolophus inornatus*). Other species observed included black-tailed deer (*Odocoileus hemonius*), gray squirrel (*Sciurus gresius*), and California ground squirrel (*Otospermophilus beecheyi*). A complete list of wildlife observed is attached in Appendix C.

SECTION 5 - SENSITIVE BIOLOGICAL RESOURCES

Local, State, and federal agencies regulate special-status species and other sensitive biological resources and require an assessment of their presence or potential for presence to be on-site prior to the approval of proposed development on a property. This section discusses sensitive biological resources observed on the project site and evaluates the potential for the Project site to support additional sensitive biological resources. Assessments for the potential occurrence of special-status species are based upon known ranges, habitat preferences for the species, species occurrence records from the CNDDB and CNPS, species occurrence records from other sites in the vicinity of the BSA, relevant reports, and the results of surveys of the Project site.

5.1 - Special-Status Species

There were eight (8) special-status plant and wildlife species determined to have potential to occur within the BSA and potentially be affected by the Project (Table 5-1). The complete list of species evaluated for this Project is included in Appendix D. Each species with potential to occur on the site is further discussed in the subsections below.

Table 5-1
Special-Status Species with Potential to Occur On-Site

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Potentially Affected by Project? Yes/No	Viability Threat? Yes/No
Plants			
Clarkia australis Small's southern clarkia	-/- 1B.2/-	Yes	No
Clarkia biloba ssp. *australis* Mariposa clarkia	-/- 1B.2/-	Yes	No
Diplacus pulchellus yellow-lip pansy monkeyflower	-/- 1B.2/-	Yes	No
Erythronium tuolumnense Tuolumne fawn lily	-/- 1B.2/-	Yes	No
Iris hartwegii ssp. *columbiana* Tuolumne iris	-/- 1B.2/-	Yes	No
Navarretia miwukensis Mi-Wuk navarretia	-/- 1B.2/-	Yes	No
Rhynchospora capitellata brownish beaked-rush	-/- 2B.2/-	Yes	No
Birds			
Accipiter gentilis northern goshawk	-/- -/SSC	Yes	No

CRPR (California Rare Plant Rank):
1A Presumed Extinct in California
1B Rare, Threatened, or Endangered in California and elsewhere
2A Plants presumed extirpated in California, but more common elsewhere

SSC CDFW Species of Special Concern

2B Plants Rare, Threatened, or Endangered in California, but more common elsewhere

CRPR Threat Code Extension:

.1 Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)

.2 Fairly endangered in California (20-80% occurrences threatened)

5.1.1 - SPECIAL-STATUS PLANT SPECIES

The literature and database review identified 15 special-status plant species known or with potential to occur in the vicinity of the Project (see Appendix D). Eight (8) of these species were eliminated from consideration because the Project occurs outside of the species' known range, outside of the elevation range of the species, or because habitat that could support the species was absent from the BSA (Table 5-1). The remaining seven (7) species that have potential to occur within the BSA are discussed below.

Small's Southern Clarkia

CLARKIA AUSTRALIS

Status: California Rare Plant Rank 1B.2

The Small's southern clarkia is endemic to California and typically occurs in open, rocky sites within cismontane woodland and lower montane coniferous forest habitats (CNPS 2021). It blooms from May to August and occurs at elevations between 2,625 and 6,810 feet. The Small's southern clarkia is primarily threatened by logging activities.

There is one CNDDB record of this species from 1965 that overlaps the 250-foot survey buffer for the Project (EONDX 18855). This species was not observed during the September 15, 2021 reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat for Small's southern clarkia in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA.

Mariposa Clarkia

CLARKIA BILOBA* SSP. *AUSTRALIS

Status: California Rare Plant Rank 1B.2

The Mariposa clarkia is an annual herb, endemic to California. It occurs in serpentinite soils, in chaparral, ultramafic, and foothill and cismontane woodlands and sometimes in riparian areas as well as large talus rockslides (CNPS 2021). The Mariposa clarkia has a blooming period from April to July and occurs at elevations between 980 and 4,790 feet. It is threatened by road maintenance, foot traffic and competition with non-native plants.

The nearest CNDDB record for Mariposa clarkia is approximately 1.1 mile southeast of the BSA, from 1958 (EONDX 91125). Another CNDDB occurrence is approximately 2.1 miles southeast of the Project, where a large population was observed over multiple years between 2001 and 2008 (EONDX 110557). This species was not observed during the September 15, 2021 site visit, which was conducted outside of the blooming period for this species. There

is suitable habitat for Mariposa clarkia in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA.

Yellow-lip Pansy Monkeyflower

DIPLACUS PULCHELLUS

Status: California Rare Plant Rank 1B.2

The yellow-lip pansy monkeyflower is an annual herb, endemic to California. It occurs in vernally wet and often disturbed areas, either on clay, volcanic or granitic soils in lower montane coniferous forest and meadows and seeps (CNPS 2021). The yellow-lip pansy monkeyflower blooms from April to July and occurs in elevations from approximately 1,960 to 6,565 feet. It is generally threatened by vehicles, logging, competition from non-native plants, and grazing, and potentially threatened by development.

The nearest CNDDB occurrence for the species that is presumed extant is from 1971, approximately 0.5 mile southeast of the Project (EONDX 76169). This species was not observed during the September 15, 2021 reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat within the BSA for yellow-lip pansy monkeyflower in the Valley Foothill Riparian habitat along the unnamed creek that runs through Twain Harte, and potentially in the Montane Hardwood-Conifer habitat.

Tuolumne Fawn Lily

ERYTHRONIUM TUOLUMNENSE

Status: California Rare Plant Rank 1B.2

Tuolumne fawn lily is a perennial bulbiferous species endemic to California that blooms between March and June. It occurs in cismontane woodland, lower montane coniferous forest, and chaparral habitats, often on clay soils and on cliffs and near drainages in broadleaf upland forests, at elevations between 1,675 and 4,480 feet. The species is threatened by competition with non-native plants, grazing, and mining activities.

The nearest CNDDB occurrence for Tuolumne fawn lily is from 2003 and approximately 1.7 miles northwest of the BSA, on a steep north-facing slope above the South Fork Stanislaus River (EONDX 3378). This species was not observed during the September 15, 2021 reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat for Tuolumne fawn lily in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA.

Tuolumne Iris

IRIS HARTWEGII* SSP. *COLUMBIANA

Status: California Rare Plant Rank 1B.2

Tuolumne iris is a perennial herb that is endemic to California and blooms between May and June (CNPS 2021). It occurs in cismontane woodland, lower montane coniferous forest, and yellow pine forest habitats at elevations between 1,395 and 4,595 feet.

The nearest CNDDB occurrence for Tuolumne iris is from 2006, approximately 2.8 miles northwest of the BSA, in mixed oak-conifer forest (EONDX 97839). This species was not observed during the September 15, 2021 reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat for Tuolumne iris in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA.

Mi-Wuk Navarretia

NAVARRETIA MIWUKENSIS

Status: California Rare Plant Rank 1B.2

Mi-Wuk navarretia is an annual herb endemic to California and blooms between May and July or August. It occurs in openings on gentle slopes in lower montane coniferous forest habit on pyroclastic (volcanic) soils, at elevations between 2,625 and 4,920 feet (CNPS 2021). Threats to the species include urbanization, off-road vehicles and recreational activities, and competition with non-native plants.

The nearest CNDDB occurrence for Mi-Wuk navarretia overlaps the south side of the BSA documenting a population observed over a road cut in 2014 (EONDX 11504). This species was not observed during the September 15, 2021 reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat for the species in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA.

Brownish Beaked-Rush

RHYNCHOSPORA CAPITELLATA

Status: California Rare Plant Rank 2B.2

Brownish beaked rush is a perennial herb that blooms between July and August (CNPS 2021). It occurs in mesic montane coniferous forest, in meadows and seeps, and in marshes and swamps at elevations between 150 and 6,560 feet.

The nearest CNDDB occurrence for the species is from 2014 and over 10 miles southeast of the BSA (EONDX 113950). This species was not observed during the September 15, 2021 reconnaissance survey, which was conducted outside of the blooming period for this species. There is suitable habitat within the BSA for this species in the Valley Foothill Riparian habitat along the unnamed creek that runs through Twain Harte, and potentially in the Montane Hardwood-Conifer habitat.

5.1.2 - SPECIAL-STATUS ANIMAL SPECIES

The literature and database review identified 19 special-status wildlife species known or with potential to occur in the vicinity of the BSA (see Appendix D). Of those, only one was determined to have the potential to occur within the BSA, northern goshawk (*Accipiter gentilis*), which is discussed below.

Northern Goshawk

ACCIPITER GENTILIS

Status: CDFW Species of Special Concern

The northern goshawk is a large raptor that prefers mature old-growth forests with relatively high canopy closures (Squires et al. 2020). It typically nests in large trees on moderate slopes with open understories. Nests are built in coniferous, deciduous, or mixed-pine forests, usually in the largest tree available. Preferred prey items include rabbits, large rodents, and other birds, which goshawks will aggressively capture from an observation perch.

The nearest CNDDB occurrence for northern goshawk is approximately 2.8 miles northeast of the BSA, where a nest was observed in a stand of tall conifers between the Stanislaus River and Deer Creek in 1996 (EONDX 29760). This species was not observed during the September 15, 2021 reconnaissance survey, which was conducted on the last day of the accepted "nesting bird season", which begins on February 1 and ends on September 15. There is suitable habitat for northern goshawk in the Montane Hardwood-Conifer habitat that is present throughout much of the BSA and in the lands surrounding the BSA.

5.1.3 - OTHER PROTECTED SPECIES

Nesting Birds and Raptors

Habitat within the BSA would support nesting native bird species, which are protected by the federal Migratory Bird Treaty Act (MBTA) and the California Fish and Game Code. The site survey for the Project was conducted on the last day of the nesting bird season (February 1 to September 15). No bird nests, active or inactive, were observed during the survey.

Various species of migratory birds will construct nests in a variety of habitats and structures, and nests may be constructed in trees or shrubs, man-made structures, and directly on the ground at any time during the nesting season. Since the BSA supports several types of habitats and characteristics suitable for nesting birds, it is likely that birds will nest within the BSA.

5.2 - Sensitive Natural Communities

5.2.1 - SENSITIVE PLANT COMMUNITIES

The database and literature review identified one sensitive plant community in the vicinity of the BSA, Big Tree Forest (CDFW 2021a). This community consists of mixed conifer species and is defined by including the giant sequoia (*Sequoiadendron giganteum*) in this mix (Holland 1986). No giant sequoias were observed within the BSA and there are no CNDDB occurrences of this sensitive community within 10 miles of the BSA.

5.2.2 - CRITICAL HABITATS

There is no federally designated critical habitat within the BSA or in its immediate vicinity (USFWS 2021b).

5.3 - Jurisdictional Aquatic Resources

A formal delineation of waters of the U.S. and waters of the State was not conducted for this BAR. The database and literature review showed that the NHD and NWI identify two water resources within the BSA. Twain Harte Lake and the unnamed creek that feeds it (see Figure 4-1; USFWS 2021c, USGS 2021). These two features were verified to be present during the reconnaissance survey.

Twain Harte Lake is a small artificial pond formed as a result of the levy at its southwestern end. The northern banks are concrete-lined and do not support wetland habitat. The southern banks support a small amount of hydrophytic vegetation along the waterline near the levy.

The unnamed creek identified by the NWI has an intermittent flow through most of the BSA, as described in Section 4.1.5. After exiting Twain Harte Lake this creek flows in a general southwestward direction, connecting to the Tuolumne River through a series of creeks and reservoirs. This unnamed creek is likely a federally jurisdictional waterway.

5.4 - Wildlife Movement

Wildlife movement corridors, also referred to as dispersal corridors or landscape linkages, are generally defined as linear features along which animals can travel from one habitat or resource area to another. Wildlife movement corridors can be large tracts of land that connect regionally important habitats that support wildlife in general, such as stop-over habitat that supports migrating birds or large contiguous natural habitats that support animals with very large home ranges (e.g., coyotes [*Canis latrans*], black-tailed deer , etc.). They can also be small scale movement corridors, such as riparian zones, that provide connectivity and cover to support movement at a local scale.

The unnamed creek that runs through the town of Twain Harte could provide a movement corridor to wildlife. However, the levy at the southwestern end of Twain Harte Lake presents a significant barrier along this corridor.

5.5 - Resources Protected by Local Policies and Ordinances

The Tuolumne County General Plan contains policies aimed at the preservation of biological resources and promotes coordination with federal and State resource agencies. The General Plan also outlines implementation measures with which it proposes to achieve these goals, which include the preservation of native oak trees (*Quercus* sp.) when possible.

5.6 - Habitat Conservation Plans

The Project is not within the boundaries of any habitat conservation plans (HCPs) and is not subject to any associated regulations (USFWS 2021b).

SECTION 6 - IMPACT ANALYSIS AND RECOMMENDED MITIGATION MEASURES

This section provides an analysis of the potential for special-status biological resources to be impacted by the proposed Project. The analysis was developed using the CEQA Appendix G checklist, but also provides sufficient information to support NEPA documentation.

6.1 - Special-Status Species

The proposed project would have a significant effect on biological resources if it would:

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

6.1.1 - PROJECT IMPACTS TO SPECIAL-STATUS PLANT SPECIES

There are seven (7) special-status plant species that may occur within and near the Project and be potentially impacted by Project activities, as detailed in Section 5.1.1, above. No plant species that may occur on the Project site are federally or State listed for protection, but rare plants should be conserved to the extent possible.

If any of these species were present within the BSA, direct impacts could include the mortality of or injury to individual plants. During the growth and blooming period, the spread of dust during construction, soil contamination, or alteration of existing hydrology could cause an indirect impact to the species, as could the spread of non-native or invasive species caused by Project activities. Because the Project may impact the vegetated areas along roadway shoulders and the southern bank of Twain Harte Lake, Measures BIO-1 through BIO-3 and BIO-5 are recommended, as outlined below. Implementation of these measures would reduce impacts to these plant species to a less than significant level.

BIO-1 **Special-Status Plant Avoidance.** There are no State or federally protected plant species expected to occur on the Project site, though seven rare plant species have the potential to occur. If the Project is expected to occur during the blooming period, as listed in Table 6-1, plant identification may occur and therefore avoided to maximum extent possible. If Project activities cannot avoid those areas, a qualified botanist or biologist may have opportunity to salvage and relocate the plants that will be impacted.

Table 6-1
Blooming Period of Special-status Plants with Potential to Occur

Special-Status Plant Species	Optimal Blooming Period
Clarkia australis Small's southern clarkia	May - August

Clarkia biloba ssp. *australis* Mariposa clarkia	April - July
Diplacus pulchellus yellow-lip pansy monkeyflower	April - July
Erythronium tuolumnense Tuolumne fawn lily	March - June
Iris hartwegii ssp. *columbiana* Tuolumne iris	May - June
Navarretia miwukensis Mi-Wuk navarretia	May - August
Rhynchospora capitellata brownish beaked-rush	July - August

BIO-2 **Invasive Species.** The introduction and spread of invasive and non-native plant species should be avoided and controlled wherever possible during construction, on both the Project and surrounding areas. This may be achieved through measures such as cleaning vehicles and equipment before they enter construction areas, removing invasive species that exist on the site and disposing of the removed debris in a manner that prohibits their spread on- and off- site.

BIO-3 **Best Management Practices to Avoid Indirect Impacts to Special-Status Plants.** To reduce any indirect impacts to special-status plants that may be in the vicinity of the Project, best management practices (BMPs) should be implemented to control dust pollution, prevent discharge of potentially harmful chemicals, and prevent changes in hydrology. BMPs may include the installation of erosion and sedimentation control devices, applying water to control dust, placing drip pans under equipment when not in use, refueling in designated areas, and containing concrete washout properly, among other practices.

Significance After Mitigation. Implementation of the avoidance, minimization, and mitigation measures above will reduce impacts to special-status plant species to a less than significant level.

6.1.2 - PROJECT IMPACTS TO SPECIAL-STATUS ANIMAL SPECIES

One special-status wildlife species has potential to occur in the BSA: northern goshawk. There is also potential for native birds and raptors to nest on the Project and in its vicinity, and these species are covered by the federal MBTA.

Northern Goshawk

No northern goshawks or nests were observed during the reconnaissance survey. However, the Montane Hardwood-Conifer forest surrounding the Project presents suitable nesting habitat for the species.

Direct and indirect impacts to the species could result if an active nest is present in the vicinity during construction activities. Noise, vibration, and increased human activity could alter the normal behaviors of individual hawks and affect foraging success or lead to nest abandonment or failure. There would be no loss of foraging habitat as a result of the Project. Implementation of Measures BIO-4 and BIO-5, listed below, would reduce impacts to the species to a less than significant level.

Nesting Birds

The BSA supports several habitats for nesting birds, which may nest on trees and shrubs, man-made structures, and directly on the ground. Migratory birds could nest throughout the entire BSA.

If the construction activities and vegetation removal occur during the nesting season, they could lead to the destruction of nests. Construction-related vibration, noise, and dust production, and human presence could alter the normal behaviors of nesting birds in the vicinity of the Project and lead to nest failure.

To avoid and minimize impacts to migratory birds including special-status bird species, mitigation measures BIO-5 and BIO-6, listed below, should be implemented during construction to reduce impacts to nesting birds to a level that is less than significant.

Avoidance and Minimization Measures

Implementation of the avoidance and minimization measures listed below would reduce impacts of the Project to special-status wildlife species to level that would be less than significant. The following measures are recommended to avoid and minimize impacts to the northern goshawk and nesting migratory birds and raptors.

BIO-4 **Pre-activity Surveys for Nesting Birds.** If Project construction activities will be initiated during the nesting season (February 1 to September 15), a pre-activity nesting bird survey should be conducted within 14 days prior to the start of construction. The surveys should encompass the Project footprint and accessible areas or land visible from accessible areas within a 250-foot buffer for songbirds and a 500-foot buffer for raptors. If no active nests are found, no further action is required. However, existing nests may become active and new nests may be built at any time prior to and throughout the nesting season, including when construction activities are in progress.

If active nests are found during the survey or at any time during construction of the Project, an avoidance buffer ranging from 50 feet to 500 feet may be required, with the avoidance buffer from any specific nest being determined by a qualified biologist. The avoidance buffer will remain in place until the biologist has determined that the young are no longer reliant on the adults or the nest, or if breeding attempts have otherwise been unsuccessful. Work may occur within the avoidance buffer under the approval and guidance of the biologist, but full-time monitoring may be

required. The biologist shall have the ability to stop construction if nesting adults show any sign of distress.

BIO-5 **Worker Environmental Awareness Training.** Prior to the initiation of construction activities, all construction personnel should attend a Worker Environmental Awareness Training program developed by a qualified biologist. Any personnel associated with construction that did not attend the initial training shall be trained by the authorized biologist prior to working on the project site. Any employee responsible for the operations and maintenance or decommissioning of the project facilities shall also attend the Worker Environmental Awareness Training program prior to starting work on the project and on an annual basis. The Program shall be developed and presented by the project qualified biologist(s) or designee approved by the qualified biologist(s). The program should include information on the life histories of special-status species with potential to occur on the Project, their legal status, course of action should these species be encountered on-site, and avoidance and minimization measures to protect these species. It shall include the components described below:

a. Information on the life history and identification of special-status species that may occur or that may be affected by Project activities. The program shall also discuss the legal protection status of each such species, the definition of "take" under the Federal Endangered Species Act and California Endangered Species Act, measures the Project proponent/operator shall implement to protect the species, reporting requirements, specific measures for workers to avoid take of special-status plant and wildlife species, and penalties for violation of the requirements outlined in the California Environmental Quality Act mitigation measures and agency permit requirements.
b. An acknowledgement form signed by each worker indicating that the Worker Environmental Awareness Training and Education Program has been completed shall be kept on file at the construction site.
c. A copy of the training transcript and/or training video, as well as a list of the names of all personnel who attended the Worker Environmental Awareness Training and Education Program, and signed acknowledgement forms shall be submitted to the Tuolumne County Planning Department.
d. A copy of the training transcript, training video or informational binder for specific procedures shall be kept available for all personnel to review and be familiar with as necessary.
e. A sticker shall be placed on hard hats indicating that the worker has completed the Worker Environmental Awareness Training and Education Program. Construction workers shall not be permitted to operate equipment within the construction areas unless they have attended the Worker Environmental Awareness Training and Education Program and are wearing hard hats with the required sticker.

The construction crews and contractor(s) shall be responsible for preventing unauthorized impacts from project activities to sensitive biological resources that

are outside the areas defined as subject to impacts by Project permits. Unauthorized impacts may result in project stoppage, and/or fines depending on the impact and coordination with the California Department of Fish and Wildlife and/or U.S. Fish and Wildlife Service.

6.2 - Sensitive Natural Communities and Critical Habitat

The proposed project would have a significant effect on biological resources if it would:

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

No sensitive natural communities are present that would be impacted by the Project. As such, no measures are warranted.

Significance: No significance.

6.3 - Jurisdictional Aquatic Resources

The proposed project would have a significant effect on biological resources if it would:

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

A formal delineation of wetlands and water features was not conducted for this BAR. During the reconnaissance survey, an unnamed creek was observed, running northeast to southwest through the town of Twain Harte and feeding Twain Harte Lake. This creek is mapped by the NHD and is traced as a tributary to the Tuolumne River, so is likely federally jurisdictional as a Traditionally Navigable Water under the U.S. Army Corps of Engineers.

Project activities will occur only on previously disturbed areas, beneath previously disturbed roadways paved with asphalt. The unnamed creek and Twain Harte Lake will not be impacted by Project activities. As such, the Project will have no impact on any jurisdictional aquatic resources and no measures are warranted.

Significance: No significance.

6.4 - Wildlife Movement

The proposed project would have a significant effect on biological resources if it would:

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

No movement corridors are present that would be impacted by the Project. As such, no measures are warranted.

Significance: No significance.

6.5 - Local Policies and Ordinances

The proposed project would have a significant effect on biological resources if it would:

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

The Project does not conflict with the County of Tuolumne General Plan and is not subject to any local ordinances. No trees will be removed as a result of the Project. Therefore, no measures are warranted.

Significance: No significance.

6.6 - Adopted or Approved Plans

The proposed project would have a significant effect on biological resources if it would:

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan.

The Project is not within an area covered by any HCP. No Project impacts related to adopted or approved plans would occur, and no measures are warranted.

Significance: No significance.

SECTION 7 - LIMITATIONS, ASSUMPTIONS, AND USE RELIANCE

This Biological Analysis Report has been performed in accordance with professionally accepted biological investigation practices conducted at this time and in this geographic area. The findings and opinions conveyed in this report are based upon on-site field examinations, jurisdictional areas, and specified historical and literature sources. The biological investigation is limited by the scope of work performed. Biological surveys conducted as part of this assessment may not have been performed during a particular blooming period, nesting period, or particular portion of the season when positive identification of certain taxa would be expected if present, and therefore cannot be considered definitive. The biological surveys are limited also by the environmental conditions present at the time of the surveys. In addition, general biological (or protocol) surveys do not guarantee that the organisms are not present and will not be discovered in the future within the site. In particular, mobile animal species could occupy the site on a transient basis or re-establish populations in the future. No other guarantees or warranties, expressed or implied, are provided.

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APPENDIX A

REGULATORY SETTING

Regulatory Setting

Federal Laws and Regulations

FEDERAL ENDANGERED SPECIES ACT OF 1973 (USC, TITLE 16, SECTIONS 1531 -1543)

The federal Endangered Species Act (FESA) and subsequent amendments provide guidance for the conservation of endangered and threatened species and the ecosystems upon which they depend. The FESA defines species as threatened or endangered and provides regulatory protection for listed species. The FESA provides a program for the conservation and recovery of threatened and endangered species as well as the protection of designated critical habitat that USFWS determines is required for the survival and recovery of listed species.

Section 9 lists actions that are prohibited under the FESA. Although take of a listed species is prohibited, it is allowed when it is incidental to an otherwise legal activity. Section 9 prohibits take of listed species of fish, wildlife, and plants without special exemption. The definition of "harm" includes significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns related to breeding, feeding, or shelter. "Harass" is defined as actions that create the likelihood of injury to listed species by disrupting normal behavioral patterns related to breeding, feeding, and shelter significantly.

Section 7 of the FESA requires federal agencies, in consultation with and assistance from the Secretary of the Interior or the Secretary of Commerce, as appropriate, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction of adverse modification of critical habitat for these species. The USFWS and National Marine Fisheries Service (NMFS) share responsibilities for administering the FESA. Regulations governing interagency cooperation under Section 7 are found in California Code of Regulations (CCR) Title 50, Part 402. If an activity could result in "take" of a listed species as an incident of an otherwise lawful activity, then a biological opinion can be issued with an incidental take statement that exempts the activity from FESA's take prohibitions.

Section 10 provides a means whereby a nonfederal action with the potential to result in take of a listed species can be allowed under an incidental take permit. Application procedures are found at CFR Title 50, Sections 13 and 17 for species under the jurisdiction of USFWS and CFR, Title 50, Sections 217, 220, and 222 for species under the jurisdiction of NMFS. Section 10 would apply to the Project if take of a species (as defined in Section 9) were determined to occur.

Section 4(a)(3) and (b)(2) of the FESA requires the designation of critical habitat to the maximum extent possible and prudent based on the best available scientific data and after considering the economic impacts of any designations. Critical habitat is defined in section 3(5)(A) of the FESA: 1) areas within the geographic range of a species that are occupied by individuals of that species and contain the primary constituent elements (physical and biological features) essential to the conservation of the species, thus warranting special

management consideration or protection; and 2) areas outside of the geographic range of a species at the time of listing but that are considered essential to the conservation of the species.

MIGRATORY BIRD TREATY ACT (USC, TITLE 16, SECTIONS 703 - 711)

The MBTA, first enacted in 1918, is a series of treaties that the United State has with Great Britain (on behalf of Canada), Mexico, Japan, and the former Soviet Union that provide for international migratory bird protection. The MBTA authorizes the Secretary of the Interior to regulate the taking of migratory birds. The act provides that it shall be unlawful, except as permitted by regulations, "to pursue, take, or kill any migratory bird, or any part, nest or egg of any such bird" (U.S. Code Title 16, Section 703). The MBTA currently includes several hundred species and includes all native birds.

BALD AND GOLDEN EAGLE PROTECTION ACT OF 1940 (USC, TITLE 16, SECTION 668)

The Bald and Golden Eagle Protection Act (BGEPA) of 1940 protects bald eagles (*Haliaeetus leucoephalus*) and golden eagle (*Aquila chrysaetos*) by prohibiting the taking, possession, and commerce of these species and established civil penalties for violation of this act. Take of bald and golden eagles includes to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." To disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially inferring with normal breeding, feeding, or sheltering behavior. (Federal Register [FR], volume 72, page 31132; 50 CFR 22.3).

FEDERAL CLEAN WATER ACT (USC, TITLE 33, SECTIONS 1521 - 1376)

The Federal Clean Water Act (CWA) provides guidance for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Section 401 requires that a Project applicant that is pursuing a federal license or permit allowing a discharge to waters of the U.S. to obtain State Certification of Water Quality, thereby ensuring that the discharge will comply with provisions of the CWA. The Regional Water Quality Control Board (RWQCB) administers the certification program in California. Section 402 establishes a permitting system for the discharge of any pollutant (except dredged or fill material) into waters of the U.S. Section 404 establishes a permit program administered by the United States Army Corps of Engineers (USACE) that regulates the discharge of the dredged or fill material into waters of the U.S., including wetlands. The USACA implementing regulations are found in CFR, Title 33, Sections 320 and 330. Guidelines for implementation are referred to as the Section 404(b)(1) Guidelines, which were developed by the United States Environmental Protection Agency (EPA) in conjunction with USACE (40 CFR 230). The guidelines allow the discharge of dredged or fill material into the aquatic system only if there is no practicable alternative that would have less adverse impacts.

Applicable State Laws and Regulations

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CALIFORNIA PUBLIC RESOURCES CODE, SECTIONS 21000 - 21178, AND TITLE 14 CCR, SECTION 753, AND CHAPTER 3, SECTIONS *15000 - 15387)*

The California Environmental Quality Act (CEQA) is California's broadest environmental law. CEQA helps guide the issuance of permits and approval of projects. Courts have interpreted CEQA to afford the fullest protection of the environment within the reasonable scope of the statutes. CEQA applies to all discretionary projects proposed to be conducted or approved by a State, County, or City agency, including private projects requiring discretionary government approval.

The purpose of CEQA is to disclose to the public the significant environmental effects of a proposed discretionary project; prevent or minimize damage to the environment through development of project alternatives, mitigation measures, and mitigation monitoring; disclose to the public the agency decision making process to approve discretionary projects; enhance public participation in the environmental review process; and improve interagency coordination.

State CEQA Guidelines Section 15380(b) provides that a species not listed on the federal or State list of protected species nonetheless may be considered rare or endangered for purposed of CEQA if the species can be shown to meet certain specified criteria. These criteria have been modeled after the definition in FESA and the section of the California Fish and Game Code dealing with rare or endangered plants or animals.

CALIFORNIA ENDANGERED SPECIES ACT (CALIFORNIA FISH AND GAME CODE SECTION 2050 ET SEQ.)

The California Endangered Species Act (CESA) establishes the policy of the State to conserve, protect, restore, and enhance threatened or endangered species and their habitats. The CESA mandates that State agencies should not approve Projects that would jeopardize the continued existence of threatened or endangered species if reasonable and prudent alternatives are available that would avoid jeopardy. For Projects that would result in take of a species listed under the CESA, a project proponent would need to obtain a take permit under Section 2081(b). Alternatively, the CDFW has the option of issuing a Consistency Determination (Section 2080.1) for Projects that would affect a species listed under both the CESA and the FESA, as long as compliance with the FESA would satisfy the "fully mitigate" standard of CESA, and other applicable conditions.

PORTER-COLOGNE WATER QUALITY CONTROL ACT

Under Section 401 of the CWA, the RWQCB must certify that actions receiving authorization under Section 404 of the CWA also meet State water quality standards. The RWQCB regulates waters of the State under the authority of the Porter-Cologne Water Quality Control Act (Porter Cologne Act). The RWQCB requires Projects to avoid impacts to wetlands whenever feasible and requires that Projects do not result in a net loss of wetland acreage or a net loss

of wetland function and values. The RWQCB typically requires compensatory mitigation for impacts to wetlands and/or waters of the State. The RWQCB has jurisdiction over waters deemed 'isolated' or not subject to Section 404 jurisdiction under the Solid Waste Agency of Northern Cook County (SWANCC) decision. Dredging, filling, or excavation of isolated waters constitutes a discharge of waste into waters of the State, and such discharges are authorized through an Order of Waste Discharge (or waiver of discharge) from the RWQCB.

VARIOUS SECTIONS OF THE CALIFORNIA STATE AND FISH AND GAME CODE

Section 460 and Sections 4000-4003

Chapter 5 of the California Fish and Game Code (FGC) describes regulations concerning the take of furbearing mammals, including defining methods of take, seasons of take, bag and possession limits, and areas of the State where take is allowed. Section 4000-4003 defines furbearing mammals, and the issuance of permits by the Department. Sections 460 and 4000 identifies fisher, marten, river otter, desert kit fox and red fox as furbearing mammals, and Section 460 prohibits take of these species at any time. This section of the California Fish and Game Code (FGC) has historically been interpreted to apply to restriction on furbearer trapping permit but has recently been expanded by CDFW to apply to any forms of take and treated as if these species were listed under CESA.

Sections 1600 through 1616

Under these sections of the FGC, a Project operator is required to notify CDFW prior to any Project that would divert, obstruct, or change the natural flow, bed, channel, or bank of any river, stream, or lake. Pursuant to the California Code of Regulations, a "stream" is defined as a body of water that flows at least periodically, or intermittently, through a bed or channel having banks and supporting fish or other aquatic life. Based on this definition, a watercourse with surface or subsurface flows that supports of has supported riparian vegetation is a stream and is subject to CDFW jurisdiction. Altered or artificial watercourses valuable to fish and wildlife are subject to CDFW jurisdiction. CDFW also has jurisdiction over dry washes that carry water during storm events. Preliminary notification and Project review generally occur during the environmental process. When an existing fish or wildlife resource may be substantially adversely affected, CDFW is required to propose reasonable Project changes to protect the resource. These modifications are formalized in a Streambed Alteration Agreement.

Sections 3511, 4700, 5050, and 5515

The protection of fully protected species are described in Sections 3511, 4700, 5050, and 5515 of the FGC. These statues prohibit take or possession of fully protected species. CDFW is unable to authorize incidental take of fully protected species, except as allowed for in an approved Natural Communities Conservation Plan (NCCP), or through direct legislative action.

Sections 1900 through 1913 - Native Plant Protection Act

California's Native Plant Protection Act (CNPA) requires all State agencies to use their authority to carry out programs to conserve endangered and rare native plants. Provision of the NPPA prohibit that taking of listed plants from the wild and require notification of CDFW at least ten days in advance of any change in land use. This allows CDFW to salvage listed plant species that otherwise would be destroyed. A Project proponent is required to conduct botanical inventories and consult with CDFW during Project planning to comply with the provisions of this act and sections of CEQA that apply to rare or endangered plants.

Local and Regional Laws, Regulations, and Policies

TUOLUMNE COUNTY GENERAL PLAN

The Tuolumne County General Plan (2018) has a Natural Resources Element which combines the traditional conservation and open space elements that are more common in general plans. This Element addresses the conservation, development, and utilization of natural resources, as well as identify land that should remain unimproved for the purpose of preservation of natural resources. Natural resources considered in the Element include forests, soils, fisheries, wildlife, plants, energy, minerals, and viewsheds.

There is also a Water Supply Element that addresses water resources and associated habitat and their protection.

Aspects of these Elements that are relevant to biological resources, including waters and wetlands, are summarized below in Tables A-1 and A-2.

Table A-1
Chapter 14 – Water Supply Element

Goal	
Goal 14C:	Protect and improve the quality and quantity of the County's water resources, while protecting the rights of landowners.
Policies	
Policy 14.C.4	Encourage the conservation of water resources in a systematic manner that is sensitive to the maintenance of water quality, natural capacities, ecological values, and consideration of the many water related needs of the County.
Policy 14.C.6	Recognize that the decisions made by the County of Tuolumne concerning water resources have an effect on water supply needs for all beneficial uses of water consistent with the California Water Code, including, but not limited to, domestic, municipal, agricultural and

	industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.
Policy 14.C.7	Recognize that clean water is essential to the public health, safety and welfare, fosters economic development and job creation, protects the environment, maintains fish and wildlife, and supports recreation.
Policy 14.C.9	Promote improved watershed health, improved water quality and water quantity yields of the watersheds in Tuolumne County.
Implementation Measures	
Measure 14.C.e:	Update the Tuolumne County Water Quality Plan, subject to receiving funding, to facilitate a consistent, fair and cost-effective approach to water resource mitigation and encourage and support the restoration of degraded riparian areas through public education programs demonstrating the value of healthy riparian habitats in protecting water quality, and provide for permit streamlining while conserving important water resources.
Measure 14.C.g:	Continue to consult with local public water agencies to determine that water supplies and delivery systems can meet the demands of the anticipated new development and population growth of the County. In accordance with Section 65352.5 of the California Government Code, the General Plan Land Use Diagrams were formulated in consultation with the applicable urban water management plans from these agencies and any amendments to those diagrams shall be reviewed in consultation with the respective public water agency serving the parcel or parcels affected by the proposed amendment.
Measure 14.C.i:	Promote the development of plans for watershed rehabilitation projects which provide for such watershed improvements as: • A reduction in the presence of contaminants in drinking water by addressing the origins and treatment of the contaminants, including, to the maximum extent practicable, the specific activities that affect the drinking water supply of a community or communities. • An increase in the quantity of water available from the watershed. • The improvement, restoration, or enhancement of fisheries habitat, including riparian habitat, in and along streams and watercourses in the watershed. These projects may address factors which increase

	sedimentation in streams and watercourses in the watershed. • The improvement of overall forest health, including the reduction of factors which may contribute to the severity of wildfires in the watershed.
Measure 14.C.k	Cooperate and consult with Federal, State and local agencies, such as the Tuolumne County Water Agency, in promoting the stewardship of the watersheds within the County. Consult with these agencies to avoid duplication of effort and to maximize use of public resources in working towards a common goal of improving the watersheds within Tuolumne County which will, in turn, contribute to the State and Federal objective of providing long-term Bay-Delta recovery and protection.

Table A-2
Chapter 16 – Natural Resources Element

Goal	
Goal 16A:	Balance property rights with the conservation of the environment and rural character of the County, which contributes to the quality of life of residents, encourages tourism and supports economic development.
Policies	
Policy 16.A.6	Encourage the protection of clusters of native trees and vegetation and outstanding individual native and non-native trees which help define the character of Tuolumne County.
Policy 14.C.6	Recognize that the decisions made by the County of Tuolumne concerning water resources have an effect on water supply needs for all beneficial uses of water consistent with the California Water Code, including, but not limited to, domestic, municipal, agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves.
Policy 14.C.7	Recognize that clean water is essential to the public health, safety and welfare, fosters economic development and job creation, protects the environment, maintains fish and wildlife, and supports recreation.
Policy 14.C.9	Promote improved watershed health, improved water quality and water quantity yields of the watersheds in Tuolumne County.
Implementation Measures	

Measure 14.C.e:	Update the Tuolumne County Water Quality Plan, subject to receiving funding, to facilitate a consistent, fair and cost-effective approach to water resource mitigation and encourage and support the restoration of degraded riparian areas through public education programs demonstrating the value of healthy riparian habitats in protecting water quality, and provide for permit streamlining while conserving important water resources.
Measure 14.C.g:	Continue to consult with local public water agencies to determine that water supplies and delivery systems can meet the demands of the anticipated new development and population growth of the County. In accordance with Section 65352.5 of the California Government Code, the General Plan Land Use Diagrams were formulated in consultation with the applicable urban water management plans from these agencies and any amendments to those diagrams shall be reviewed in consultation with the respective public water agency serving the parcel or parcels affected by the proposed amendment.
Measure 14.C.i:	Promote the development of plans for watershed rehabilitation projects which provide for such watershed improvements as: • A reduction in the presence of contaminants in drinking water by addressing the origins and treatment of the contaminants, including, to the maximum extent practicable, the specific activities that affect the drinking water supply of a community or communities. • An increase in the quantity of water available from the watershed. • The improvement, restoration, or enhancement of fisheries habitat, including riparian habitat, in and along streams and watercourses in the watershed. These projects may address factors which increase sedimentation in streams and watercourses in the watershed. • The improvement of overall forest health, including the reduction of factors which may contribute to the severity of wildfires in the watershed.
Measure 14.C.k	Cooperate and consult with Federal, State and local agencies, such as the Tuolumne County Water Agency, in promoting the stewardship of the watersheds within the County. Consult with these agencies to avoid duplication of effort and to maximize use of public resources in working towards a common goal of improving the watersheds within Tuolumne County which will, in turn, contribute to

	the State and Federal objective of providing long-term Bay-Delta recovery and protection.
Measure 14.C.l	Support the Tuolumne County Resource Conservation District in its efforts to improve watersheds within Tuolumne County, including stream water quality sampling, which can assist agencies where to direct their efforts.
Measure 16.A.k	Establish an incentive program to retain existing vegetation, such as Heritage Trees, stands of oak woodlands, or clusters of native shrubs within new development
Measure 16.A.l.	Maintain the Premature Removal of Native Oak Trees Ordinance.
Measure 16.A.m.	Establish a Heritage Tree Program which: • Establishes criteria for identifying individual or groves of native and non-native trees and street trees as heritage trees, based on outstanding scenic, historic or biological value and/or the status of the tree as unique in terms of age and/or size when compared to other trees of the same species. Trees considered local landmarks and those contained in the National Register of Big Trees also should be considered as heritage trees. • Creates programs encouraging the preservation of heritage trees including recognition and public education programs and participation in inter-county and interstate competitions. • Addresses health and safety issues associated with trees located adjacent to local airports.

Goal	
Goal 16B:	Support the diversity and quality of biological resources while balancing the needs of public use and private property rights.
Policies	
Policy 16.B.1	Recognize and map the variety of open space types and areas that are located within the County, including natural resources, recreation areas, geologic hazards, floodplains, groundwater recharge areas, managed resource areas and other open areas that support biological resources.

Policy 16.B.2	Recognize that agricultural and timberlands may be compatible with conservation of biological resources.
Policy 16.B.4	Recognize that wildlife, fish and their habitats provide opportunities for recreational uses and educational pursuits and are a source of revenue to the County.
Policy 16.B.5	Evaluate and mitigate impacts to biological resources in accordance with the requirements of State and Federal law.
Policy 16.B.6	Allow property owners to utilize the Tuolumne County Wildlife Handbook, which may be updated periodically, to assist in designing mitigation for impacts to biological resources resulting from new development
Policy 16.B.7	Encourage development in identified communities to minimize impacts to biological resources.
Policy 16.B.8	Balance the conservation of biological resources with the need to reduce wildland fire hazards.
Policy 16.B.9	Encourage the eradication of invasive plant species to protect native habitats, conserve agricultural land, support ecological diversity and reduce the wildland fire hazard.
Policy 16.B.10	Encourage planting of native species or other drought tolerant species.
Policy 16.B.11	Expand the list of permitted uses in the Open Space-1 zoning district in Title 17 of the Tuolumne
Policy 16.C.1	Develop a Natural Resources Division in the Community Resources Agency to centralize County efforts and involvement in issues and projects involving natural resources.
Policy 16.C.2	Develop incentive programs to encourage private property owners to conserve areas that support high value biological resources.
Policy 16.C.3	Support efforts to identify and protect high value biological resource areas on private lands from willing owners, especially on land that provides additional public benefits including educational, recreational and scenic opportunities.
Policy 16.C.4	Support educational programs that describe methods of habitat conservation, encourage voluntary efforts to protect and enhance biological resources, provide opportunities for ongoing study by local students, and provide opportunities for recreation and enjoyment by the community.

Policy 16.C.5	Encourage the conservation of oak woodlands and the preservation of heritage trees.

Implementation Programs	
Measure 16.B.2	16.B.a - Recognize that the open area provided by land designated as Agricultural or Timber Production on the General Plan land use diagrams that supports an agricultural, timber management or residential land use or is unimproved may be used to provide on-site or off-site mitigation for development projects, such as conservation easements, mitigation banks for plant and wildlife species impacts, and other in perpetuity mitigation options. streamlining while conserving important water resources.
Measure 16.B.4:	16.B.b - Encourage the preservation of open areas for recreational activities, including provision of an appropriate balance of facilities suitable for intensive use (e.g. playgrounds, sports fields) and low intensity use (e.g., hiking, camping) that meet the needs of residents and visitors. Preservation of open areas that provide cultural, historical and educational opportunities for residents and visitors should also be encouraged. 16.B.c - Allow trails, other recreational uses and educational pursuits in areas conserved for biological resources if the effects of such uses are determined to be compatible with conservation of the resources. 16.B.d - Design parks and trails incorporating scenic resources and biological and water resource areas consistent with the goals and policies of this Element of the General Plan. (formerly 8.C.3) 16.B.e - Review all revisions of the Recreation Master Plan prior to adoption for consistency with this Element of the General Plan. In addition, design plans for all trails, especially those adjacent to creeks, shall require the input and review of the Tuolumne County Community Resources Agency and the California Department of Fish and Wildlife for consistency with this Element. (formerly 8.C.c) 16.B.f - To provide recreational use in water resource areas, continue to conditionally permit, in the O (Open Space) and O-1 (Open Space -1) zoning districts, recreational uses where such uses do not adversely impact water resources, such as beaches, picnic areas, non-motorized pedestrian and equestrian trails and other recreational uses.

Measure 16.B.g:	16.B.g - Maintain the Tuolumne County Wildlife Maps to assist in evaluating the effects of land development projects. 16.B.h - Provide the following information to assist in the evaluation of biological resources: - Tuolumne County Wildlife Maps - Deer Herd Maps and Management Plans - California Wildlife Habitat Relationships habitat typing and mapping - U.S. Department of Agriculture Forest Service Calveg mapping data - 16.B.i - Require development that is subject to a discretionary entitlement from the County and to environmental review under the California Environmental Quality Act (CEQA) to evaluate potential impacts to biological resources and mitigate significant impacts for the following or as otherwise required by State or Federal law: - species listed or proposed for listing as threatened, rare, or endangered under the federal Endangered Species Act (ESA) or California Endangered Species Act (CESA); - species considered as candidates for listing under the ESA or CESA; - wildlife species designated by CDFW as Species of Special Concern; - animals fully protected under the California Fish and Game Code; and - plants considered by CDFW to be "rare, threatened, or endangered in California" (California Rare Plant Ranks [CRPR] of 1A, presumed extinct in California and not known to occur elsewhere; 1B, considered rare or endangered in California and elsewhere; 2A, presumed extinct in California, but more common elsewhere and 2B, considered rare or endangered in California but more common elsewhere). - Sensitive natural communities, including wetlands under Federal or State jurisdiction, other aquatic resources, riparian habitats, and valley oak (*Quercus lobata*) woodland. - Important wildlife movement corridors and breeding sites. - Oak woodlands, as provided in Implementation Program 16.B.j.

	16.B.j - Establish thresholds of significance under the California Environmental Quality Act (CEQA) for the conversion of oak woodlands in Tuolumne County. The following provides the County's recommended standard guidelines for determining whether a project may result in a significant impact to oak woodlands, for purposes of review under the California Environmental Quality Act and Public Resources Code Section 21083.4. • An oak woodland is defined in the General Plan as a woodland stand with 10% or greater native oak canopy cover. Tree removal from parcels with less than 10% native oak canopy cover is not considered a significant conversion or loss of oak woodland. • For parcels with 10% or greater native oak canopy cover (i.e., parcels with oak woodland, as defined in the General Plan), a significant impact to oak woodland includes tree removal that reduces the total oak canopy cover onsite to below 10% (i.e., conversion to non-oak woodland), or a loss of 10% or greater of oak canopy woodland stand on the parcel, if the conversion or loss is determined to be substantial in consideration of, but not limited to, the following: -Total acres and amount of woodland stand removed or disturbed, and amount retained onsite. -Pattern of development or habitat loss onsite (e.g., clustered vs. dispersed). -Existing habitat functions and quality (e.g., intact/high-quality, moderately degraded, or severely degraded). -Stand age- or size-class structure. -Rarity. -Landscape position in relation to larger wildlife corridors, stream systems, or other important natural features. -Loss of valley oak (*Quercus lobata*) woodland, which is a sensitive habitat. -Proximity to other oak woodland patches and connectivity to large blocks of intact habitat. -Contribution to a cumulative loss, degradation, or fragmentation of oak woodland across the County.
	Periodically update the Tuolumne County Wildlife Handbook in accordance with changes in State and Federal laws and environmental review standards, recognizing that state and federal laws may require mitigation beyond what is adopted in the Wildlife Handbook.
Measure 16.B.l	Evaluate, on a project by project basis, the appropriateness of exempting projects in identified communities from

	Implementation Program 16.B.j to encourage development in identified communities to minimize impacts to biological resources.
Measure 16.B.m	When evaluating land development projects proposed in identified communities, recognize that there may be reduced impacts to biological resources from concentrating new development within identified communities.
Measure 16.B.n	Conserve areas, such as wildlife habitat and corridors, wetlands, watersheds, and groundwater recharge areas, that provide carbon sequestration benefits and other biological functions.
Measure 16.B.o	Within identified communities, retain oak woodland habitat as much as practical, such as incorporating oak woodland into landscaped or public spaces to enhance project site aesthetics, using oak woodland as visual buffers between land uses, and using oak woodland habitat to maintain slopes and reduce on-site runoff.
Measure 16.B.p	Encourage vegetation removal for fire protection purposes or as otherwise required by the Tuolumne County Fire Department in the Open Space zoning district or other areas conserved through zoning, provided such vegetation removal is addressed in a management plan and approved following review under the California Environmental Quality Act.
Measure 16.B.q	Discourage the sale of invasive plant species and noxious weeds identified by the State. (formerly 6.J.q)
Measure 16.B.r	Support efforts to control, and where possible, eradicate, invasive plant species in the County. (formerly 6.J.p)
Measure 16.B.s	Seek grant and other funding sources for programs to eradicate invasive plant species from the County.
Measure 16.B.	Refer applications for discretionary land development entitlements to the Agricultural Commissioner to identify potential impacts from invasive plant species and recommend appropriate mitigation measures.
Measure 16.B.u	Encourage eradication of invasive plant species in biological resource conservation areas provided such eradication is addressed in a management plan prepared by a biologist on the County's list of approved environmental consultants and approved by the County following review under the California Environmental Quality Act.
Measure 16.B.v	Develop a programmatic approach to vegetation removal for the eradication of invasive plant species.

Measure 16.B.w	Develop an incentive program to encourage the eradication of invasive plant species and the removal of vegetation for fire protection.
Measure 16.B.x	Encourage the use of native species and other drought tolerant species listed on the Tuolumne County Landscape Guidelines to promote water efficiency and reduce impacts associated with the introduction of exotic species. Policy
Measure 16.C.a	Create a voluntary register of high value biological resources, such as habitat for rare, threatened and endangered species; habitats that are particularly valuable to wildlife and/or rare in the County; and undisturbed oak woodlands. Listing on the register shall only occur at the request of the property owner. Prior to listing an area on the register, the area shall be surveyed by County Staff or a biologist on the County's list of approved environmental consultants to verify the value of the biological resources thereon. Surveys conducted on private property shall occur only with prior written permission from the property owner. The register would assist in implementing voluntary preservation efforts, assist in reducing the cost of new development associated with identifying biological resources and identifying areas which may be acquired and/or managed as off-site areas to mitigate impacts of new development. Lands listed on the register may qualify the owner for incentive programs, be acquired from willing sellers, or be managed in cooperation with willing property owners. Oak woodlands listed on the register could be purchased by the County or co
Measure 16.C.b	Identify agencies to accept and/or manage land dedications, donations and conservation easements.
Measure 16.C.c	Notify owners of high value biological resources of available incentive programs including tax incentives and the California Forest Stewardship Program.
Measure 16.C.d	Assist willing property owners to enter into conservation programs through coordination with outside stewardship programs and accessing financing programs to conserve biological resources.
Measure 16.C.e	Apply for grants from local, state and federal sources to assist in funding the acquisition of high value biological resources, such as habitat for rare, threatened and endangered species, habitats that are particularly valuable to wildlife and/or rare in the County, and undisturbed oak woodlands.
Measure 16.C.f	Protect biodiversity and habitats from climate change effects by cooperating with other agencies to acquire or

	otherwise protect open space areas that provide key habitat linkages and wildlife movement corridors on a regional level.
Measure 16.C.g	Plant native trees throughout Tuolumne County.
Measure 16.C.h	Make the Tuolumne County Oak Woodland Voluntary Management Guidelines available to property owners upon request to assist them with voluntary conservation of oak woodlands.
Measure 16.C.i	Cooperate with agencies and entities in their efforts to encourage voluntary stewardship of tree resources including: • Providing brochures, produced by these and other interested agencies, illustrating protection methods for construction near native trees. • Distributing handouts promoting the retention of tree quality and quantity throughout the County by providing guidelines for replacing native trees removed during construction, including size and quantity. • Promoting elementary and secondary school programs providing education on the benefits of native trees and including acorn and tree planting programs

APPENDIX B

REPRESENTATIVE PHOTOGRAPHS



Photograph 1: Eastern end of Segment 1, facing south.
GPS: 38.045216, -120.231158
Photograph taken by Karissa Denney on September 15, 2021.



Photograph 2: Center of Segment 2, facing southeast.
GPS: 38.044371, -120.232730.
Photograph taken by Shannon Gleason on September 15, 2021.



Photograph 3: Center of Segment 3, facing northeast.
GPS: 38.034249, -120.234862,
Photograph taken by Karissa Denney on September 15, 2021.



Photograph 4: East end of Segment 4, facing southwest.
GPS: 38.032352, -120.238222,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 5: Intersection of Golf Club Drive and Lakeview Drive, north side of Segment 5, facing south.
GPS: 38.030799, -120.242962,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 6: Southern edge of Segment 5 along bank of Twain Harte Lake, facing northeast.
GPS: 38.028133, -120.242508,
Photograph taken by Shannon Gleason on September 15, 2021



Photograph 7: Center of Segment 6, facing southwest.
GPS: 38.031056, -120.236816,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 8: Southern end of Segment 7, facing northeast.
GPS: 38.031004, -120.235351,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 9: Midsection of Segment 8, facing south.
GPS: 38.032617, -120.232906,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 10: Midsection of Segment 8, facing southwest.
GPS: 38.032948, -120.230647,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 11: Midsection of Segment 9, facing west.
GPS: 38.040445, -120.230647,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 12: Southern end of Segment 9, facing west.
GPS: 38.039236, -120.230396,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 13: Southeastern end of Segment 10, facing northeast.
GPS: 38.039236, -120.230396,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 14: East end of Segment 11, facing south.
GPS: 38.038225, -120.233580,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 15: Southern end of Segment 12, facing north.
GPS: 38.035818, -120.235401,
Photograph taken by Karissa Denney on September 15, 2021



Photograph 16: Riparian habitat and pooled water along the unnamed creek at the northern edge of Segment 6, facing northeast.
GPS: 38.032383, -120.235712,
Photograph taken by Shannon Gleason on September 15, 2021

APPENDIX C

PLANT AND ANIMAL SPECIES OBSERVED WITHIN THE BIOLOGICAL STUDY AREA

Table C-1
Plant Species Observed within the Biological Study Area on September 15, 2021
Twain Harte Sewer Pipeline Improvements Project, Tuolumne County, California

Scientific Name	Common Name	Listing Status	Regional Status
Trees			
Acer negundo	boxelder	None	Native
Aesculus californica	California buckeye	None	Native
Arbutus menziesii	Pacific madrone	None	Native
Calocedrus decurrens	incense cedar	None	Native
Cornus nuttallii	Pacific dogwood	None	Native
Juglans californica	California black walnut	None	Native
Malus domestica	apple	None	Introduced
Notholithocarpus densiflorus	tanoak	None	Native
Pinus jeffreyi	Jeffrey pine	None	Native
Pinus ponderosa	ponderosa pine	None	Native
Platanus racemosa	California sycamore	None	Native
Populus fremontii	cottonwood	None	Native
Quercus chrysolepis	canyon live oak	None	Native
Quercus kelloggii	California black oak	None	Native
Quercus wislizeni	interior live oak	None	Native
Salix laevigata	red willow	None	Native
Salix lasiolepis	arroyo willow	None	Native
Sequoia sempervirens	coast redwood	None	Introduced
Shrubs & Vines			
Actostaphylos viscida	whiteleaf manzanita	None	Native
Genista monspessulana	French broom	None; Cal-IPC: High	Introduced
Hedera helix	english ivy	None; Cal-IPC: High	Introduced
Hypericum calycinum	St. John's wort	None	Introduced
Ilex aquifolium	holly	None; Cal-IPC: Limited	Introduced
Rubus armeniacus	Himalayan blackberry	None	Introduced
Spartium junceum	Spanish broom	None; Cal-IPC: High	Introduced
Spiraea cantoniensis	Reeve's spiraea	None	Introduced
Toxicodendron diversilobum	poison oak	None	Native
Vitis californica	California grape	None	Native
Herbs			
Artemesia douglasiana	California mugwort	None	Native
Bidens frondosa	devil's beggartick	None	Native
Capsella bursa-pastoris	shepherd's purse	None	Introduced
Centaurea solstitialis	yellow starthistle	None; Cal-IPC: High	Introduced
Cirsium vulgare	bull thistle	None; Cal-IPC: Moderate	Introduced
Epilobium ciliatum	slender willowherb	None	Native
Erythranthe guttata	yellow monkeyflower	None	Native

Hirschfeldia incana	shortpod mustard	None; Cal-IPC: Moderate	Introduced
Lactuca saligna	willowleaf lettuce	None	Introduced
Lactuca serriola	prickly lettuce	None	Introduced
Lathyrus latifolius	perennial pea	None; Cal-IPC: Watch	Introduced
Ludwigia peploides	floating primrose willow	None; Cal-IPC: High	Introduced
Medicago lupulina	black medic	None	Introduced
Melilotus albus	white sweetclover	None	Introduced
Mentha spicata	spearmint	None	Introduced
Nasturtium officinale	watercress	None	Native
Plantago lanceolata	English plantain	None; Cal-IPC: Limited	Introduced
Polygonum aviculare	prostrate knotweed	None	Introduced
Pteridium aquilinum	bracken fern	None	Native
Rumex crispus	curly dock	None; Cal-IPC: Limited	Introduced
Solanum americanum	American black nightshade	None	Native
Stachys ajugoides	hedge nettle	None	Native
Tanacetum parthenium	feverfew	None	Introduced
Torilis arvensis	field hedge parsley	None; Cal-IPC: Moderate	Introduced
Trifolium hirtum	rose clover	None; Cal-IPC: Limited	Introduced
Verbascum thapsus	woolly mullein	None; Cal-IPC: Limited	Introduced
Veronica americana	American speedwell	None	Native
Grasses & Grass-like			
Avena sp.	wild oat	None; Cal-IPC: Moderate	Introduced
Bromus carinatus	California brome	None	Native
Bromus diandrus	ripgut brome	None; Cal-IPC: Moderate	Introduced
Bromus hordeaceus	soft brome	None; Cal-IPC: Limited	Introduced
Bromus madritensis ssp. *rubens*	red brome	None; Cal-IPC: High	Introduced
Cynodon dactylon	Bermuda grass	None; Cal-IPC: Moderate	Introduced
Cynosurus echinatus	dogtail grass	None; Cal-IPC: Moderate	Introduced
Cyperus eragrostis	tall flatsedge	None	Native
Dactylis glomerata	orchard grass	None; Cal-IPC: Limited	Introduced
Elymus glaucus	blue wildrye	None	Native
Eragrostis cilianensis	lovegrass	None	Introduced
Festuca sp.	fescue	N/A	N/A
Holcus lanatus	common velvet grass	None; Cal-IPC: Moderate	Introduced
Hordeum murinum	foxtail barley	None; Cal-IPC: Moderate	Introduced
Juncus effusus	common rush	None	Native
Panicum acuminatum	western panicgrass	None	Native
Typha latifolia	broadleaf cattail	None	Native

*Cal-IPC = California Invasive Plant Council.
Rating system: **High** = several ecological impacts; **Moderate** = substantial but not severe ecological impacts; **Limited** = minor ecological impacts or not enough information to justify higher score; **Alert** = species ranked as High or Moderate with limited distribution, but potential to spread; **Watch** = could pose a high risk of becoming invasive in the future.

Table C-2
Wildlife Species Observed within the Biological Study Area on September 15, 2021
Twain Harte Sewer Pipeline Improvements Project, Tuolumne County, California

Scientific Name	Common Name	Status	Native or Introduced
Birds			
Aix sponsa	wood duck	None	Native
Aphelocoma californica	California scrub jay	None	Native
Baeolophus inornatus	oak titmouse	None	Native
Buteo lineatus	red-shouldered hawk	None	Native
Callipepla californica	California quail	None	Native
Calypte anna	Anna's hummingbird	None	Native
Cathartes aura	turkey vulture	None	Native
Colaptes auratus	northern flicker	None	Native
Corvus corax	common raven	None	Native
Cyanocitta stelleri	Steller's jay	None	Native
Dryobates pubescens	downy woodpecker	None	Native
Euphagus cyanocephalus	Brewer's blackbird	None	Native
Melanerpes formicivorus	acorn woodpecker	None	Native
Poecile gambeli	mountain chickadee	None	Native
Sitta carolinensis	white-breasted nuthatch	None	Native
Mammals			
Canis familiaris	domestic dog	None	Introduced
Felis catus	domestic cat	None	Introduced
Odocoileus hemonius	black-tailed deer	None	Native
Otospermophilus beecheyi	California ground squirrel	None	Native
Sciurus gresius	western gray squirrel	None	Native

APPENDIX D

SPECIAL-STATUS SPECIES DATABASE SEARCH RESULTS

IPac query and 9 QUAD CNDDDB RESULTS

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
Phone: (916) 414-6600 Fax: (916) 414-6713

In Reply Refer To: September 11, 2021
Consultation Code: 08ESMF00-2021-SLI-2746
Event Code: 08ESMF00-2021-E-07996
Project Name: Twain Harte Sewer Upgrade Project

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, under the jurisdiction of the U.S. Fish and Wildlife Service (Service) that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Please follow the link below to see if your proposed project has the potential to affect other species or their habitats under the jurisdiction of the National Marine Fisheries Service:

http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to

utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

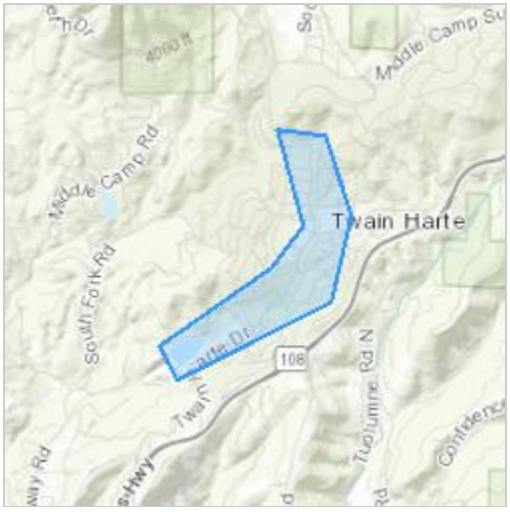
This species list is provided by:

Sacramento Fish And Wildlife Office
Federal Building
2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846
(916) 414-6600

Project Summary

Consultation Code: 08ESMF00-2021-SLI-2746
Event Code: Some(08ESMF00-2021-E-07996)
Project Name: Twain Harte Sewer Upgrade Project
Project Type: WASTEWATER PIPELINE
Project Description: Repairs to 9 stretches of buried sewer line.
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@38.03653145,-120.22981275625821,14z



Counties: Tuolumne County, California

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii*	Threatened

There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/2891

Fishes

NAME	STATUS
Delta Smelt *Hypomesus transpacificus*	Threatened

There is **final** critical habitat for this species. The location of the critical habitat is not available.
Species profile: https://ecos.fws.gov/ecp/species/321

Insects

NAME	STATUS
Monarch Butterfly *Danaus plexippus*	Candidate

No critical habitat has been designated for this species.
Species profile: https://ecos.fws.gov/ecp/species/9743

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Table D-1
Special-Status Plant Species in the Regional Vicinity of the Project Site
Twain Harte Sewer Pipeline Improvements Project, Tuolumne County, California

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
Sensitive Natural Communities				
Big Tree Forest	G3/S3.2	This community is very similar to Sierran Mixed Conifer forest but lacking more xeric species and with the conspicuous addition of the giant sequoia (*Sequoiadendron giganteum*), which grows up to about 100 meters tall and 12 meters DBH. Giant sequoias usually occur in discrete groves, usually intermixed with Sierran Mixed conifer forest; very isolated individual trees of this species rarely occur. Usually associated with abundant groundwater, often near springs, but rarely associated with major streams. Dependent on periodic fires for establishment of Sequoia seedlings. Other characteristic species include *Abies concolor, Calocedrus decurrens, Pinus lambertiana, P. ponderosa,* and *Pseudotsuga menziesii,*	No	No giant sequoia specimens were observed, and this sensitive natural community is not present.
Plants				
Allium tribracteatum three-bracted onion	-/- 1B.2/-	This is a perennial herb (bulb) that blooms from April to August. It occurs on volcanic slopes in yellow pine forest, red fir forest, and chaparral. It commonly occurs at elevations ranging from 4,265 to 6,233 feet and has been observed as high as 9,842 feet.	No	Suitable habitat is absent from the Project site, and the Project is below the accepted elevational range for the species.
Balsamorhiza macrolepis big-scale balsamroot	-/- 1B.2/-	This is a perennial herb that blooms from March to June. It occurs in chaparral, cismontane woodland, and valley and foothill grassland habitats and sometimes on serpentinite. It occurs at elevations ranging from approximately 147 to 5,101 feet and occurrences are scattered along lower foothill and mountain regions along the perimeter of the Sacramento Valley. This species is threatened by	No	Suitable habitat is absent from the Project site.

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
		grazing and potentially residential, recreational, and energy development.		
Botrychium crenulatum scalloped moonwort	-/- 2B.2/-	This is a perennial rhizomatous fern that does not produce flowers but produces spores June to September. It occurs in bogs, fens, meadows, seeps, marshes, and swamps, as well as lower and upper montane coniferous forests. It occurs at elevations ranging from approximately 4,160 to 10,761. This species is threatened by foot traffic, grazing, trampling, recreational activities, fuel reduction projects, road deconstruction, and vehicles.	No	Suitable habitat is absent from the Project site, and the Project is below the accepted elevational range for the species.
Botrychium minganense Mingan moonwort	-/- 2B.2/-	This is a perennial rhizomatous fern that does not produce flowers but produces spores from July to September. It occurs in bogs and fens, lower montane coniferous forest, meadows and seeps (edges), and upper montane coniferous forest habitats. It grows in mesic soils in open forests along streams or around seeps. It occurs at elevations ranging from approximately 4,773 to 7,152 feet. This species is threatened by grazing, trampling, fire, vehicles, habitat alteration, and logging and associated road usage.	No	Suitable habitat is absent from the Project site, and the Project is below the accepted elevational range for the species.
Clarkia australis Small's southern clarkia	-/- 1B.2/-	This is an annual herb that blooms from May to August. It occurs in cismontane woodland and lower montane coniferous forest. It grows in open, rocky sites in conifer forest or oak woodland. This species is endemic to California. It occurs at elevations ranging from approximately 2,625 to 6,810 feet. It is threatened by logging.	Yes	Suitable habitat is present within the BSA but not on the Project site. The nearest CNDDB occurrence overlaps the Project buffer and documents a population on a shaded hillside in 1965 (EONDX 18855)
Clarkia biloba ssp. *australis* Mariposa clarkia	-/- 1B.2/-	This is an annual herb that blooms from April to July. It occurs in serpentinite soils, and in chaparral and foothill woodlands sometimes with riparian areas as well as large talus rockslides. This species	Yes	Suitable habitat is present within the BSA but not on the Project site. The nearest CNDDB occurrence

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
		is endemic to California. It occurs at elevations ranging from approximately 980 to 4,790 feet. This species is threatened by road maintenance, foot traffic, and non-native plants.		is from 1958 and approximately 1.1 miles southeast of the Project (EONDX 91125). The next nearest occurrence is from 2008, where a large population was observed over multiple years along an OHV trail approximately 2.1 miles southeast of the Project (EONDX 110557).
Diplacus pulchellus yellow-lip pansy monkeyflower	-/- 1B.2/-	This is an annual herb that blooms from April to July. It occurs in vernally wet and often disturbed areas. It grows in clay, volcanic, or granitic soils. It occurs in lower montane coniferous forest, meadows and seeps. This species is endemic to California. It occurs at elevations ranging from approximately 1,970 to 6,565 feet. It is threatened by vehicles, logging, non-native plants, grazing, and potentially by development.	Yes	Suitable habitat is present in the BSA along the unnamed creek in Twain Harte, but not on the Project site. The nearest CNDDB occurrence overlaps the north side of the Project but is from 1944 and likely extirpated due to development (EONDX 56932). The next nearest occurrence is from 1971 and approximately 0.5 mile southeast of the Project (EONDX 76169).
Eryngium pinnatisectum Tuolumne button-celery	-/- 1B.2/-	This is an annual or perennial herb that blooms from May to August. It occurs in vernal pools and mesic conditions in cismontane woodland and lower montane coniferous forest. It occurs at elevations from approximately 230 to 3,000 feet. It is threatened by development, agriculture, grazing, and trampling. It has been recorded in western Sierra Nevada foothills and lower mountains in	No	The Project is at elevations outside of the accepted elevational range for the species.

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
		Tuolumne, Calaveras, Amador, and Sacramento counties. It also occurs in Sonoma County.		
Erythranthe marmorata Stanislaus monkeyflower	-/- 1B.1/-	This is an annual herb that blooms from March to May. It occurs in cismontane woodland, yellow pine forest, and lower montane coniferous forest habitats. It is endemic to California and occurs at elevations from approximately 330 to 2,955 feet.	No	The Project is at elevations outside of the accepted elevational range for the species.
Erythronium tuolumnense Tuolumne fawn lily	-/- 1B.2/-	This perennial herb (bulb) is endemic to California and blooms between March and June. It often occurs on clay soils and on cliffs and near drainages in broadleaf upland forests, cismontane woodland, lower montane coniferous forest, and chaparral habitats. It occurs at elevations between approximately 1,675 and 4,480 feet.	Yes	Suitable habitat is present within the BSA but not on the Project site. The nearest CNDDB occurrence is from 2003 and 1.7 miles northwest of the Project, on a steep north-facing slope above the South Fork Stanislaus River (EONDX 3378)
Horkelia parryi Parry's horkelia	-/- 1B.2/-	This is a perennial herb that blooms from April to September. It occurs in lone formation and other soils (has been observed in fuel breaks) in chaparral and cismontane woodland. It is endemic to California and occurs at elevations from approximately 260 to 3,510 feet. It is potentially threatened by clay mining, road maintenance, and erosion.	No	Suitable habitat is absent from the Project site.
Iris hartwegii ssp. *columbiana* Tuolumne iris	-/- 1B.2/-	This is a perennial herb (rhizomatous) that blooms from May to June. It occurs in dry slopes within yellow pine forest and foothill woodland. It is endemic to California and occurs at elevations from 1,770 to 4,595 feet.	Yes	Suitable habitat is present within the BSA but not on the Project site. The nearest CNDDB occurrence is from 2006 and approximately 2.8 miles northwest of the Project, in mixed oak-conifer forest (EONDX 97839).

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
Lomatium stebbinsii Stebbins' lomatium	-/- 1B.1/-	This is a perennial herb that blooms from March to May. It occurs in yellow pine forest and chaparral habitat on gravelly volcanic soil. It is endemic to California and occurs at elevations from 4,100 to 5,580 feet.	No	Suitable habitat is absent from the Project site, and the Project is below the accepted elevational range for the species.
Navarretia miwukensis Mi-Wuk navarretia	-/- 1B.2/-	This annual herb is endemic to California and blooms between May and August. It occurs in openings in lower montane coniferous forest, on pyroclastic soils and gently sloping terrain at elevations between approximately 2,625 and 4,920 feet. It is threatened by urbanization, vehicles and recreational activities, and spread of invasive species.	Yes	Suitable habitat is present within the BSA but not on the Project site. The nearest extant occurrence overlaps the south side of the Project, documenting a population observed above a road cut in 2014 (EONDX 115504).
Rhynchospora capitellata brownish beaked-rush	-/- 2B.2/-	This is a perennial herb that blooms from July to August. It occurs in mesic lower and upper montane coniferous forest, meadows and seeps, and marshes and swamps. It occurs at elevations from approximately 150 to 6,560 feet and is possibly threatened by grazing and development.	Yes	Suitable habitat is present within the BSA but not on the Project site. The nearest CNDDB occurrence is from 2014 and over 10 miles southeast of the Project (EONDX 113950).
Invertebrates				
Bombus crotchii Crotch bumble bee	-/SC -/-	This bee occurs in relatively warm and dry environments, including the inner Coast Range of California and the margins of the Mojave Desert. It inhabits grassland and scrub habitats, where it nests in abandoned rodent burrows, occasionally nesting above ground in tufts of grass, rock piles, or cavities in dead trees. This species is classified as a short-tongued species, whose food plants include *Asclepias, Chaenactis, Lupinus, Medicago, Phacelia,* and *Salvia*. The species is threatened by habitat loss and degradation, including agricultural intensification and rapid urbanization.	No	Suitable habitat is absent from the Project site.

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
Desmocerus californicus dimorphus valley elderberry longhorn beetle	FT/- -/-	This beetle species is closely associated with elderberry shrubs (*Sambucus* sp.) for food and reproduction. This species usually occur along rivers and streams and eggs are laid on the bark of elderberry shrubs and larvae hatch and burrow into the stems. Adults eat elderberry leaves and flowers. Stem diameter must be a minimum of one inch and exit holes in stems are the most common methods for identification. This species ranges from southern Shasta County to Fresno County.	No	No elderberry shrubs were observed, so suitable habitat is absent from the Project site.
Danaus plexippus Monarch – California overwintering population	FC/- -/-	This butterfly species occurs in various open habitats including fields, meadows, weedy areas, marshes, and roadsides. Adults make massive migrations from August to October, flying thousands of miles south to hibernate along the California coast and in central Mexico. Larvae feed on plants in the Milkweed family primarily Milkweeds (*Asclepias*), but also other genera including *Calotropis, Cynanchum, Gonolobus, Sarcostemma*, etc.; each butterfly lives from two to six weeks.	No	Suitable habitat is absent from the Project site.
Fish				
Lavinia symmetricus ssp. 1 San Joaquin roach	-/- -/SSC	The San Joaquin roach occurs within varying habitats from coastal streams to foothill streams. They prefer small, warm, intermittent streams with deep-bottomed pools, but they have also been found in cooler water streams, but populations have also been found in isolated pools. They are tolerant of high temperatures and low dissolved oxygen levels.	No	Suitable habitat is absent from the Project site.
Hypomesus transpacificus delta smelt	FT/- -/-	This is a small fish species endemic to the San Francisco Estuary and the larger Sacramento-San Joaquin Delta. It moves between freshwater and low salinity water throughout the year and most spawning happens in tidally influenced backwater sloughs and channel edgewaters. It occurs primarily	No	The Project is outside the known range of the species.

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
		in main water bodies and sloughs of the Delta and Suisun Bay and is not directly associated with small stream systems. This species historical distribution does not extend beyond Mossdale on the San Joaquin River and Sacramento on the Sacramento River.		
Amphibians				
Rana boylii foothill yellow-legged frog	-/SE -/SSC	This frog is found in streams and rivers with rocky substrates and open, sunny banks, and sometimes isolated pools, vegetation backwaters, and deep, shaded spring-fed pools. It is also found in forests, chaparral, and woodlands. It lays eggs on downstream side of rocks in shallow, slow-moving water. The current distribution includes north coast, northern Sierra Nevada, foothills of southern Sierra Nevada mountains (almost extinct). It occurs at elevations from sea level to 6,000 feet.	No	Suitable habitat is absent from the Project site.
Rana draytonii California red-legged frog	FT/- -/SSC	This species occurs primarily in and near ponds in forests, woodlands, grasslands, coastal scrub, and stream sides with plant cover, preferably with dense shrubby vegetation such as cattails and willows near deep water pools. This species occurs primarily at elevations ranging from sea level to 5,000 feet. Breeding habitat may be permanent or ephemeral and it estivates in animal burrows or other moist refuges when ephemeral habitat is dry. This frog is endemic to California and northern Baja California, found throughout coastal California from Mendocino County south. Its inland distribution includes northern Sacramento Valley and foothills of Sierra Nevada south to Tulare County (possibly Kern County).	No	Suitable habitat is absent from the Project site.
Reptiles				
Actinemys [=Emys] marmorata	-/-	This species is highly aquatic and diurnally active. It is found in ponds, lakes, rivers, streams, creeks,	No	Suitable habitat is absent from the Project site. The

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
western pond turtle		marshes, and irrigation ditches with vegetation and rocky or muddy bottoms in a wide variety of habitats. It needs basking areas near water (logs, rocks, vegetation mats, banks). This species may enter brackish water and even seawater and it digs a nest on land near water. It ranges from north of the San Francisco Bay area south, including the Central Valley.		man-made Twain Harte Lake does not contain any basking habitat, the banks are concrete-lined, and the lake is fenced, which would prevent the species from seeking upland nesting habitat.
Birds				
Accipiter gentilis northern goshawk	-/- -/SSC	This species prefers mature and old-growth forests with relatively high canopy closures. It favors large trees on moderate slopes with open understories for nesting. It builds nests in either coniferous, deciduous, or mixed-pine forests. It prefers to perch and scan for prey followed by quick bursts of speed to capture their prey.	Yes	Suitable foraging and nesting habitat is present in the vicinity of the Project. The nearest CNDDB occurrence is approximately 2.8 miles northeast of the Project, where a nest was observed in a stand of tall conifers between the Stanislaus River and Deer Creek in 1996 (EONDX 29760).
Agelaius tricolor tricolored blackbird	-/ST -/-	This species is a year-round resident that is a colonial breeder. It occurs in freshwater, emergent wetlands with tall, dense cattails or tule, but also thickets of willow, blackberry, wild rose, and tall herbs. Breeding colonies consist of a minimum of approximately 50 pairs. This species forages for mostly insects and spiders and less often seeds and cultivated grains in pastures, grain fields, cropland, and similar habitats near breeding areas.	No	Suitable foraging and nesting habitat is absent from the Project site.
Athene cunicularia burrowing owl	-/- -/SSC	This species occupies a variety of open, semi-arid to arid habitats throughout central and southern California, including desert regions. It prefers open habitats with few shrubs or trees and low-growing vegetation. It is most active around sunrise and	No	Suitable foraging and burrowing habitat is absent from the Project site.

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
		sunset and utilizes burrows constructed by mammals year-round for shelter and nesting. This species is well documented in urban areas where patches of undeveloped areas are present (e.g., canals, airports, drainage basins), and in areas of dense agricultural development, particularly where canals provide burrow habitat. It forages primarily for rodents and insects within several miles of its burrow, usually in open grassy habitats if available. It has been observed hunting bats and insects around parking lot lights. Threats to this species include development resulting in habitat loss/fragmentation.		
Haliaeetus leucocephalus bald eagle	-/SE -/SFP	This large raptor is a permanent resident, occurring in forested habitats near water. Nesting activity is restricted mainly in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity Counties in California, with additional scattered occurrences throughout the state, excepting the high Sierra Nevada. The species is a common winter migrant near inland waters in Southern California. It feeds primarily on fish, typically hunting from a perch on the water's margins. It will also wade into shallow waters in pursuit of fish, opportunistically take small mammals, and feed on carrion. Bald eagles nest in large, old-growth trees with open branches near open water, most often in the largest tree in a stand with less than 40% company.	No	Suitable foraging and nesting habitat is absent from the Project site.
Strix nebulosa great gray owl	-/SE -/-	This species is a rarely seen resident that typically occurs in old-growth red fir, mixed conifer, or lodgepole pine habitats, but can occur in a wide range of habitats and elevations and always in the vicinity of wet meadows. Generally, it occurs from 4,500 to 7,500 feet in the Sierra Nevada from the vicinity of Quincy, Plumas County south to the	No	Suitable foraging habitat is absent from the Project site, and the Project is below the accepted elevational range for the species.

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
		Yosemite region. It is occasionally reported in northwestern California in the winter and in the Warner Mountains in the summer. It feeds on meadow-dwelling rodents, especially pocket gophers and voles and occasionally eats birds. Threats include timber harvesting, grazing decreasing prey populations, and secondary strychnine poisoning of pocket gophers.		
Mammals				
Antrozous pallidus pallid bat	-/- -/SSC	This species occurs at low elevations throughout California in a wide variety of habitats including grasslands, shrublands, woodlands, forests, and mixed conifer. It occurs most commonly in open, dry habitats with rocky areas for roosting. It is a yearlong nocturnal resident that hibernates during winter. It forages in open areas mainly on insects and arachnids, occasionally on the ground. Day roosts occur in caves, crevices, mines, and occasionally hollow trees, buildings, and bridges and night roosts occur in more open sites. Maternity colonies form in early April with young volant by July or August. This bat species is very sensitive to disturbance of roosting sites.	No	Suitable roosting habitat is absent from the Project site.
Corynorhinus townsendii Townsend's big-eared bat	-/- -/SSC	This species occurs in coniferous forests, mixed meso-phytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat types. Its distribution is correlated with the availability of caves and cave-like roosting habitat (e.g., mines, tunnels, buildings, or other manmade structures). It occurs in open areas for roosting and typically do not tuck themselves into cracks and crevices like many other bat species. It feeds primarily on moths but may also eat beetles and soft bodies insects. This species is extremely sensitive to disturbance of roosting sites.	No	Suitable roosting habitat is absent from the Project site.

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
Euderma maculatum spotted bat	-/- -/SSC	This species occurs in a wide variety of habitats from arid deserts and grasslands through mixed conifer forests within British Columbia, Canada south through the western United States and into Mexico. It feeds almost entirely on moths foraging over water and along washes. This species needs rock crevices in cliffs or caves for roosting. Mating occurs in fall and the young are born before mid-June.	No	Suitable roosting habitat is absent from the Project site.
Eumops perotis californicus western mastiff bat	-/- -/SSC	This species occurs in open, semi-arid to arid habitats throughout southeastern San Joaquin Valley and Coast Ranges from Monterey County southward. It can also occur in urban areas. It feeds on insects captured in flight and roosts in cliff faces, high buildings, trees, and tunnels. The maternity season begins in March with young typically volant by September. Nursery roosts most often occur in tight rock crevices or crevices in buildings.	No	Suitable roosting habitat is absent from the Project site.
Gulo gulo California wolverine	-/ST -/SFP	This species occurs in tundra, remote mountains, and boreal forests. It generally occurs in areas at or above timberline but will use lower-elevation forests during the winter. Habitat requirement on a landscape scale are currently unknown and may differ substantially between populations. It is most common in regions with snow-covered ground throughout the winter. It is morphologically well suited to hunting in the snow and may rely heavily on this advantage during severe winters. There has only been one sighting of this species in California within the last 100 years. In 2008, a male wolverine was captured on camera near Tahoe National Forest.	No	Suitable habitat is absent and the Project is outside the accepted range of the species.
Lepus americanus tahoensis	-/- -/SSC	This species occurs in the mid-elevations of the northern and central Sierra Nevada Mountains from southeastern Shasta County south through Mono	No	Suitable habitat is absent and the Project is outside of

Scientific Name Common Name	Status Fed/State ESA CRPR/CDFW	Habitat Requirements	Potential to Occur	Rationale
Sierra Nevada snowshoe hare		and Mariposa Counties. It generally occurs in riparian communities characterized with thickets of deciduous trees and shrubs such as willows and alders. They feed on various green succulent plants such as grasses, sedges, ferns, and forbs. In the winter, they forage on bark and twigs of conifers, deciduous trees, and evergreen shrubs.		the accepted elevation range for the species.

CRPR (California Rare Plant Rank):		FE	Federally Endangered
1A	Presumed Extinct in California	FT	Federally Threatened
1B	Rare, Threatened, or Endangered in California and elsewhere	FC	Federal Candidate Species
2A	Plants presumed extirpated in California, but more common elsewhere	FS	Federally Sensitive
2B	Plants Rare, Threatened, or Endangered in California, but more common elsewhere	SE	State Endangered
CRPR Threat Code Extension:		ST	State Threatened
.1	Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat)	SC	State Candidate
		SS	State Sensitive
.2	Fairly endangered in California (20-80% occurrences threatened)	SSC	State Species of Special Concern
.3	Not very endangered in California (<20% of occurrences threatened)	SFP	State Fully Protected
		SR	State Rare
		WL	Watch List

CNDDB 9 QUAD Query

Rana boylii	foothill yellow-legged frog	Amphibians	None	Endangered		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_NT-Near Threatened | USFS_S-Sensitive	Aquatic | (	Partly-shai	Needs at least some cobble-sized substrate for egg-laying. Needs at least 15 weeks to attain metamorphosis.	49
Rana draytonii	California red-legged frog	Amphibians	Threatened	None		CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable	Aquatic | /	Lowlands s	Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	1
Banksula melones	Melones Cave harvestman	Arachnids	None	None		IUCN_VU-Vulnerable	Limestone	Limestone	Cave temps range from 14-16 deg C; humidity, from 82-97%. Found under rocks or wandering on floor or walls.	1
Banksula tuolumne	Tuolumne cave harvestman	Arachnids	None	None			Limestone	Known onl	Species is troglobitic.	1
Larca laceyi	Lacey's Cave pseudoscorpion	Arachnids	None	None			Limestone	Caves.		1
Pseudogarypus orpheus	Music Hall Cave pseudoscorpion	Arachnids	None	None			Limestone	Caves.		1
Accipiter gentilis	northern goshawk	Birds	None	None		BLM_S-Sensitive | CDF_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive	North coas	Within, an	Usually nests on north slopes, near water. Red fir, lodgepole pine, and aspens are typical nest trees.	9
Accipiter striatus	sharp-shinned hawk	Birds	None	None		CDFW_WL-Watch List | IUCN_LC-Least Concern	Cismontan	Ponderosa	North-facing slopes with plucking perches are critical requirements. Nests usually within 275 ft of water.	1
Agelaius tricolor	tricolored blackbird	Birds	None	Threatened		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_EN-Endangered | NABCI_RWL-Red Watch List | USFWS_BCC-Birds of Conservation Concern	Freshwate	Highly colo	Requires open water, protected nesting substrate, and foraging area with insect prey within a few km of the colony.	1
Athene cunicularia	burrowing owl	Birds	None	None		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFWS_BCC-Birds of Conservation Concern	Coastal prz	Open, dry,	Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	1
Haliaeetus leucocephalus	bald eagle	Birds	Delisted	Endangered		BLM_S-Sensitive | CDF_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern | USFS_S-Sensitive | USFWS_BCC-Birds of Conservation Concern	Lower mor	Ocean sho	Nests in large, old-growth, or dominant live tree with open branches, especially ponderosa pine. Roosts communally in winter.	2
Pandion haliaetus	osprey	Birds	None	None		CDF_S-Sensitive | CDFW_WL-Watch List | IUCN_LC-Least Concern	Riparian fo	Ocean sho	Large nests built in tree-tops within 15 miles of a good fish-producing body of water.	1
Strix nebulosa	great gray owl	Birds	None	Endangered		CDF_S-Sensitive | IUCN_LC-Least Concern | USFS_S-Sensitive	Lower mor	Resident o	Requires large diameter snags in a forest with high canopy closure, which provide a cool sub-canopy microclimate.	4
Bruchia bolanderi	Bolander's bruchia	Bryophytes	None	None	4.2	USFS_S-Sensitive	Lower mor	Lower mor	Moss which grows on damp clay soils. Seems to colonize bare soil along streambanks, meadows, fens and springs. This species has an ephemeral nature and fr disturbance adapted. 1610-3340 m.	1
Stygobromus harai	Hara's Cave amphipod	Crustaceans	None	None		IUCN_VU-Vulnerable		Central Cal	Mostly found in caves and mine tunnels. Also taken from a spring.	2
Balsamorhiza macrolepis	big-scale balsamroot	Dicots	None	None	1B.2	BLM_S-Sensitive | USFS_S-Sensitive	Chaparral	Chaparral,	Sometimes on serpentine. 35-1465 m.	1
Clarkia australis	Small's southern clarkia	Dicots	None	None	1B.2	BLM_S-Sensitive | USFS_S-Sensitive	Cismontan	Cismontan	Open, rocky sites in conifer forest or oak woodland. 910-2075 m.	9
Clarkia biloba ssp. australis	Mariposa clarkia	Dicots	None	None	1B.2	SB_CalBG/RSABG-California/Rancho Santa Ana Botanic Garden | USFS_S-Sensitive	Chaparral	Chaparral,	On serpentine. Several sites occur in the foothill woodland/riparian ecotone. 120-1480m.	47
Diplacus pulchellus	yellow-lip pansy monkeyflower	Dicots	None	None	1B.2	BLM_S-Sensitive | USFS_S-Sensitive	Lower mor	Lower mor	Vernally wet sites. Soils can be clay, volcanic, or granitic. 670-1950 m.	32
Eryngium pinnatisectum	Tuolumne button-celery	Dicots	None	None	1B.2		Cismontan	Vernal poo	Volcanic soils; vernal pools and mesic sites within other natural communities. 65-915 m.	3
Evithranthe marmorata	Stanislaus monkeyflower	Dicots	None	None	1B.1		Cismontan	Cismontan	300-1435 m.	1
Horkelia parryi	Parry's horkelia	Dicots	None	None	1B.2	BLM_S-Sensitive | USFS_S-Sensitive	Chaparral	Chaparral,	Openings in chaparral or woodland; especially known from the lone formation in Amador County. 85-1115 m.	2
Lomatium stebbinsii	Stebbins' lomatium	Dicots	None	None	1B.1	USFS_S-Sensitive	Chaparral	Lower mor	Thin, gravelly volcanic clay in open yellow pine forest. Grows where other vegetation is absent. 1140-2350 m.	56
Navarretia miwukensis	Mi-Wuk navarretia	Dicots	None	None	1B.2		Lower mor	Lower mor	Open, sparsely vegetated pyroclastic flows, often gently sloping terrain. 800-1500 m.	7
Botrychium crenulatum	scalloped moonwort	Ferns	None	None	2B.2	USFS_S-Sensitive	Bog & fen	Bogs and f	Moist meadows, freshwater marsh, and near creeks. 1185-3110 m.	1
Botrychium minganense	Mingan moonwort	Ferns	None	None	2B.2	USFS_S-Sensitive	Bog & fen	Lower mor	Creekbanks in mixed conifer forest. 1190-3295 m.	1
Lavinia symmetricus ssp. 1	San Joaquin roach	Fish	None	None		CDFW_SSC-Species of Special Concern	Aquatic | S	Tributaries	to the San Joaquin River from the Cosumne	2
Big Tree Forest	Big Tree Forest	Forest	None	None			Lower montane	coniferous forest		1
Atractelmis wawona	Wawona riffle beetle	Insects	None	None			Aquatic	Aquatic; fc	Strong preference for inhabiting submerged aquatic mosses.	1
Bombus crotchii	Crotch bumble bee	Insects	None	Candidate Endangered				Coastal Ca	Food plant genera include Antirrhinum, Phacelia, Clarkia, Dendromecon, Eschscholzia, and Eriogonum.	1
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	Insects	Threatened	None			Riparian sc	Occurs onl	Prefers to lay eggs in elderberries 2-8 inches in diameter; some preference shown for "stressed" elderberries.	3
Hydroporus simplex	simple hydroporus diving beetle	Insects	None	None			Aquatic | S	Known from	aquatic habitats in Tuolumne and San Ber	1
Peltigera gowardii	western waterfan lichen	Lichens	None	None	4.2	USFS_S-Sensitive	Riparian fo	Riparian fc	On rocks in cold water creeks with little or no sediment or disturbance. Often associated with rich bryophyte flora. 1065-2375 m.	2
Antrozous pallidus	pallid bat	Mammals	None	None		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive | WBWG_H-High Priority	Chaparral	Deserts, gr	Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	2
Corynorhinus townsendii	Townsend's big-eared bat	Mammals	None	None		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive | WBWG_H-High Priority	Broadleave	Throughou	Roosts in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	7
Erethizon dorsatum	North American porcupine	Mammals	None	None		IUCN_LC-Least Concern	Broadleave	Forested h	Wide variety of coniferous and mixed woodland habitat.	2
Euderma maculatum	spotted bat	Mammals	None	None		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | WBWG_H-High Priority		Occupies a	Feeds over water and along washes. Feeds almost entirely on moths. Needs rock crevices in cliffs or caves for roosting.	4
Eumops perotis californicus	western mastiff bat	Mammals	None	None		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | WBWG_H-High Priority	Chaparral	Many open	Roosts in crevices in cliff faces, high buildings, trees and tunnels.	1
Gulo gulo	California wolverine	Mammals	None	Threatened		CDFW_FP-Fully Protected | IUCN_NT-Near Threatened | USFS_S-Sensitive	Alpine | Al	Found in th	Needs water source. Uses caves, logs, burrows for cover and den area. Hunts in more open areas. Can travel long distances.	1
Lasiurus cinereus	hoary bat	Mammals	None	None		IUCN_LC-Least Concern | WBWG_M-Medium Priority	Broadleave	Prefers ope	Roosts in dense foliage of medium to large trees. Feeds primarily on moths. Requires water.	1
Lepus americanus tahoensis	Sierra Nevada snowshoe hare	Mammals	None	None		CDFW_SSC-Species of Special Concern	Riparian w	Boreal ripa	Thickets of deciduous trees in riparian areas and thickets of young conifers.	1
Margaritifera falcata	western pearlshell	Mollusks	None	None			Aquatic	Aquatic.	Prefers lower velocity waters.	2
Monadenia circumcarinata	keeled sideband	Mollusks	None	None		BLM_S-Sensitive | IUCN_VU-Vulnerable	Limestone	Occurs in	limestone where fractures or loose talus allov	6
Monadenia mormonum buttoni	Button's Sierra sideband	Mollusks	None	None			Chaparral	Known from	the central Sierra Nevada counties.	1
Monadenia mormonum hirsuta	hirsute Sierra sideband	Mollusks	None	None		BLM_S-Sensitive	Chaparral	Known only	from a few basaltic outcrops in Tuolumne C	1
Monadenia tuolumneana	Tuolumne sideband	Mollusks	None	None		BLM_S-Sensitive	Limestone	Endemic to	Occurs in limestone where fractures or loose talus allow deep, sub-surface sheltering.	2
Allium tribracteatum	three-bracted onion	Monocots	None	None	1B.2	USFS_S-Sensitive	Chaparral	Chaparral,	Volcanic slopes and ridges. 880-2835 m.	18
Erythronium tuolumnense	Tuolumne fawn lily	Monocots	None	None	1B.2	BLM_S-Sensitive | SB_CalBG/RSABG-California/Rancho Santa Ana Botanic Garden | USFS_S-Sensitive	Broadleave	Broadleafe	Often on clay soils; on cliffs and near drainages. 485-1405 m.	33
Iris hartwegii ssp. columbiana	Tuolumne iris	Monocots	None	None	1B.2	BLM_S-Sensitive | USFS_S-Sensitive	Cismontan	Cismontan	485-1130 m.	3
Rhynchospora capitellata	brownish beaked-rush	Monocots	None	None	2B.2	IUCN_LC-Least Concern	Lower mor	Lower mor	Mesic sites. 45-1710 m.	1
Emys marmorata	western pond turtle	Reptiles	None	None		BLM_S-Sensitive | CDFW_SSC-Species of Special Concern | IUCN_VU-Vulnerable | USFS_S-Sensitive	Aquatic | /	A thorough	Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.	1

Bryophyte and Lichen removed from consideration because 4.2 CRPR = 49 species total
Add in IPaC Monarch and delta smelt = 51 species total

APPENDIX C

CLASS III INVENTORY/PHASE I SURVEY REPORT

Archaeological Survey Report

Results of a Phase I NHPA (CEQA+)
Cultural Resource Assessment
of
The Twain Harte Sewer Upgrade Project
Tuolomne County, California

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PSI Report: CA21TuolomneQK01R

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MANAGEMENT SUMMARY

PURPOSE AND SCOPE

This report is prepared for federal compliance with the National Historic Preservation Act (NHPA) of 1966, as amended. The project involves use of a funds from the California Regional Water Quality Control Board Twain Harte Community Services District Sewer Upgrade Project (Project). This document has been prepared to satisfy Section 106 of the National Historic Preservation Act (NHPA) and Section 15064.5 of the California Environmental Quality Act (CEQA) Guidelines with respect to the identification and preservation of cultural resources. Paleo Solutions was retained by Quad Knopf, Inc. to provide cultural resource services for the Project.

The Project Area of Potential Effects (APE) (Figures 1 and 2) is located in the Community of Twain Harte, California. Within the APE ground disturbance will occur in areas where existing sewer lines occur, so it is assumed that all areas where construction will occur have been disturbed previously. Trenching to replace or repair sewer lines will be roughly 2 to 3 feet wide and excavated up to 6-feet deep for the new sewer pipe placement.

DATES OF INVESTIGATION

The background research and preparation of this report were conducted by Michael E. Macko, MA, RPA, Principal Investigator at Paleo Solutions. The field survey was conducted by Karen Brehm, MS, Field Director for Paleo Solutions. Resumes are provided in (Appendix B). A cultural resources records search was requested on September 14, 2021 from the California Historical Resources Information System (CHRIS) facility at the Central California Information Center (CCIC) at California State University Stanislaus. The results were provided by the CCIC on September 24, 2021 and are appended here as Confidential Appendix C. Field surveys were conducted by Karen Brehm on September 29, 2021 and Michael Macko on November 18-19, 2021.

FINDINGS OF THE INVESTIGATION

The records on file at the CCIC indicate that six cultural resources are present in the APE. These resources include four historic resources and two prehistoric resources. Only two historic resources, Twain Harte Lake (P-55-007117) and Twain Harte Dam (P-55-007116), are recommended as potentially eligible for the NRHP under criteria A and B and CRHR under criteria 1 and 2 as significant contributors to the development of the Twain Harte Community. A prehistoric encampment (P-55-001422) is also recommended potentially eligible for inclusion in the NRHP under criterion D and the CRHR under criterion 4.

FINDING OF EFFECT

A determination of ***No Adverse Effect*** is recommended four cultural resources in the APE, including Twain Harte Dam (P-55-007116), Twain Harte Lake (P-55-007117), the Sonora-Mono Road (P-55-000054) and Bald Rock (P-55-000130)A determination of ***Potential Adverse Effect*** is recommended for two cultural resources within the APE. These include P-55-001422 (Prehistoric Encampment) and P-55-006544 (Wildwood Ditch).

RECOMMENDATIONS

Avoidance of adverse effects is recommended by incorporating non-destructive sewer repairs using appropriate lining techniques on existing lines in Sections 3A and 3B and Section 8C. Additional investigation is recommended for P=-55-001422 should excavation be required in Sections 3A and 3B to repair/improve the existing sewer line.

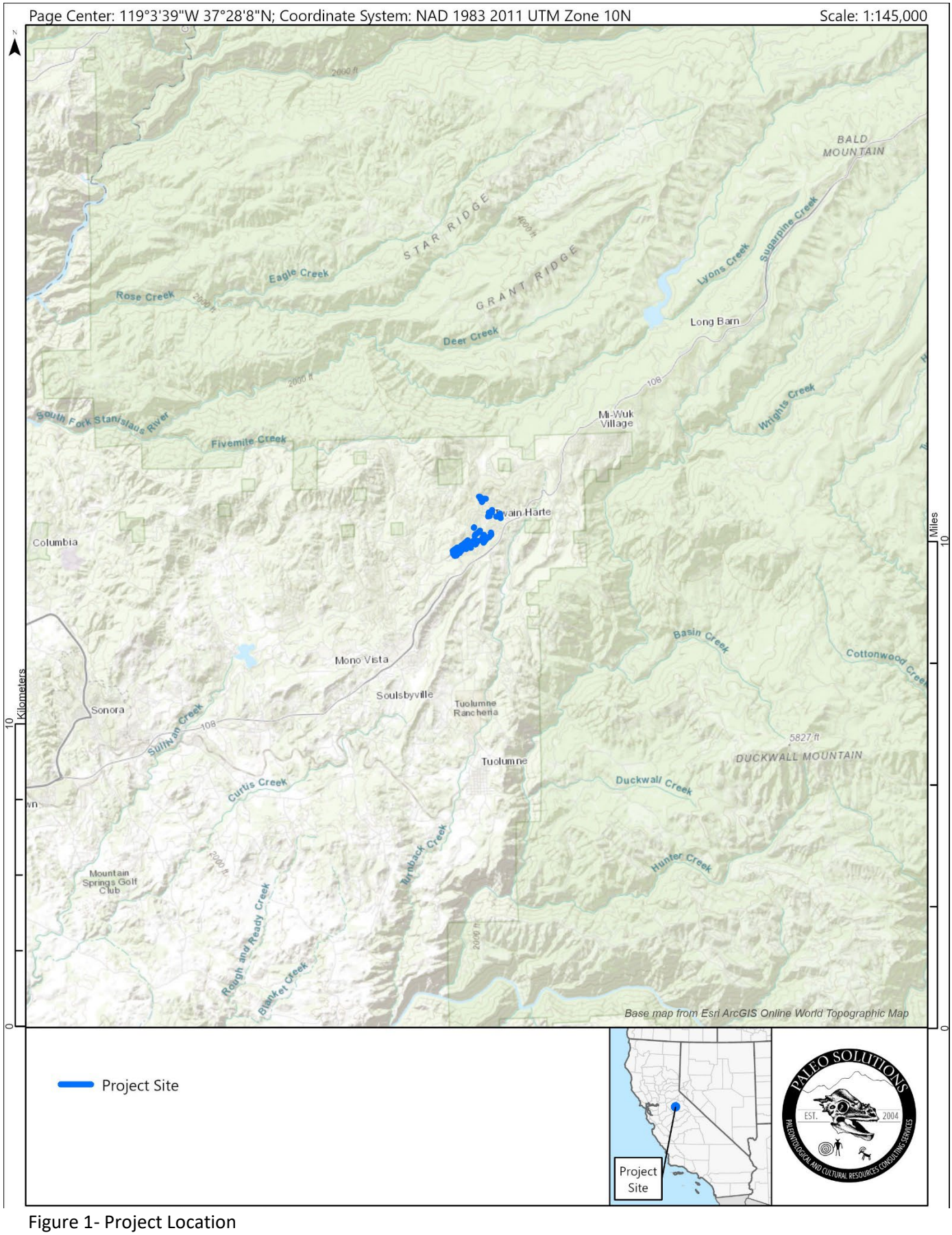


Figure 1- Project Location

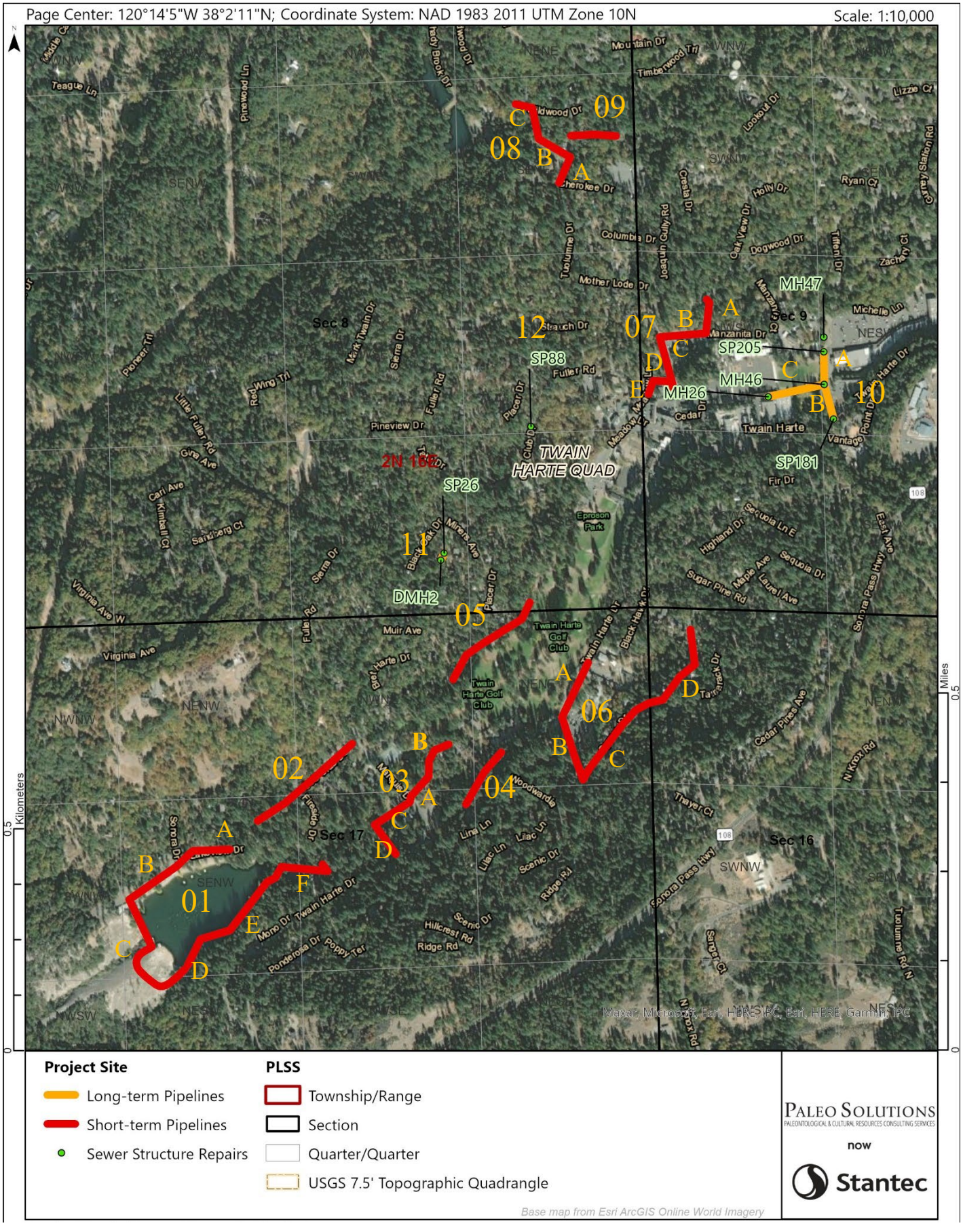


Figure 2- Twain Harte Sewer Improvement Sections (01-12) and Subsections (A-F).

1.0 PROJECT DESCRIPTION

1.1 AREA OF POTENTIAL EFFECTS

The Project is located within the boundaries of the Twain Harte Community Service District (District). The District serves the unincorporated community of Twain Harte, Tuolumne County, California.

The District provides water, parks, recreation, and fire protection services and operates and maintains the sewer collection system serving the community with an estimated population of 2,500, which includes a total of 1,607 equivalent single-family resident units and 1,436 physical connections (1,347 residential, 84 commercial and 5 public facilities). The proposed project consists of the replacement or repair of existing 6-inch to 10-inch diameter sewer pipelines within approximately 2.15 miles (11,430.5 feet) of existing rights-of-way (ROW). Most of the sewer lines to be repaired or replaced were installed in 1965. As of this reporting the designs are at 30% completion. The types of replacements and repair could include combinations of lining existing pipes, removing and replacing pipes, or abandoning existing lines in place and placing new lines within the same ROW. Table 1 lists these Project areas that are also identified on Figure 2:

Table 1- APE Project Areas

Project Area (see Figure 2)	Location in Twain Harte	Length (feet)
1	Surrounding Twain Harte Lake	3,169.0
2	Golf Club Drive (South)	908.5
3	Marquis Drive	133.2
4	Twain Harte Drive	472.4
5	Golf Club Drive (North)	821.0
6	Twain Harte Drive to Spruce Drive	2,513.7
7	Fuller to Manzanita Drive	1,245.3
8	South of Wildwood Drive	835.9
9	East of Tuolumne Drive	334.2
10	Tiffeni Drive	937.2
11	Bret Harte Drive	60.1
12	Golf Club Drive	NA
		11,430.5

The District is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the areas listed above. The CWSRF is a federally funded program through the Environmental Protection Agency. Implementation of the proposed project will allow the District to maintain, replace, and upgrade its collection system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality.

Construction is expected to take approximately five months, with construction anticipated to start in Quarter 2 of 2023 (depending on funding). The construction will require approximately 10 crew members. Construction equipment will include a backhoe, bobcat, trencher, generator, grader, dump truck, concrete truck, and three pickup trucks. Construction will include exposing the existing pipeline for removal and replacement.

The depth of ground excavation or trenching will be no more than six feet below grade.

Figure 2 shows an aerial photograph depicting the APE boundaries of the 12 Project sections listed in Table 1.

2.0 REGULATORY SETTING

This section contains a discussion of the applicable laws, ordinances, regulations, and standards that govern cultural resources and must be adhered to both prior to and during project implementation. Because the project is a federal action under the National Environmental Policy Act (NEPA) due to partial funding by the U.S. Environmental Protection Agency, cultural resources analysis under Section 106 of the National Historic Preservation Act (16 United States Code [USC] 470f) and its implementing regulations (36 Code of Federal Regulations [CFR] 800, Protection of Historic Properties) is required.

2.1 FEDERAL

Cultural resources are considered during federal undertakings chiefly under Section 106 of the NHPA of 1966 (as amended) through one of its implementing regulations (36 Code of Federal Regulations [CFR] 800, Protection of Historic Properties). Properties of traditional religious and cultural importance to Native Americans are considered under Section 101(d) (6) (A) of the NHPA.

Section 106 of the NHPA (16 United States Code [USC] 470f) requires federal agencies to take into account the effects of their undertakings on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places (NRHP) and to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings (36 CFR 800.1). Under Section 106, the significance of any adversely affected cultural resource is assessed and mitigation measures are proposed to reduce the impacts to a less than significant level. Significant cultural resources (i.e., historic properties) are those that are listed in or are eligible for listing in the NRHP in accordance with the criteria stated at 36 CFR 60.4.

2.1.1 National Register of Historic Places

Eligibility for inclusion in the NRHP considers whether the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association and,

(a) that are associated with events that have made a significant contribution to the broad patterns of our history; or

(b) that are associated with the lives of persons significant in our past; or

(c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

(d) that have yielded, or may be likely to yield, information important in prehistory or history.

2.2 STATE

2.2.1 California Register of Historical Resources

CEQA requires a lead agency to determine whether a project would have a significant effect on one or more historical resources. A “historical resource” is defined as a resource listed in or determined to be eligible for listing in the California Register of Historical Resources (CRHR) (California Public Resources Code [PRC], Section 21084.1); a resource included in a local register of historical resources (14 California Code of Regulations [CCR], Section 15064.5[a][2]); or any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant (14 CCR 15064.5[a][3]).

Section 5024.1 of PRC, Section 15064.5 of the State CEQA Guidelines (14 CCR), and Sections 21083.2 and 21084.1 of the CEQA Statutes were used as the basic guidelines for the cultural resources study. PRC 5024.1 requires evaluation of historical resources to determine their eligibility for listing on the CRHR. The purposes of the CRHR are to maintain listings of the State’s historical resources and to indicate which

properties are to be protected from substantial adverse change. The criteria for listing resources in the CRHR were expressly developed to be in accordance with criteria developed for listing in the National Register of Historic Places (NRHP) (per the criteria listed in the Code of Federal Regulations [CFR], Title 36, Section 60.4) and include those listed below.

A resource may be listed as an historical resource in the California Register if it meets any of the following criteria:

(1) Is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

(2) Is associated with the lives of persons important in our past.

(3) Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values or

(4) Has yielded, or may be likely to yield, information important in prehistory or history.

According to Section 15064.5(a)(3)(A–D) of the State CEQA Guidelines (14 CCR), a resource is considered historically significant if it meets the criteria for listing in the NRHP (per the criteria listed at 36 CFR 60.4, previously discussed). Impacts that affect those characteristics of the resource that qualify it for the NRHP or that would adversely alter the significance of a resource listed in or eligible for listing in the CRHR are considered to have a significant effect on the environment. Impacts to cultural resources from the proposed project are thus considered significant if the project (1) physically destroys or damages all or part of a resource; (2) changes the character of the use of the resource or physical feature within the setting of the resource that contributes to its significance; or (3) introduces visual, atmospheric, or audible elements that diminish the integrity of significant features of the resource.

The purpose of a Phase I cultural resources investigation is to evaluate whether any cultural resources are present in or near the Project or can reasonably be expected to exist in subsurface contexts. If resources are discovered, management recommendations would be included that require evaluation of the resources for NRHP or CRHR eligibility.

2.2.2 Assembly Bill 52

This project is subject to Assembly Bill (AB) 52. AB52 is applicable to projects that have filed a Notice of Preparation (NOP) of an Environmental Impact Report (EIR) or notice of a Mitigated Negative Declaration (MND) or Negative Declaration (ND) on or after July 1, 2015. AB 52 requires lead agencies to initiate consultation with California Native American Tribes that are traditionally and culturally affiliated with the geographic area of the project and have requested such consultation prior to determining the type of CEQA documentation is applicable to the project (i.e, EIR, MND, ND). Significant impacts to Tribal cultural resources are considered significant impacts to the environment. AB52 allows Tribes 30 days after receiving notification to request consultation.

2.2.3 Human Remains

Section 7050.5 of the California Health and Safety Code provides for the disposition of accidentally discovered human remains. Section 7050.5 states that, if human remains are found, no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains shall occur until the County Coroner has determined the appropriate treatment and disposition of the human remains.

Section 5097.98 of the PRC states that, if remains are determined by the County Coroner to be of Native American origin, the Coroner must notify the Native American Heritage Commission within 24 hours which, in turn, must identify the person or persons it believes to be the most likely descended from the deceased Native American. The descendants shall complete their inspection within 48 hours of being granted access to the site. The designated Native American representative would then determine, in consultation with the property owner, the disposition of the human remains.

3.0 CULTURAL BACKGROUND

The Project area's location in the foothills on the western slope of the Sierra Nevada Mountains is associated with many thousands of years of native occupation and use as well as being near the center of American Period mining and settlement. Known cultural resources identified in and near the Project are associated with these cultural contexts.

3.1 PREHISTORIC BACKGROUND

The prehistory of the Project area is summarized in the comprehensive overview of the Stanislaus National Forest by Miksicek et al. (1999). Prehistoric populations in the Sierra Nevada Foothills likely made seasonal incursions into the region as early as 10,000 years ago, but archaeological evidence is sorely lacking. More permanent settlements are known between 3,000 and 4,000 years ago based on the voluminous research of Moratto (1984) and Moratto et al. (1988). Among the evidence of early human occupation in the Stanislaus River Basin are village sites, material procurement and food processing (bedrock milling) and ritual sites exhibiting petroglyphs.

3.2 ETHNOGRAPHIC BACKGROUND

Contemporary archaeological studies in California are profoundly influenced by ethnological research conducted in the late 19th and early 20th centuries by the Anthropologists associated with the University of California Berkeley, particularly Franz Boas, Edward Gifford, and Alfred Kroeber. Ethnographic studies provide the interpretive models to address archaeological remains.

The Project is located a few miles south of the Stanislaus River Canyon, the latter being a rough border between the Central and Northern Sierra Me-Wuk. In 1840, just prior to the start of the gold rush, the Central Sierra Me-Wuk Indians were the primary inhabitants of the Stanislaus River Basin. The Northern, Central, and Southern Sierra Me-wuk languages, their material, and their cultural practices were closely related. Linguistic data suggest that the Me-Wuk languages began separating into dialects about 2,000 years ago. These data suggest that the ancestral Me-wuk have been present in central California for several thousand years (Levy 1978:398).

Twain Harte was within Central Sierra Miwok territory. Several locations are known where the Me-Wuk had settled, the best known and commemorated location being at their 19th century village of Bald Rock Rancheria, along Twain Harte Creek. According to ethnographer C.H. Merriam (1967) ten Me-Wuk families were living at the Rancheria in late summer 1903. Structures noted there include roundhouse, several traditional Indian houses and a half-dozen or more ordinary rough board houses. William Fuller was identified as the leader of the small group. William was born to Alfred Fuller, a native of Ohio, and his Me-Wuk wife Jenita. William became the leader of the area Me-Wuk in 1888 at the age of 15. By 1933 William and many other Me-Wuk relocated to the Tuolumne Rancheria near Tuolumne.

3.3 HISTORIC BACKGROUND

The surge of American settlers and miners beginning in the 1840s brought tremendous changes to the landscape. The mining operations that developed required numerous support services and facilities, and the logging, farming, ranching and irrigation industries grew rapidly along with other commercial and residential development. Water companies diverted water for use by miners. Rail lines and highways coursed into the Sierras to improve transportation and communication. In the 1890`s utility companies began generating hydroelectric power on the Stanislaus River, much of which they sent outside the area to places such as Twain Harte. The early 1900`s saw development of several irrigation districts to serve local farmers and the many orchards being planted to apples and pears. In 1926, the Oakdale and South San Joaquin Irrigation Districts built the Melones Dam and Powerplant. The peak of construction by irrigation districts came in the 1950`s with construction of the Tri-Dam Project. That consisting of the Donnells and Beardsley Dams on the upper Stanislaus River, Tulloch Dam on the lower Stanislaus River, and the enlargement of Goodwin Dam, also on the lower river.

3.2.1 Twain Harte

The history of Twain Harte begins with the trans-sierran route across the 9,624-foot Sonora Pass. Beginning as a native trail, which some assert was used by Jedediah Smith in 1827 during his exploits in the Sierras, the route developed rather quickly into a wagon road. The earliest emigrant crossing was by the Bidwell-Bartleson party in late 1841 followed 10 years later by the numerous miners and settlers heading west.

The Sonora-Mono Road was surveyed to Bridgeport, Mono County in 1860, the road was completed In 1864, when a six-horse team took three weeks for the round trip between Sonora and Bridgeport. A monument to the toll house is located on Twain Harte Drive (See Appendix A, Photo 33) with the following inscription:

> Located 100 feet west of this marker, the toll road started in the mid 1860's and continued until the state took it over in 1901. The road was built because of the need for a route between Sonora and Bodie. Under state franchise, tolls did not exceed 3 dollars for a horse or mule & rider, a stage 6 dollars, a buggy 5 dollars, cows 50 cents & sheep 25. The adjacent spring was used for watering stock. Alfred Fuller, father of Chief William Fuller, was toll collector. Many streets and roads were named after the Fuller family. A barn housing the toll collector's office, later became the first Waltz home which burned in 1980 & since rebuilt on present site.

Several early settlers of Twain include the 1854 arrival of the Calvin Williams family. The Williams family acquired land in the valley for farming and ranching. Apples and pears were main crops, and they ran a small number of cattle. Calvin Williams was the first toll taker, followed by Alfred Fuller.

Other early settlers arriving in the 1860s included William Calder, Austin Abbott, the Jasper brothers, and the Hiatts, who all pursued farming, ranching, timber and milling. The pursuit of gold did not occur in Twain Harte to any appreciable degree, and what little placer and hydraulic mining that did occur fizzled out quickly. The primary concerns of the early settlers were those related to supplying the bustling mining areas to the east and west of the valley with lumber and food. As the mining operations required substantial water for hydraulic mining and sluicing, so did the orchards and farms in the valley. Numerous ditches were constructed in the 1850s to accommodate this need, the Soulsbyville Ditch being a prominent local conduit through Twain Harte.

The fruit business became a large economic focus alongside lumber in the late 19th century, and with its growth came greater needs for shipping. The Sugar Pine Railroad arrived in the early 1900s and provided the necessary transportation of goods to market and mills.

Wiiliams continued his lumber and other interests until selling his ranch to Alonzo and Keturah Wood in 1921. The original intent was for Alonzo to continue the timber business but sinking market conditions for lumber forced them to reconsider. The Woods alternate plan was to establish a summer resort community in the valley with recreational grounds including a lake. Mrs. Wood named the new community Twain Harte after her favorite authors, Mark Twain and Bret Harte, and the name Twain Harte Lodge was registered for the community with the State of California in 1924. The Woods' plans were soon dashed due to financial problems, and in 1926 they sold their holdings to Albert L. Nevins and Dr. R. E. Turner, successful developers with several projects under their belt including the coastal community of Pismo Beach. Nevins and Turner proceeded with a widespread marketing effort and initiated plans for a dam that would realize the Woods' original plan for the lake. Edward M. Marquis provided the funding for the dam, and it was dedicated on July 4, 1929. Marquis became the owner after of the holdings after default by Nevins and Turner.

The Twain Harte Improvement Association was formed in the late 1930s. The latter group bought Twain Harte Lake and dam from Marquis for $10 in 1939. In 1943 Nevins and Eproson purchased the Marquis holdings, which included the subdivision, a hotel, service station, and some outbuildings. By this time the identity of the Twain Harte development as a recreational colony of seasonal cabins had been established and took hold as the main contextual character of community.

In the mid-1930s community services were provided by Twain Harte Fire Protection District, Twain Harte Recreation and Park District, and the Tuolumne County Water District No. 1. The latter installed the current sewer system, the subject of this report, in 1965. The Twain Harte Community Services District was formed

in 1996 to provide water, sewer, park and recreation, fire protection and hydroelectric services to the Twain Harte community.

4.0 METHODS

4.1 ARCHAEOLOGICAL RESOURCES RECORDS SEARCH

A records search and literature review of documents on file at the Central California Information Center (CCIC) at California State University Stanislaus was requested on August 14, 2021 (Appendix C). It was reviewed by Paleo Solutions prior to the field survey. The review also consisted of an examination of the U.S. Geological Survey's (USGS) 7.5-minute Twain Harte Quadrangle to determine if any sites are recorded on or if any cultural resources studies have been conducted previously within the Project or within 500-feet of the Project. Additional data sources consulted at the CCIC included archaeological records, Archaeological Determinations of Eligibility (DOE), historic maps, and the Historic Property Data File (HPDF) maintained by the Office of Historic Preservation (OHP). The HPDF contains listings for the CRHR and/or the NRHP, California Historical Landmarks (CHL), and California Points of Historical Interest (CPHI).

Other records of importance include historic aerial and map data at a number of repositories and online sources.

4.2 ARCHAEOLOGICAL FIELD SURVEY

A pedestrian archaeological survey of the Project site and APE was conducted on September 29, 2021, by Paleo Solutions Field Director Karen Brehm, MS. A follow up recordation and documentation of resources was conducted by Principal Investigator Michael E. Macko, MA, RPA on November 18-19, 2021. Much of the APE is within or adjacent to improved roadways. Though the entire APE was examined on foot, most all ground surfaces were obscured completely by various covers from pavement to vegetation.

The survey involved careful visual inspection of exposed ground surfaces within the APE where visible. Documentation of the survey included photographic details of all Project sections (Figure 2) and compiling location details and notes using the ESRI Collector data collection app.

5.0 RESULTS

5.1 CULTURAL RESOURCES RECORDS SEARCH RESULTS

The record search at the CCIC showed that 19 cultural resource studies have been conducted within 500-feet of the Project (Table 2). None of these studies provide CRHR or NRHP evaluations of resources within the APE.

Table 2- Historic Resource Reports Conducted for Projects Within Properties Identified Within 500 feet of the APE

Report No.	Author(s)	Date	Title	Company
TO-01059	Davis-King, Shelly	1989	Cultural Resources Investigations for the Twain Harte Improvement Association	Infotec Research Incorporated for Twain Harte Improvement Association
TO-01060	Davis-King, Shelly	1989	Cultural Resources Investigations for the Twain Harte Improvement Association Project.	Shelly Davis-King
TO-01297	Peak & Associates, Inc.	1987	Cultural Resource Assessment of the Tuolumne County Ditch Improvement Project, California.	Peak and Associates, Inc.; for Engineering-Science, Inc., Berkeley, CA
TO-01321	Van Bueren, T.	1986	Letter Report: Lorick Enterprises.	Infotec Research Inc.
TO-02268	Davis-King, S. and J. Marvin	1994	Contextual History of Tuolumne County.	Davis-King & Associates (and) Foothill Resources, Ltd.; prepared for The County of Tuolumne
TO-02681	Davis-King, Shelly and Ozbirn, R.	1995	Sugar Pine Railroad: Archaeological and Global Positioning Survey, Ralph Station to Lyons Dam.	Davis-King & Associates (and) Golden State Surveying Engineering; for Tuolumne Co.Planning Dept.
TO-02757	Davis-King, S. and C. De Ferrari	1990	Archaeological and Historical Investigation for the Twain Harte Elementary School Project.	Davis-King & Associates

Table 2- Historic Resource Reports Conducted for Projects Within Properties Identified Within 500 feet of the APE

Report No.	Author(s)	Date	Title	Company
TO-02917	Turner, Kelly and Daniel R. Elliot	1995	Evaluation of Significance for the Sonora-Mono Road, CA-TUO-1629H (FS 05-16-53-450); Summit Ranger District, Stanislaus National Forest.	Stanislaus National Forest
TO-05425	Napoli, Donald S.	2000	Twain Harte Townsite Cultural Resource Survey.	Donald Napoli for Community Development Department, County of Tuolumne
TO-05710	Francis, Charla Meacham	2005	Cultural Resources Assessment of the Twain Harte Community Services District Trail Project.	Francis Heritage Services
TO-06050	Pitsenberger, Tina and Trish Fernandez	2004	Cultural Resources Inventory and Evaluation, Twain Harte Forest Fire Station, Tuolumne County, California	Pacific Legacy, Inc.
TO-06150	Francis, Charla Meacham	2006	Addendum No. 1, Twain Harte Community Services District Trail Project	Francis Heritage Services
TO-07521	Foothill Resouces, Ltd. and Francis Heritage, LLC	2012	Tuolumne Utilities District Ditch Sustainability Project Historic Resource Evaluation Report.	Foothill Resources, Ltd. (and) Francis Heritage, LLC, for Stantec Consulting Services, and for TUD
TO-07521	Francis, C. M.	2020	Cultural Resources Investigation for Tuolumne Utilities District Ditch Meters Small-Scale Water Efficiency Project, Tuolumne County, California; Project Tracking Number 19-CCAO-256.001, WaterSMART Grants	Francis Heritage for Tuolumne Utilities District
TO-07619	Frese, Adam (RPF)	2012	An Archaeological Survey Report for the Twain Harte Lake CFIP Tuolumne County, California	CAL FIRE
TO-07751	Grijalva, Daniel	2011	Field Office Report of Cultural Resources Ground Survey Findings. Contract No. 749104113NF. NRCS-USDA.	NRCS
TO-08337	Francis, Charla Meacham	2015	Twain Harte Community Services District Bald Rock Project	Francis Heritage, LLC
TO-08776	Baker, Scott	2002	Appendix: Archaeological Survey Report for the Final Report: Twain Harte Reconnaissance Survey Phase III	Consultant for Tuolumne County Community Development Department and Guerra and McBane LLC
TO-08789	Francis, Charla Meacham	2018	Memo from Francis Heritage to Augustine Planning Associates, Inc., RE: Upper Shadybrook Emergency Draft, Twain Harte Community Services District Record Search, Native American Consultation and Field Review	Francis Heritage, LLC

Table 3- Cultural Resources Previously Identified within 500 Feet of the APE

Primary No.	Trinomial	Resource Name	Age	Notes
P-55-000006	CA-TUO-001456H	Sugar Pine Railroad, FS 05-16-53-0281	Historic	
P-55-000054*	CA-TUO-001629H	Sonora-Mono Road; Sonora-Mono Toll Road; CHL 422	Historic	Physically overlaps or intersects 55-002502
P-55-000130*		Bald Rock Rancheria, TCH-69	Prehistoric, Historic	No precise location of features or deposits that would indicate a rancheria
P-55-001422*	CA-TUO-000399	4-TUO-S399	Prehistoric, Historic	Large Me-Wuk encampment with several milling features (40+ mortar locations. A buried hearth and artifacts of obsidian and jasper noted. Likely a major settlement.
P-55-005959		Soulsbyville Ditch	Historic	Is an element of district 55-008270
P-55-006544*		Wildwood Ditch	Historic	
P-55-007116*		Twain Harte Dam	Historic	
P-55-007117*		Twain Harte Lake	Historic	
P-55-007404		Twain Harte Forest Fire Station; Twain Harte CDF Station	Historic	

P-55-008270	Tuo Co. Water Co Ditch and Flume System; Tuolumne Utilities District Ditch and Flume System	Historic	Is a district with elements 55-000980; 55-001011; 55-003161; 55-003505; 55-003751; 55-003845; 55-005959; 55-006362; 55-006364; 55-006538; 55-006539; 55-008208; 55-008221
P-55-008307	Twain Harte Lake Road Trace	Historic	

*In APE

5.2 ARCHAEOLOGICAL SURVEY RESULTS

The following resource descriptions have been supplemented with excerpts from the CA DPR 523 forms provided by the CCIC Records Search. The results are presented for each survey section (see Figure 2).

Section 1- Surrounding Twain Harte Lake

See Appendix A, Photos 1-15.

Section 1 is the longest of the 12 project sections examined. The sewer easement includes a 10-inch pipeline that follows the perimeter of Twain Harte Lake and is exposed where it is suspended near the top of the downstream side of Twain Harte Dam. Three cultural resource sites are within the Section 1 APE

55-000130 (Bald Rock Rancheria)

This resource has been identified as the possible former Bald Rock Rancheria about which little is known. The records search from CCIC identifies an arbitrary area with a 0.35-mile radius around Twain Harte Lake as the suspected location of the Bald Rock Rancheria, or its being somewhere within the designated 0.4 square mile area (Appendix C). No other details are recorded.

First documented in 1903 by Merriam (1967), the rancheria may have been the extended household of Chief William Fuller. At least one roundhouse, three burial areas, a melon patch, and houses had been identified by Me-Wuk who either lived at or were familiar with the site area.

The precise location of the "rancheria" is not certain. [The site record] mentions the "real" Bald Rock settlement as being located in Crystal Falls, slightly northwest beneath the large expanse of granite [there]; other suggestions are that the portion of the Calder Ranch purchased by William Fuller was actually Bald Rock Rancheria.

According to Dorothy Stanley, Fuller's granddaughter by marriage, Fuller lost the ranch in 1928 but lived in the house for another five years or so until moving to the Tuolumne Rancheria in 1933. Mrs. Stanley also suggested that other Me-Wuk left Bald Rock because it cost money to live there, where the Tuolumne Rancheria didn't cost money. She notes that Fuller grew a number of fruits and vegetables on his ranch. Magwood (1977) mentions that Fuller grew potatoes near the spot where his father had collected tolls on the Mono Highway.

According to Merriam (1967 :334) about ten Me-Wuk families were living at Bald Rock Rancheria in August of 1903, where there was a roundhouse, several Indian houses, and "a half a dozen or more ordinary rough board houses." All of the Me-Wuk were gone from Bald Rock Rancheria by 1933. While ceremonial gatherings were held on Bald Rock (up by the present dam) as late as 1898 (Hodge 1961), Mrs. Stanley notes that there was a round house across the road from Chief Fuller's ranch house. Presumably this is where many ceremonial gatherings were held during the years from 1900-1933, and it may be the round house observed by Merriam.

The current survey did not find any indications of a settlement around the periphery of Twain Harte Lake. Twelve bedrock mortars were recorded within a small area on the downstream side of the dam, but over 20 meters from the APE and on granite bedrock. The current APE in the vicinity of P-55-000130 shows no signs of surface cultural resources.

Potential Effects

A determination of no potential adverse effects is recommended for project construction at P-55-000130 in Section 1.

55-007116 (Twain Harte Lake Dam)

This low concrete buttress dam extends across the bed of Twain Harte Creek to form Twain Harte Lake. The dam has two sections. The larger part stretches south southeast about 240 feet from the north shore to Bald Rock. The smaller part continues from the rock east southeast for about another 60 feet to the south shore. The lake obscures the structure's upstream face. The downstream facade, which rises about 20 from the creek bed, contains an evenly spaced set of openings separated by concrete posts. A walkway atop the dam leads from the beach to Bald Rock on the southeast. The dam was altered in 1965 with the addition of a 10-inch sewer line near the top of the downstream face (Appendix A, Photo 8).

The creation of Twain Harte Dam, and the ensuing lake behind it, is a primary contributing factor to the historical significance of Twain Harte as an early recreational community. As such the dam is potentially eligible under criteria a and b of the NRHP and criteria 1 and 2 of the CRHR. The suspension of the 10-inch sewer line on the face of the dam in 1965 altered the dam's visual appearance and its integrity at the time, but it has been a part of the resource for the last 55 years. Replacing the sewer line in place would have no adverse effect on the physical or visual integrity of the resource.

Potential Effects

A determination of no potential adverse effects is recommended for project construction at P-55-007116 in Section 1.

55-007117 (Twain Harte Lake)

This artificial lake has a roughly triangular shape, with its base formed primarily by the Twain Harte Dam. The lake measures approximately 1,075 feet from the base on the southwest to its apex on the northeast. Its maximum breadth is about 600 feet. At its deepest point the lake is 35 to 40 feet deep. A sandy beach forms part of the northwest shore. Benches line the beach. A cyclone fence borders much of the lake. The lake is identified as a focus of the recreational character of Twain Harte since the lake's creation in 1929. As such the lake, like the dam discussed above, is potentially eligible under criteria a and b of the NRHP and criteria 1 and 2 of the CRHR. Replacing the sewer line in place would have no adverse effect on the physical or visual integrity of the resource.

Potential Effects

A determination of no potential adverse effects is recommended for project construction at P-55-007117 in Section 1.

Section 2- Golf Club Drive (South)

See Appendix A, Photos 16-17.

The western reach of Section 2 extends into the arbitrary boundary of P-55-000130 discussed above. No indications of cultural resources were evident during the survey. The entire alignment in this section is paved asphalt concrete.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 2.

Section 3- Marquis Drive

See Appendix A, Photos 17-28.

55-001422 (Gables Inn Prehistoric Site)

This poorly known prehistoric resource has been recorded as a large bedrock mortar/milling complex with at least 35 mortar holes of various sizes between 1 and 7-inches deep being noted in 1968. The site has not been recorded or updated since 1968. The site was considered part of a much larger resource that included abundant obsidian and jasper artifacts, ashy soils, and at least one buried hearth. The 1968 site record provides little information on extent other than the site is estimated at ¾-acre but "…part of a larger encampment of Mi-Wuk Indians…[covering] about one sq. mile." This large size could be taken to indicate that the recorder in 1968 considered the entire valley a "large encampment."

The current survey identified the bedrock milling features as previously recorded (Appendix A, photos 20-22). The survey documented the milling features as greater than 20 meters from the APE. The property owner attested to finding various artifacts on the property, including an old horseshoe stamped Pony Express, but no corroboration or inspection was allowed.

The size of the bedrock milling feature is suggestive of those associated with large settlements. The denial of permissions to investigate the property since 1968 precludes a sufficient evaluation. With the absence of such large features elsewhere in the valley, it is plausible to assume this resource was a central habitation of the Me-Wuk in prehistoric times if not part of the Bald Rock Rancheria in historic times. The site is located at the mid-point between Bald Rock and the Sonora-Mono Toll House operated by William Fuller.

The field survey did not produce any artifacts or other remains in association with the milling features. Nor were soils visible due to dense vegetation cover and a combination of oak and redwood/cedar leaf duff. No soil probing was conducted to ascertain the presence, types, and quantities of artifacts or other remains that may be present in the sewer line easement.

Potential Effects

The soils in the area of Section 3B occur adjacent to a substantial bedrock milling feature and where obsidian and jasper artifacts had been identified previously. No professional excavations have ever occurred here, and the presence of such a large bedrock milling feature strongly suggests substantial habitation nearby. The resource may be potentially eligible under criterion d of the NRHP and criterion 4 of the CRHR. Excavations involving trenching for pipeline replacement could adversely impact this resource. *A determination of potential adverse effects is recommended for project construction at P-55-001422 in Section 3B.*

55-000054 (Sonora-Mono Road)

The Sonora-Mono Road was officially opened in October of 1864, with contractor J. D. Patterson making the trip by wagon from Strawberry Flat to Aurora, Nevada between October 19 and 21. It was completed as a joint project between San Joaquin, Stanislaus, and Tuolumne Counties, who granted rights to the Sonora-Mono Toll Road Company. This was a one-track road with turnouts; it was widened out the next year. Segments within the Project are found in or near Project Sections 3, 4, and 6 (Figure 2). The segment(s) in this area parallel with Twain Harte Drive which may overlap the old road in parts. In 1968, this segment was relinquished as state highway, being replaced by the new highway 108 located to the south. An earlier alignment of the historic road may be represented by Mono Drive, which appears to have the same characteristics as other segments recorded within the Stanislaus National Forest. The Sonora-Mono Road was integral to the settlement of the Central Sierras in general and Twain Harte in particular.

The records search plot of the old road in Section 3D places it approximately 80-90 feet north of Twain Harte Drive. Field survey did not identify any trace of a road grade where it is plotted. (Appendix A, Photo 27).

Potential Effects

A determination of no potential adverse effects is recommended for project construction at P-55-000054 in Section 3.

Section 4- Twain Harte Drive

See Appendix A, Photo 29.

This short section follows Twain Harte Drive and the assumed alignment of the Sonora-Mono Road (P-55-000054). The records search results provide a plot of the Sonora-Mono Road route that parallels the north edge of Twain Harte Drive, and in Section 4 the old road appears to be within 10-20 feet of the road shoulder (Appendix C). The sewer easement is located along the south shoulder of Twain Harte Drive. Twain Harte Drive has been improved and paved numerous times since the first few decades of the 20th century. The old dirt road from the 1860s is nowhere in evidence.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 4.

Section 5- Golf Club Drive (North)

See Appendix A, Photos 30-31.

No previously recorded resources occur within this section, and no cultural resources were noted during survey.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 5.

Section 6- Twain Harte Drive to Spruce Drive

See Appendix A, Photos 32-35.

No previously recorded resources occur within this section, and no cultural resources were noted during survey. The Sonora-Mono Road (P-55-000054) is recorded adjacent to section 6B but beyond the 20-foot buffer.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 6.

Section 7- Fuller to Manzanita Drive

See Appendix A, Photos 36-40.

No previously recorded resources occur within this section, and no cultural resources were noted during survey.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 7.

Section 8- South of Wildwood Drive

See Appendix A, Photos 41-47.

55-006544 (Wildwood Ditch)

Integral to the successful mining operations around Twain Harte was the redirection of water through a series of ditches and flumes. Water was redirected from the Stanislaus and Tuolumne Rivers to the valley and mines throughout the area. The Wildwood Ditch, named for its proximity to Wildwood Drive, is an offshoot of the larger water diversion structures mapped by USGS in the 20th century. The site record states:

> This resource is an earthen ditch segment contouring the slope of hill parallel to Wildwood Drive. It is well formed with a six -foot berm on its downhill side. Most of ditch is choked with vegetation and only 25 feet length is visible. It is located on private land, so it was not investigated further, but it looks to continue to the southeast. It Could be associated with early mining or ranching in Twain Harte.

The ditch was relocated as mapped, and it was confirmed that it indeed continued to the southeast. An extension of 65 feet was identified, and the sewer easement runs within 2 meters of the ditch. There is a section between the new extension identified and the previously recorded section that shows severe erosion from landslide. It is not known whether this erosion occurred before or after the original recording in 2002.

Potential Effects

A determination of potential adverse effects is recommended for project construction at P-55-006544 in Section 8.

Section 9- East of Tuolumne Drive

See Appendix A, Photo 48.

No previously recorded resources occur within this section, and no cultural resources were noted during survey.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 9.

Section 10- Tiffeni Drive

See Appendix A, Photos 49-53.

The sewer alignment in this section crosses Twain Harte Drive in an area where the Sonora-Mono Road (P-55-00054) has been previously recorded. Photo 51 in Appendix A shows the sewer alignment crosses beneath the recorded location of the resource within this section, but the original Sonora-Mono Road surface is not visible in this section. No cultural resources were noted during survey in section 10.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 10.

Section 11- East of Tuolumne Drive

See Appendix A, Photo 54.

No previously recorded resources occur within this section, and no cultural resources were noted during survey.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 11.

Section 12- East of Tuolumne Drive

See Appendix A, Photo 55.

No previously recorded resources occur within this section, and no cultural resources were noted during survey.

Potential Effects

A determination of no potential adverse effects is recommended for project construction in Section 12.

5.3 FINDING OF EFFECT

Six cultural resources, two prehistoric and four historic, were identified in the project APE. The historic resources include:

P-55-007116 (Twain Harte Dam)
P-55-007117 (Twain Harte Lake)
P-55-000054 (The Sonora-Mono Road)
P-55-006544 (Wildwood Ditch)

The project will have no adverse effects on Twain Harte Lake, Twain Harte Dam, or the Sonora-Mono Road. The Wildwood Ditch is very close to intersecting the sewer line easement and may suffer adverse impacts from equipment transport and excavation.

The prehistoric resources include:
P-55-000130 (Bald Rock)
P-55-001422 (Prehistoric Encampment)

The project will have no adverse effects on Bald Rock. There are no indications of prehistoric settlement or use within the APE in Section1.

The Section 3 sewer line easement is within the recorded boundary of P-55-001422 east of Marquis Drive. No documented features at the site are within the APE, but soils in Sections 3A and 3B may contain artifacts and buried features which may suffer adverse effects from equipment transport and excavation.

5.4 RECOMMENDATIONS AND MITIGATION MEASURES

Avoidance is the preferred measure for mitigating adverse effects to cultural resources. With both P-55-001422 (Sections 3A and 3B) and P-55-006544 (Section 8C), avoidance would be achieved by lining the existing pipes in the corresponding sections. If excavation is required to replace existing pipe, then the following mitigation measures are recommended:

P-55-006544 (Wildwood Ditch): This resource easily visible and is roughly parallel to the existing sewer line in section 8C. At its closest point the ditch is within 5 feet of the easement. This should be sufficient distance to avoid impacts from construction. It is recommended that the ditch be substantially flagged as an Environmentally Sensitive Area (ESA) prior to construction and carefully monitored to ensure avoidance.

P-55-001422 (Prehistoric Encampment):
Prior to any excavation in Sections 3A and 3B, a Phase II test excavation program should be implemented to determine whether significant artifacts or features occur in the proposed locations for sewer line improvements. Significant features would include, but not limited to, house and round house floors and other structural remains, human burials, cooking hearths, other stone features, storage pits, food processing areas and tool manufacturing loci.

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APPENDIX A:
PROJECT PHOTOGRAPHS

Note: Sewer alignments shown in yellow are approximations of easement centerlines



Photo 1-Section 1A-View W.



Photo 2-Section 1B-View SW.



Photo 3-Section 1B-View SW



Photo 4-Section 1B-View SE of Monument to Me-Wok Indians at Twain Harte Lake.



Photo 5-Section 1C-View East of 12 Bedrock Mortars at TUO-130.



Photo 6-Section 1C-View West (260°) of possible recent shrine at TUO-130. Note large blocks of red ochre and other stones on a a makeshift altar. A chert flake (Photo 7) was noted on the ground to right. Thin granite slab erected like a stelae.



Photo 7- Chert flake. Grid units are 0.2-inch.



Photo 8-Section 1C-Panorama view east of Twain Harte Dam and Bald Rock. Note existing sewer line suspended below dam and on steep face of Bald Rock.



Photo 9-Panorama view east of Twain Harte Lake.



Photo 10-Section 1D, View westfrom manhole up to Bald Rock



Photo 11- Section 1D, view NE along S shore.



Photo 12-Section 1D. View WSW showing typical slope along SW shore.



Photo 13-Section 1E. View NE. Note dense vegetation.



Photo 14-Section 1F near line terminus. View E.



Photo 15-Section 1F at line terminus noting dense blackberry thicket along Twain Harte Creek.



Photo 16-Section 2. View SW.



Photo 17-Section 2. View NE.



Photo 18-Section 3A. View NE from MH at Marquis Drive.



Photo 19-Section 3B. View NNE toward MH near Twain Harte Creek



Photo 20- Section 3B- Bedrock mortar feature 1 at P-001422. View E. Stake 1-meter long pointing N.



Photo 21- Section 3B- Bedrock mortar feature 2 at P-001422. View E.



Photo 22-Section 3B-Large Bedrock Mortar feature 3 at P-001422. View WSW. Stake 1-meter long pointing N.



Photo 23-Section 3B.View WSW at terminus.



Photo 24-Section 3C. View SSW of line crossing Marquis Dr.



Photo 25-Section 3C. View SW.



Photo 26-Section 3C. View SW.



Photo 27-Section 3D. View SE toward Twain Harte Drive.



Photo 28-Section 3D. View NW across Twain Harte Drive.



Photo 29- Section 4. View SW



Photo 30- Section 5- View NE along N side of Golf Course Drive.



Photo 31- Section 5- View SW along N side of Golf Course Drive.



Photo 32- Section 6A- View SSW on Twain Harte Drive at El Dorado Hotel.



Photo 33- Section 6A. Sonora-Mono Road toll gate monument.



Photo 34- Section 6B. View SSE.



Photo 35- Section 6C & 6D. View SW



Photo 36- Section 7A View N from Manzanita Road. Inaccessible.



Photo 37- Section 7B. View W to Tuolumne Road



Photo 38- Section 7C. View S on Tuolumne Road to Fuller Road



Photo 39- Section 7D. View along Fuller Road



Photo 40- Section 7E. View NNE along E side of Meadow Lane.



Photo 41- Section 8A. View SSW to intersection at Chapel of the Pines.



Photo 42. Section 8B. View WNW at Black Bear Lodge



Photo 43- Section 8C. View SSE across Wildwood Drive



Photo 44- Section 8D. View E along N side of Wildwood Drive.



Photo 45- Section 8C. View NW to extension of Wildwood Ditch (red) adjacent to sewer line (yellow).



Photo 46- Section 8C. View SE of Wildwood Ditch extension.



Photo 47- Section 8D. View SE of Wildwood Ditch (P-55-006544) as originally recorded.



Photo 48- Section 9. View E across Tuolumne Drive.



Photo 49- Section 10A. View SW to estimated location of MH47.



Photo 50- Section 10B. View N from MH46 to SP205.



Photo 51- Section 10B. View N from SP181 to MH46



Photo 52- Section 10C. View W from MH46 to MH26.



Photo 53- Section 10C. View E from MH26 to MH46 at Twain Harte School.



Photo 54- Section 11. View NNE from DMH2 to SP88.



Photo 55- Section 12. SP88 on Golf Course Drive.

APPENDIX B:
PERSONNEL QUALIFICATIONS

MICHAEL MACKO

Principal Investigator

PALEO SOLUTIONS
PALEONTOLOGICAL & CULTURAL RESOURCES CONSULTING SERVICES

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PROFILE

Mr. Macko is an archeological and cultural resources professional with more than 35 years of experience providing cultural and historical studies, master project plans, field study research, and agency coordination for numerous public and private clients. Mr. Macko specializes in cultural and historical surveys with an emphasis on Native American consultation. He has published in professional journals and has prepared hundreds of reports and records of investigations. Mr. Macko has designed and implemented projects involving all phases of cultural resource field studies, including preparation of research designs and treatment plans, conducting records and collections research, and survey and excavations from small to large and complex projects. He has managed project budgeting, staffing, subcontracting, agency coordination, permit approvals, and all aspects of research necessary. Major clients have included the Los Angeles Department of Water and Power, Southern California Edison Company, AT&T, Contel of California, the Counties of Los Angeles, Santa Barbara, Orange, Riverside, San Diego, San Bernardino, and San Luis Obispo.

EXPERIENCE & EDUCATION

Years of Experience
35 years

Education
M.A. Anthropology, University of California, Santa Barbara

B.A. Anthropology, University of California, Santa Barbara

CERTIFICATIONS & TRAINING

- BLM California Statewide Cultural Resource Use Permit Holder (CA-19-04)
- BLM Nevada Statewide Cultural Resource Use Permit Holder (NV-694)
- Certified in Field Research by the Society of Professional Archaeologists
- Certified in Collections Research, by the Society of Professional Archaeologists
- Registered Professional Archaeologist (990181)
- Riverside County Certified Archaeologist
- Certificate of Completion-Identifying Clovis Lithics in the Desert West. SCA 2016
- U.S. Forest Service, Advanced Effects Analysis Training: How to "right-size" document preparation. Conducted by USDA Forest Service, Region 5 (Pacific Southwest Region)
- FAA Remote UAV Pilot Certificate Number 4381004

AFFILIATIONS

- Society for American Archaeology
- Society for California Archaeology
- Pacific Coast Archaeological Society
- California Rock Art Foundation
- Southern California Paleontological Society

PROJECT EXPERIENCE

Twain Harte Sewer Pipeline Improvement Project
Twain Harte Community Services District • Tuolumne County, CA

Principal Investigator. Mr. Macko conducted a cultural records/literature search to identify known cultural resources and previous investigations within the project area and surrounding records search area. He is also responsible for preparing the Cultural Resources Technical Report presenting the methods and results of the record search and field survey. The District provides water, parks, recreation, and fire protection services and operates and maintains the sewer collection system serving the community with an estimated population of 2,500, which includes a total of 1,607 equivalent single-family resident units and 1,436 physical connections. The proposed project consists of the replacement of existing 4- to 10-inch diameter pipelines, within existing rights-of-way (ROW).

Division 20 Portal Widening/Turnback Facility Project
Los Angeles Metropolitan Transportation Authority • Los Angeles County, CA

Principal Investigator. Mr. Macko provided senior level review and transmitted weekly cultural, paleontological, and Native American monitoring summaries that are prepared for Metro. The Metro Division 20 rail yard, located at 300 S. Santa Fe Avenue in Los Angeles, serves as a maintenance and operations facility for Metro's Red and Purple line trains. Metro is proposing facility improvements to accommodate future service increases on the Metro Red and Purple Lines. These improvements, including widening the portal and new tracks and switches, will allow trains to provide faster service times at Union Station. Los Angeles County Metropolitan Transportation Authority.

PREVIOUS PROFESSIONAL EXPERIENCE

Aspen Environmental Group
Cultural Resources Group Manager. Mr. Macko was responsible for the design, execution and reporting of Aspen's archaeological and historic resource investigations per CEQA and NEPA requirements. Mr. Macko's projects included federal, state, county and city projects in Alpine, Fresno, Humboldt, Imperial, Inyo, Kern, Kings, Lassen, Los Angeles, Merced, Mono, Monterey, Nevada, Orange, Placer, Riverside, Sacramento, San Bernardino, San Diego, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Shasta, Siskiyou, Tulare, and Ventura Counties.

Firstcarbon Solutions (FCS Int'l)
Principal Archaeologist. Mr. Macko prepared CEQA and NEPA documentation for projects requiring state and federal permit review. Notable projects include a Historical Property Survey Report and Archeological Survey Report documentation for Caltrans Section 106 review of Native American consultation, execution of an Inadvertent Discovery Plan and Monitoring Plan per the Naval Weapons Station Seal Beach ICRMP, and a Phase 1 Cultural Resource Assessments for Orange, Los Angeles, Riverside and San Bernardino Counties clients.

The Keith Companies (TKC)
Director of Archaeology. Mr. Macko completed design, implementation and management of the Newport Coast Archeological Project for the Irvine Company. Management duties included staffing, budgeting, reporting to clients and supervisors, media coordination and direct coordination with the California NAHC and Native American Most likely Descendants (MLDs). Other Projects included the preparation of The Master Archaeological Preservation Plan of Audie Murphy Ranch for Pacific Coast Homes; and an evaluation of archaeological resources on the North Campus, University of California, Irvine.

Applied Conservation Technology, Inc. (ACT)
Senior Archaeologist. Mr. Macko was responsible for project design and implementation of all surveys, site recording, testing and data-recovery excavations to mitigate impacts for numerous projects. Management duties included staffing, budgeting, reporting to company officers and clients, and direct coordination with the California Native American Heritage Commission (NAHC) and Native American Most Likely Descendants). Key projects included The Intermountain Power Project (Great Basin - Utah to California) for the LA Department of Water and Power; the Bishop Creek (Owens Valley, California) Hydroelectric Project for Southern California Edison; and the San Joaquin Hills Transportation Corridor for the County of Orange.

HDR, Inc.
Principal Archaeologist. Mr. Macko was responsible for coordinating field surveys, testing and mitigation excavations, and report writing for the U.S. Department of the Air Force MX Missile Program. Initial projects focused on Areas of Potential Effect in the San Antonio Dunes at Vandenberg AFB, California.

PUBLICATIONS AND CULTURAL RESOURCE MANAGEMENT REPORTS

Phase I Cultural Resource Assessment for the Stagecoach Solar Project, San Bernardino County, CA (2020).

Class III Cultural Resource Survey for the Mesa Wind Repower Project. Riverside County, CA. (2019).

Class I Cultural Resource Survey for the Mesa Wind Repower Project. Riverside County, CA. (2019).

AERA EIR. Santa Barbara County, California (2018-Present).

Strauss Wind Energy Project Supplemental Environmental Impact Report Cultural Resource Sections. (2018-2019).

Powerhouse Fuels and Sawmill Reforestation Project Archaeological Resources Report. Angeles National Forest. (2019).

Phase I Cultural Resource Assessment for the Puerco Canyon Campground and Malibu Bluffs facilities Proposed by the Mountain Conservation Recreation Authority. Malibu, California. (2018-2029).

Omya Solar Project Phase I Cultural Resource Survey, San Bernardino County, California. (2018).

Archaeological Resources Report in Advance of Geotechnical Testing at the 1916 Water Surge Tower in Angeles National Forest. (2018).

Archaeological Resources Report for the Power Plant 1 and 2 Optical Ground Wire (OPGW) Line Project, Angeles National Forest, USDA Forest Service. (2018).

Cultural Resources Records Search and Pedestrian Survey for the Santa Clara River (SCR-1) Levee Improvement Project, Ventura County, CA. Responsibilities included consultation with tribal groups pursuant to AB 52, and SHPO Section 106 consultation with the USACE. (2018).

Cultural Resources Monitoring Plan: Santa Clara River (SCR-1) Levee Improvement Project, Ventura County, California. (2018).

Cultural Resources Records Search and Pedestrian Survey for the Ventura River (VR-1) Levee Rehabilitation Project. Responsibilities included consultation with tribal groups pursuant to AB 52, and SHPO Section 106 consultation. (2018).

Cultural Resources Monitoring Plan: Santa Clara River (VR-1) Levee Improvement Project, Ventura County, California. (2018).

Cultural Resource Phase I Assessment for Citizens Imperial Solar, LLC Project. (2018).

Report of Archaeological Monitoring at CA-ORA-322/1118 conducted for Naval Weapons Station Seal Beach, Energy Improvement Project, 800 Seal Beach Boulevard, Seal Beach, Orange County, California. Prepared for Firstcarbon Solutions, Irvine (2017).

Monitoring Report for Mission Bay Athletic Club (Rose Creek) #11496. 2639 Grand Avenue, San Diego, San Diego County, CA. Prepared for Envirobusiness, Inc., Long Beach, CA (2017).

Results of Archaeological Monitoring for the Verizon Wireless Highway 41/Portola Road Project, 9685 Morro Road, City of Atascadero, San Luis Obispo County, California. Prepared for Envirobusiness, Inc., Long Beach, CA (2017).

Archaeological Desk Review of Nine Proposed Telecommunication Facilities in Kern, San Bernardino, Los Angeles and Tulare Counties. Prepared for Envirobusiness, Inc., Long Beach, CA (2017).

Inadvertent Discovery Plan for Energy Improvements at Naval Weapons Station Seal Beach, Seal Beach, Orange County, California. Prepared for Silverstrand Construction, San Diego (2017).

Professional Opinion on Historic Resource Issues Regarding a Proposed Minor Remodel of 31505 Bluff Drive, Laguna Beach, California. Prepared for: the City of Laguna Beach on behalf of Mr. Charlie Kinstler, Laguna Beach, California (2016).

Results of Monitoring Ground Disturbance at the Central Carpinteria Verizon Wireless Project Site in Santa Barbara County, CA. (Includes Historical and Paleontological Analysis) Prepared for Envirobusiness, Inc., Long Beach, California (2016).

Results of Supplemental Monitoring of Ground Disturbance at the Verizon Wireless Emten Project Site in Lancaster, CA. Prepared for Envirobusiness, Inc., Long Beach, California (2016).

Results of Monitoring Ground Disturbance at the Downtown Morro Bay Verizon Wireless Project Site in San Luis Obispo County, CA. (Includes Lithic, Faunal and Human Osteological Analysis) Prepared for Envirobusiness, Inc., Long Beach, California (2015).

Results of Monitoring Ground Disturbance at the Verizon Wireless Emten Project Site in Lancaster, CA. Prepared for Envirobusiness, Inc., Long Beach, California (2015).

Implications of Ritual Biface Caches from the Irvine Site. Journal of California and Great Basin Anthropology Vol. 25, No. 1, pp. 93-108. Malki Museum, Inc. with Jeffrey S. Couch and Henry C. Koerper (2005)

The antiquity of Olivella shell beads at CA-ORA-64: AMS radiocarbon dated between 9420 and 7780 cal BP. Journal of Archaeological Science 32:393-398. With Jon Erlandson, Henry Koerper, & John Southon (2005).

Redefining the Working Assumptions of Obsidian Hydration Dating. Journal of California and Great Basin Anthropology, 22(2) pp 223-236. Coauthored with Christopher M. Stevenson and Mike Gottesman (2000).

Executive Summary of Mitigation Measures Implemented Pursuant to the Operation Plan and Research Design for the Proposed Newporter North Residential Development. Prepared for Irvine Community Development Company. (1998).

The Muddy Canyon Archaeological Project: Results of Phase II Test Excavations and Phase III Data Recovery Excavations at Archaeological Sites within the Crystal Cove Planned Community Phase IV Tentative Tract 15447, San Joaquin Hills, Orange County, California. Prepared for Irvine Community Development Company. (1998).

Final Report: Historic Town Center Park Archaeology—Identification and Preservation of Mission Period Structural Remains: Avoidance Planning for the City Christmas Tree, San Juan Capistrano, California. Prepared for City of San Juan Capistrano. (1998).

Results of a Phase I Cultural Resource Survey of the Tom's Farms Property in Temescal Canyon, Riverside County, California. Prepared for Mr. Tom Barnes. (1998).

Results of a Phase I Cultural Resource Survey of the Proposed Service Rock Products Five-Acre Concrete Batch Plant Site in Rosamond, Kern County, California. Prepared for Service Rock Products. (1997).

Final Report: Upper Newport Bay Regional Park Archaeological Project—Data Recovery at CA-ORA-170, Orange County, California. Prepared for the County of Orange Public Facilities Resources Department. (1997).

Draft Report: The Harriett Weider Regional Park Archaeological Project: Phase I Planning For Sites CA-ORA292/293, And 294, Huntington Beach, California. Prepared for EPT Company. (1996).

Final Report: Archaeological Monitoring of CA-ORA-600H Within The Mission Promenade Development, City Of San Juan Capistrano, Orange County, California. Prepared for The City of San Juan Capistrano, Planning Department. (1996).

Final Report: Results of Phase II Test Excavations and Phase III Data Recovery Excavations at Nine Archaeological Sites Within the Newport Coast Planned Community Phase III Entitlement Area, San Joaquin Hills, Orange County, California. Prepared for Coastal Community Builders, a division of The Irvine Company. (1996).

Final Report: Results of a Phase I Archaeological Resource Literature Review, Field Survey, and Report for the Proposed Glenway Ranch (Tract 50660), City of San Dimas, California. Prepared for the City of San Dimas. (1996).

Preliminary Report: Phase II Test Results from Nine Prehistoric Archaeological Sites Within the Proposed Upper Newport Bay Regional County Park. Prepared for EDAW, Inc. (1995).

Final Report: Cultural Resource Evaluation of the Mt. Wilson Toll Road Fiber-Optic Cable Route, Angeles National Forest, Los Angeles County, California. Prepared for David Evans and Associates. Inc. (1995).

Final Report: Historic Properties of the Milma Patented Claims, Hart Township, Castle Mountain, San Bernardino County, California. Prepared for Viceroy Gold Corporation. (1995).

Final Report: A Class III Intensive Survey of Five Land Exchange Sites for Hughes Land Company in the Rosamond and Palmdale Areas, Los Angeles and Kern Counties, California. Prepared for Hughes Land Company. (1995).

Final Report: A Class III Intensive Survey for Cadiz Land Company's Seismic Reflection Survey Line in Cadiz Valley, San Bernardino County, California. Prepared for Cadiz Land Company, Inc. (1995).

Final Report: A Class III Intensive Survey of a 100-Acre Sand and Gravel Mining Area, Imperial County, California. Prepared for the Lilburn Corporation. (1995).

Final Report: A Class III Intensive Survey of a Fourteen-Acre Development Site at Mesa Drive and Interstate 10 in Blythe, Riverside County, California. Prepared for Harry Ericson & Associates. (1995).

Results of an Archaeological Resource Literature Review, Field Survey and Report for the Granite Construction Co., Incorporated Section 17 Extraction Area, Thermal Canyon, Riverside County, California. Prepared for the Lilburn Corporation. (1995).

Final Report: Archaeological Investigations Conducted for the Abalone Cove Dewatering Wells, City of Rancho Palos Verdes, Los Angeles County, California. Prepared for the City of Rancho Palos Verdes, Environmental Services. (1995).

Letter Report on the Results of a Records Check and Monitoring of Excavations for the Swallows Inn Project, San Juan Capistrano, California. Prepared for the Southern California Gas Company. (1995).

Master Archaeological Operation Plan and Research Design for the Proposed Newporter North Residential Development. Prepared for the Coastal Community Builders, a division of The Irvine Company. (1994).

Final Report: Data Recovery Excavations at Five Late Prehistoric Archaeological Sites Along the Los Trancos Access Road, Newport Coast Planned Community, Orange County, California. Prepared for the Coastal Community Builders, a division of The Irvine Company. (1994).

Final Report: Cultural Resource and Paleontological Survey of the Proposed Sunwest Materials Project Site, San Bernardino County, California. Prepared for the Lilburn Corporation. (1994).

Archaeological Survey of the Mojave River Aggregate Project, Barstow, San Bernardino County, California. Prepared for Lilburn Corporation. (1994).

Final Report: Cultural Resource and Paleontological Surveys of the Proposed Kilo Gold Mines, Ltd. Project near Johnson Valley, San Bernardino County, California. Prepared for Lilburn Corporation. (1994).

Final Report: Cultural Resources Evaluation of The Atchison, Topeka and Santa Fe Railway Company, 21.1-Acre Quality Distribution Site, City of San Bernardino, California. Prepared for Mr. Patrick G. Mitchell, Attorney at Law, at Gresham, Varner, Savage, Nolan & Tilden on behalf of Atchison, Topeka and Santa Fe Railway Co. (1994).

Results of an Archaeological Resource Literature Review, Field Survey, and Report for the AT&T Anaheim to Mission Viejo Lightguide System-Santa Ana P.O.P. Diversity. Prepared for The Planning Center on behalf of AT&T. (1994).

Final Report of Archaeological Monitoring of the Ojai Valley Sanitation District 1927 Sewer Rehabilitation Project, Ventura County, California. Prepared for Willdan Associates. (1993).

Cultural Resources Investigation of the Proposed AT&T Lightguide System, Victorville to Bakersfield, California. Prepared for Lilburn Corporation on behalf on David Evans & Associates for AT&T. (1993).

Report on Cultural Resource Evaluation for National Register Eligibility Determination of CA SBR-7127, Near Barstow, San Bernardino County, California. Prepared for Ingrid Elsel & Associates on Behalf of Owl Rock Products. (1993).

Summary of Archaeological Monitoring, Test Excavations, and Data Recovery for the Foothill Transportation Corridor Northern Segment. Prepared for The Transportation Corridor Agencies, Costa Mesa, California. (1993).

Archaeological Resource Assessment of Tentative Tract Nos. 15510 & 15511, Phelan, San Bernardino County, California. Prepared for Lilburn Corporation. (1993).

Letter Report on the Results of Monitoring for the Walmart Center Project (CUP 91 265; GPA 91 05; TPM 13892) City of San Bernardino, California. Prepared for Gatlin/Doewrken Developments. (1992).

Historical, Archaeological, and Paleontological Assessment of the Silver Lake Mine, San Bernardino County, California. Prepared for Lilburn Corporation. (1992).

Results of an Intensive Archaeological Survey of the Waterman Road Debris Basin and Flood Control Channel Near Barstow, San Bernardino County, California. Prepared for Lilburn Corporation. (1992).

Results of a Phase I Archaeological Resource Literature Review and Field Survey for Project No. E6000223, Street Widening in Granada Hills Area Near Shoshone Avenue and Rinaldi, City of Los Angeles, California. Report Prepared for the City of Los Angeles Department of Public Works, Bureau of Engineering. (1992).

Results of Archaeological Test Excavations for the Foothill Transportation Corridor, Northern Segment, Construction Sections F8 and F9. Report prepared for the Transportation Corridor Agencies, Costa Mesa. With Dr. Gary S. Hurd. (1992).

Early Settlement in Agua Chiñon Canyon: Results of Archaeological Data Recovery Excavations at CA ORA 1070, 1298, and 1299, Foothill Transportation Corridor, Northern Segment, Construction Sections F8 and F9. Report prepared for the Transportation Corridor Agencies, Costa Mesa. With Dr. Gary S. Hurd. (1992).

Buried Archaeological Features in Borrego Canyon: Results of Archaeological Monitoring and Data Recovery Excavations for the Foothill Transportation Corridor, Northern Segment, Construction Sections F8 and F9. Report prepared for the Transportation Corridor Agencies, Costa Mesa. With Dr. Gary S. Hurd. (1992).

Final Report on the Results of a Class III Cultural Resource Survey of the 220 Acre New Owl Rock Products Land Exchange Near Barstow, San Bernardino County, California. Prepared for Ingrid Elsel & Associates on Behalf of Owl Rock Products. (1992).

Letter Report on the Results of a Records Check and Literature Review for the Chan Property in Rice Valley, San Bernardino County, California. Prepared for Lilburn Corporation. (1992).

An Archaeological and Paleontological Assessment of the Proposed Home Depot Site, Victorville, California. Prepared for Lilburn Corporation. 1992).

Letter Report on the Results of Monitoring for the Wescon Sewer Replacement Project Job Nos. 93 & 95, Mission Beach Area, City of San Diego. (1991).

Cultural Resources Significance Evaluation and Treatment Plan, Bolo Station Facilities, San Bernardino County, California. National Register Eligibility Determinations for Historic Properties within a proposed landfill site near Amboy, California. (1991).

Results of Archaeological Monitoring and Test Excavations for the Foothill Transportation Corridor Northern Segment, El Toro Ridge Section. Report prepared for the Transportation Corridor Agencies (1991).

Cultural Research Investigations of the Agua Alta Spring Site, San Jacinto Ranger District, San Bernardino National Forest, Riverside County. Report prepared for the United States Forest Service. (1991).

Archaeological Resource Assessment of the Proposed Indian Village Residential Development, Cabazon Indian Reservation, Riverside County, California. (1991).

Archaeological Cultural Resource Assessment of the Landers Landfill Expansion Area, San Bernardino County, California. (1991).

Archaeological Assessment of the Oak Park Commerce Center, Parcel map 25101, ASA #18, with Related Plot Plans 12468 and 12470, Riverside County, California. (1991).

Archaeological Assessment of APN 650 300 001, Thousand Palms, Riverside County, California. (1991).

Archaeological Assessment of APN 650 300 002, Thousand Palms, Riverside County, California. (1991).

Archaeological Assessment of APN 650 180 004, Thousand Palms, Riverside County, California. (1991).

Archaeological Assessment of APN 650 180 006, Thousand Palms, Riverside County, California. (1991).

Results of Archaeological Monitoring of Groundwater Well Borings for Arco Station 1706, City of San Juan Capistrano, California. (1991).

Cultural Resource Survey and Evaluation for the Walmart Center Project (CUP 91026; GPA 91 05; TPM 13892) City of San Bernardino, San Bernardino County, California. (1991).

The History and Prehistory of Mud Springs, Results of an Archaeological Test Program at CA LAn 75, City of La Verne, Los Angeles County, California. (1990).

Archaeological Resource Assessment of the Proposed Vista Santa Rosa Planned Community, City of La Quinta, Riverside County, California. (1990).

Historic Resources Evaluation for CUP 90 23 (371 375 Eleventh Street), City of San Bernardino, San Bernardino County, California. (1990).

Final Report on Implementing a Data Recovery Program for Eight Sparse Lithic Scatters Northeast of Rimrock, San Bernardino County, California. Report prepared in support of a minor subdivision for The University of Southern California and Paulist Productions. (1990).

Results of a Records Check and Intensive Survey of Tentative Parcel Map 25602, Menifee Valley, Riverside County, California. Report Prepared in Support of a Minor Subdivision. (1990).

Results of an Intensive Archaeological Survey of PM 8751 (6.2 acres), City of San Bernardino, San Bernardino County, California. Report prepared in support of a minor subdivision for John Cheeley, Cheeley Chiropractic. 1990).

Report on Olivella biplicata Artifacts from CA SCr 160 with reference to implications for Bead Manufacturing. Report prepared in support of data recovery report by Dr. Rob Edwards, Cabrillo College Archaeology Program. (1990).

Master Archaeological Preservation Plan Audie Murphy Ranch, Riverside County, California. Report prepared in support of Riverside County Specific Plan No. 209 for Pacific Coast Homes, Huntington Beach, California. (1990).

Archaeological Test Results, Significance Evaluations, and Recommendations for Mitigation of Impacts at CA ORA 115A, 115B, 116, & 121B. Report prepared for The Office of Special Project Development Real Estate, University of California, Irvine. (1989).

Report on Cultural Resource Evaluations for National Register Eligibility Determinations at CA SBR 2257, 4022, & 4024, San Bernardino County, California. Report Prepared in support of Federal Permit Approval for Contel of California Fiber Optic cable Project Ridgecrest to Helendale, California. (1989).

Construction Monitoring Plan for Archaeological and Historical Resources within the United States Borax and Chemical Company's Boron Cogeneration Facility. Report Prepared in Support of FERC Licensing. (1989).

Archaeological Survey Report of Amcor Properties, Inc. 600 Acre French Valley Specific Land Use Plan, Riverside County, California. Report Prepared in Support Of Specific Plan Approval. (1989).

ORA 614, SBR 3690, and SBR 4032: A Reassessment of the Encinitas Tradition in the Chino Hills. Pacific Coast Archaeological Society Quarterly. Vol. 25, No. 2, pp. 1 21. (1989).

Results of an Intensive Cultural Resources Survey of a 120 acre Parcel Near Calimesa, Riverside County, California. Report Prepared in Support of a Minor Subdivision. (1989).

Archaeological Survey Report of a 23 acre Parcel of Land in Apple Valley, San Bernardino County, California. Report Prepared in Support of a Minor Subdivision. (1989).

Results of an Archaeological and Paleontological Resources Records Check, Literature Review, and Site Walkover for the Hemeter Project, Laguna Niguel. (1988).

Report Prepared for Hemeter Development Company in Support of Grading Permit Approval. (1988).

An Archaeological Assessment of The Pacific Direct Current (DC) Intertie Modification Cultural Resources Evaluation Emergency Construction. Report Prepared in Support of Federal Permit Approval. (1988).

Report of an Archaeological Records Check and Literature Review for the Stoneridge Centre Specific Plan No. 211, City of Moreno Valley, Riverside County, California. Report Prepared in Support of Specific Plan Approval. (1988).

Letter Report on a Supplementary Cultural Resource Survey for the Midway Sunset 230kV Transmission Line Midway Substation to Structure 19/7. Report Prepared in Support of FERC Licensing. (1988).

Letter Report of Cultural Resource Survey Results for The High Desert Water District Pipeline Near Landers, California. Report Prepared in Support of Federal Permit Approval. (1988).

Letter Report of a Cultural Resource Survey for an Additional Parking Area for the Argus Cogeneration Expansion Project. Report Prepared for Kerr McGee Chemical Corporation in Support of Federal Permit Approval. (1988).

Cultural Resources Survey Report for the Continental Telephone Fiber Optics Cable Project Between Lee Vining and Bridgeport, Mono County, California. Report prepared in support of Federal Permit Approval for Contel of California Fiber Optic Cable Project. (1988)

The Archaeological Resources of Foothill Ranch: Evaluations and Data Recovery Specifications. Report prepared for Hon Development Company in Support of Grading Plan Approval. (1988).

Revised Final Report on the Results of an Intensive Survey of a 160 acre Minor Subdivision East of Helendale, San Bernardino County, California. Report Prepared in Support of Conditions of Approval for a minor Subdivision. (1988)

An Archaeological Assessment of Tentative Tract 13450, Phelan, California. Report Prepared for Inland Engineering as Condition of Approval for Minor Subdivision. (1988).

Archaeological Resources Technical Appendix. Report prepared in support of the Irvine Coast Planned Community Development Environmental Impact Report for the Irvine Company. (1988).

Paleontological Resources Technical Appendix. Report prepared in support of the Irvine Coast Planned Community Development Environmental Impact Report for the Irvine Company. (1988).

Final Report on Archaeological Survey Results for United States Borax and Chemical Company's Boron Cogeneration Facility Plant Site, Waterline Route, and Electrical and Gas Transmission Route Corridors. Report prepared in support of an FERC certification. (1988).

Preliminary Report on Archaeological Survey Results for the Big Bear City Community Services District Flouride Blending Project. (1988).

Results of an Intensive Cultural Resource Survey of a 160 Acre Minor Subdivision (SW 1/4 Sec. 1, T.8N.,R.4W. SBM) East of Helendale, San Bernardino County, California. Report Prepared for Karpinen Birchall, Inc. in Support of Conditions of Approval for a Minor Subdivision. (1987).

Archaeological Survey Report of a 250 Acre Parcel of Land (TT 13783 and TT 13784), City of Victorville, California. Report Prepared for William G. Kellen & Associates. (1987).

Results of an Intensive Cultural Resources Survey for the Expansion of the Twentynine Palms Water District Lear Avenue Annexation, Townships 1N & 2N, Ranges 8E & 9E, San Bernardino County, California. Report Prepared for Tom Dodson & Associates. (1987).

Results of an Intensive Cultural Resource Survey of 353 Acres Within the Hi Desert Concrete Products, Inc. Quarry Reclamation Plan, Twenty nine Palms, San Bernardino County, California. Report Prepared for Tom Dodson & Associates. (1987).

An Archaeological Assessment of El Rancho Murrieta Thoroughbred Ranch, Riverside County, California. Report Prepared for INCO Homes. (1987).

Draft Supplement to the Archaeological Survey Report, Results of Cultural Resources Stage I Investigations for the San Joaquin Hills Transportation Corridor. Report Prepared for the County of Orange, Environmental Management Agency. (1987).

Results of an Intensive Cultural Resource Survey of a 105 Acre Minor Subdivision in Summit Valley, San Bernardino County, California. Report Prepared for D. Swindle and E. Kilgore. (1987).

Results of an Intensive Cultural Resource Survey of a 6.85 Acre Expansion of the Proposed California Energy Company Field Office Site Near Coso Junction, Inyo County, California. Report Prepared for McClenahan & Hopkins Associates. (1987).

Archaeological Survey Report of the Kemper Campbell Ranch (APN 480 111, APN 480 013, and APN 480 030), Victorville, California. Report Prepared for Forecast Corporation. (1987).

Results of an Intensive Cultural Resources Survey of Three Alternate Routes for a Natural Gas Pipeline from the All American pipeline Cadiz pump Station to PG&E Gas Line, Township 5N & 6N, Range 14E, San Bernardino County, California. Report Prepared for All American Pipeline Company in Association with Applied Conservation Technology, Inc. (1987).

Results of an Intensive Cultural Resources Survey for the Impact Area of Towers 85 3 and 85 4, Sylmar Expansion Project. Report Prepared for the City of Los Angeles, Department of Water and Power, in association with Applied Conservation Technology, Inc. (1987).

Outline of a Cultural Resources Management Plan for the Coso Known Geothermal Resource Area, Inyo County, California. Report Prepared for the City of Los Angeles, Department of Water and Power, in association with Applied Conservation Technology, Inc. (1987).

Report of Field Survey of Waterline Corridor Segments and Site mapping at CA SBA 2048, Vista Del Mar School Relocation Project. Report Prepared for The Planning Corporation of Santa Barbara. (1987).

Results of Boundary Testing at Sites CA SBA 69 & CA SBA 70 Within the Winchester Common Residential Development and Cathedral Oaks Road Extension Project Sites. Report Prepared for The Planning Corporation of Santa Barbara. (1987).

Results of Test Excavations at Five Cultural Resource Sites within the Midway Sunset Cogeneration Project. Report Prepared for Midway Sunset Cogeneration Company in Association with Applied Conservation Technology. Co-authored with Jay. D. Frierman and Keith D. Rhodes. (1987).

Results of an intensive cultural resource survey of a 160 acre minor subdivision south of the Mud Hills, San Bernardino County, California. Report prepared for Mr. Robert Greenberg per scope of work requirements of the County of San Bernardino Office of Planning. (1987).

Results of exploratory backhoe trenching to determine the presence/absence of buried archaeological materials for the proposed office project at 25 Carlo Drive, Goleta, California. Report prepared for the Planning Corporation of Santa Barbara. (1987).

Report of a Historical Archaeological Investigation of the R. Gonzalez Adobe. Report Prepared for the Planning Corporation of Santa Barbara. (1987).

Results of a Supplementary Phase I Cultural Resources Survey of the Winchester Common Residential Development Project Site and Recommendations for Phase II. Report prepared for the Planning Corporation of Santa Barbara. (1987).

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Results of Archaeological Testing at CA SBA 1158, Goleta Beach County Park. Report prepared for the Santa Barbara County Parks Department. (1986).

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Preliminary Archaeological Testing Results at Prehistoric Kavinich (CA RIV 2935). Prepared for the City of Indian Wells, Riverside County, California. Co authored with Jill Weisbord. (1985).

Pacific Intertie HVDC Upgrade, Cultural Resource Survey and Monitoring Program Results. Report prepared for the City of the Los Angeles, Department of Water and Power. (1985).

Celeron/All American Pipeline Project, Cultural Resources Survey, Santa Barbara, County, California. Report prepared for Environmental Research and Technology. (1985).

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Specialized Food Procurement at the Elliott Ranch Site Along the Lower Kern River, California: Results of Kern River Cogeneration Project Cultural Resource Data Recovery Program at CA KER 1437. Report prepared for Southern California Edison Company. Co authored with Edward B. Weil. (1984).

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Report on Status of Cultural Resources on Portions of Accessor's Parcels 49 03 46 and 47, Santa Barbara, California. (1980).

Results of Archaeological Investigations at Ca SBA 16, Santa Barbara, California. Co authored with Jon Erlandson. Prepared for Cultural Resource Associates, Santa Barbara, California. (1980).

Summary of HDR Archaeological Testing and Mitigation Excavation Programs in the San Antonio Terrace Dunes, Vandenberg Air Force Base. (1980).

Analysis and Economic Implications of Olivella biplicata Artifacts from CA SBA 1582. Prepared for Social Process Research Institute, University of California, Santa Barbara. (1980).

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Cultural Resources Technical Report on Archaeological Sites at Corona Del Mar Ranch, Goleta, California. Prepared for Dames and Moore, Environmental Consultants, Santa Barbara, California. (1979).

Results of a Supplementary Field Reconnaissance of the Proposed Solar Heights Tract and Associated Developments in Pismo Beach, California. Prepared for Mr. Lonnie Wells, Project Proponent, San Luis Obispo County. (1979).

Analysis of Beads and Ornaments from the Cuyama and Sisquoc River Area in the Collections of the Smithsonian Institution (Accession No. 162205). Prepared for Dr. Stephen Horne, United States Forest Service, Goleta, California. (1978).

Analysis of Beads from San Miguel Island. Report prepared for R.S. Greenwood, under contract with the National Park Service. (1978).

Archaeological Field Reconnaissance of the Proposed Santa Barbara Health Center, Dos Pueblos Ranch, Santa Barbara, California. Report prepared for the Department of Environmental Resources, Santa Barbara County, California. (1978).

Description and Implied Dates of Artifacts Collected from Ca SMI 261 A, San Miguel Island, California. Prepared for Dr. Charles Rozairre, Los Angeles County Museum. (1978).

Ethnoarchaeology of Beads and Bead Manufacturing on Santa Cruz Island. Unpublished M.S. (1978).

Historic Background of Storke Ranch, report prepared for Larry Wilcoxon under contract with University of California at Santa Barbara. Co authored with Jeanne Arnold. (1978).

Prehistoric Economy in the Central Santa Ynez Valley. In Preliminary Archaeological Excavations at San Marcos Ranch. (1978).

KAREN BREHM

Associate Archaeologist

PALEO SOLUTIONS
PALEONTOLOGICAL & CULTURAL RESOURCES CONSULTING SERVICES

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Stantec

PROFILE

Ms. Brehm earned her Master's degree in Archaeological Sciences from Durham University, Durham United Kingdom, and her Bachelor's degrees in Anthropology with a concentration in Archaeology and Near Eastern History from the University of California, San Diego. Over the past seven years, she has gained experience in cultural resource management within the Great Basin, Mojave Desert, and in South America by conducting and supervising surveys, lithic analysis, excavations, laboratory analysis, research, monitoring, and field mapping. Ms. Brehm has recorded numerous archaeological sites and is familiar with the identification and analysis of prehistoric and historic-age artifacts and features. In addition, she is well versed with field data reporting, ancient pottery classification and reconstruction, archaeological investigations, completing Department of Parks and Recreation (DPR) Primary Record Forms, and has coordinated with Native American groups providing consultation. Ms. Brehm is also skilled and trained in using X-ray Fluorescence (XRF) technology and equipment, Scanning Electron Microscope (SEM) with XRF capabilities, Geoprobe drilling rig/equipment operation, Ground Penetrating Radar, and Trimble survey equipment.

EXPERIENCE & EDUCATION

Years of Experience
7 years

Education
M.S. Archaeological Sciences
Durham University, Durham United Kingdom, 2014

B.A. Anthropology with a Concentration in Archaeology
University of California, San Diego, 2011

B.A. Near Eastern History
University of California, San Diego, 2011

PRESENTATIONS

Baker, Jeffrey L, Elizabeth Celentano, Kaitlin A. Ruppert, and Karen D. Brehm, NRHP Evaluations of Six Prehistoric Sites and Six Historic Sites in the North Base and Branch Park Areas, Edwards Air Force Base, California. Project 2018-E (Branch Park). Redhorse Corporation, San Diego.

Baker, Jeffrey L., Elizabeth Celentano, and Karen D. Brehm, Recent Geologic Changes on Edwards Air Force Base: Implications for the Archaeology of the Western Mojave. Paper Presented at the 8th Biennial Three Corners' Conference. November 2, 2109, Las Vegas, NV.

Celentano, Elizabeth, Jeffrey L. Baker, and Karen D. Brehm, 50 Shades of Clay: The Geoarchaeology of Playa-Dune Complexes on Edwards Air Force Base. Paper Presented at the 8th Biennial Three Corners' Conference. November 2, 2109, Las Vegas, NV.

PROJECT EXPERIENCE

SCG024 eTS 47828 Intensive Pedestrian Survey L6916 TEG Replacement
Southern California Gas Company • San Bernardino County, CA

Crew Chief. Ms. Brehm conducted an intensive pedestrian survey to identify cultural resources within the project area that passed through the World War II military Desert Traning Center and the Cold War era Desert Strike military training and exercise area. The project consists of approximately 12-miles of existing disturbed pipeline ROW measuring 150-feet in width, for a total of approximately 226.52 acres with a maintenance road that is adjacent to the pipeline. The lands being surveyed are under the administration of the Bureau of Land Management, Barstow and Needles, California State, and privately-owned. The project is being undertaken for the purpose of compliance with Section 106 of the National Historic Preservation Act.

SR-138 Widening, Segment 13
California Department of Transportation, District 7 • Antelope Valley, Los Angeles County, CA

Archaeologist. Ms. Brehm conducted archaeological excavation monitoring and contributed to the preparation of the XPI study proposal to define all vertical and horizontal boundaries of archaeological sites within the Direct APE. Caltrans District 7 proposed to widen the existing two-lane divided highway of State Route (SR-) 138 to a structural section consisting of two 12-foot lanes and an 8-foot shoulder in each direction divided by a 16-foot two way left-turn median. As of 2005, the project was divided into thirteen (13) segments. Cultural resources studies are being conducted to support an environmental revalidation of the project. The project has required acquisition of new right of way and relocation of some existing utilities.

Central Park West Development Project
Lennar • Irvine, CA

Field Technician. Ms. Brehm provided construction monitoring and reviewed daily monitoring logs for accuracy. Lennar proposes to develop an eight-story parking/residential condominium structure with 285 units. Four six-story residential buildings are proposed overtop a singular two-story shaped reinforced concrete parking structure. Two levels of parking are proposed below the podium deck. The proposed development will also include residential amenities, a lobby area, retail space, monuments, water features, driveways into the parking structure, etc. Finished grades are anticipated to vary from approximately 0 to 15 feet above current grades.

Defense Environmental Restoration Program (DERP) Formerly Used Defense Sites (FUDS) Military Munitions Report Program (MMRP) Remedial Investigations (RI)
United States Army Corps of Engineers • Imperial County, CA

Archaeologist. Ms. Brehm conducted an intensive pedestrian cultural resources survey over approximately 210 acres of the project area. All cultural resources consisting of prehistoric and historic archaeological sites and historic architectural resources were identified and documented. The U.S. Army Corps of Engineers (USACE) is implementing a remedial investigation (RI) program to identify and remediate potential unexploded ordnance (UXO) within two Munitions Response Sites (MRS) in Imperial County that were previously used by the U.S. Navy as target ranges.

AVA Arts Districts Project
AvalonBay Communities, Inc. • Los Angeles County, CA

Staff Archaeologist. Ms. Brehm provided archaeological monitoring and completed daily monitoring logs for the proposed mixed-use development project. Monitoring consists of visually inspecting mass grading, backhoe, trenching, and potholing activities during and after excavations, checking spoils produced by these excavations, and inspecting the sidewalls and floors of the trenches. The project consists of a mixed-use infill development of a 3.75-acre site. The development includes constructing an 85-foot-tall building containing 475 live/work units, 61,200 square feet of ground-floor retail, and parking for up to 842 vehicles.

Whittier Narrows Water Reclamation Project
Los Angeles County Sanitation • Los Angeles County, CA

Archaeologist. Ms. Brehm conducted archaeological monitoring during construction excavation activities of approximately 600 feet of sewer pipe and three manholes. All monitoring was conducted to satisfy the requirements of the U.S Army Corps of Engineers and in accordance with the California Environmental Quality Acts, National Environmental Policy Act, and section 106 of the National Historic Preservation Act.

Pacific Emerald Residential Development
Pacific Communities Builder, Inc. • Riverside County, CA

Archaeologist. Ms. Brehm is preparing the Cultural Resource Assessment Report for the proposed Pacific Emerald Residential Development project in conformance with City of Perris regulations and the California Environmental Quality Act guidelines. The technical assessment for the project that comprised a search of existing records for the project area and a 0.5-mile radius through the Eastern Information Center at the University of California, Riverside; a review of historic maps and aerial photographs; and a search of the Sacred Lands File by the Native American Heritage Commission to identify sensitive or sacred Native American resources within or near the project area. The proposed Pacific Emerald Residential Development project will consist of the construction of approximately 201 lots of detached, single-family, one-story homes for an age-restricted (55+) community, three recreational areas on 0.96 acres, 1.66 acres of open space, and a 0.59-acre detention basin. The City of Perris requires the completion of paleontological and cultural resources technical studies for the proposed project in compliance with CEQA.

Western Purple Line Extension Project - Section 3
Los Angeles County Metropolitan Transportation Authority • Los Angeles, CA

Field Technician. Ms. Brehm is providing archaeological monitoring during earth-moving activities such as, but not limited to, grading, excavation, trenching, and drilling. The project is the third of three sections to be designed and constructed as part of Metro's Measure R and Measure M Programs. Section 3 will extend from Westwood from the future Century City Constellation Station that is part of Section 2. The project is located entirely underground, primarily following Wilshire Boulevard, and includes the design and construction of approximately 2.56 miles of double-track heavy rail, two new stations as well as the purchase of 16 heavy rail vehicles. The Westwood/UCLA Station is within the jurisdiction of the City of Los Angeles. The Westwood/Veterans Administration (VA) Hospital Station is within the jurisdiction of the unincorporated area of Los Angeles County. The project also includes train controls, signals, traffic controls, communications, traction power supply and distribution, fare collection systems and equipment, acquisition of right-of-way, and utility relocations.

Edwards Air Force Base
Staff Archaeologist. Ms. Brehm conducted various tasks for ongoing projects on base, including but not limited to survey, excavation, artifact recording and processing, report preparation, and DPR completion.

Archaeological Survey and NRHP Evaluations of the North Base and Branch Park Areas
Edwards Air Force Base, Kern County, California

Field Director. Ms. Brehm conducted a surface archaeological survey and test excavations of six prehistoric and six historic-age sites in the North Base and Branch Park Areas of Edwards Air Force Base. She was responsible for the supervision of field crew; field survey; artifact identification; documentation of prehistoric, historic, and military sites; the determination of excavation unit locations; execution of test excavations; assessment of site disturbances; and preparation of DPR records and the technical report.

Phase I Archaeological Survey in the Bissel Basin Region
Edwards Air Force Base, Kern County, California.

Crew Chief. Ms. Brehm conducted an intense pedestrian survey covering 629 acres in the Bissel Basin Region. This included the recording of several known and previously unknown prehistoric sites. She was responsible for the documentation of sites, artifact collection, identification, lab processing, and report preparation.

Archaeological Survey and NRHP Evaluations of Historic Sites in the Central Base Region
Edwards Air Force Base, Kern County, California

Crew Chief. Ms. Brehm provided an intense pedestrian survey to locate, record, and evaluate 16 archaeological sites located in the Central Basin Area of Edwards Air Force Base. She was responsible for the supervision of field crew, locating and recording of sites, surface excavation of several large historic-age refuse deposits, artifact collection and analysis, lab processing of artifacts, and report preparation.

Green Valley Road 2 Bridge Replacement Project
Placerville, CA

Crew Chief. Ms. Brehm conducted test trenching to determine the presence or absence of cultural remains prior to the rebuilding of two bridges and a retaining wall.

Red Beach Rail Bridge Expansion project
Marine Corps Base, Camp Pendleton, San Diego County, CA

Archaeological Monitor. Ms. Brehm conducted archaeological monitoring during the rebuilding and expansion of a rail bridge, and various associated tasks, located in a culturally sensitive area.

Yosemite Royal Arches Meadow Project
Yosemite National Park, CA

Crew Chief. Ms. Brehm utilized Ground Penetrating Radar to determine the presence, location, and identifaction of clay pipes installed in Royal Arches Meadow, Yosemite Valley, CA. in the early 20th century, possibly for the purpose of mosquito abatement.

Manthey Road Bridge Replacement Project
Lathrop, CA

Supervising Archaeologist. Ms. Brehm provided soil sampling and analyses through geotechnical boring and field examination to assess the need for further archaeological testing.

Manthey Road Bridge Replacement Project
Lathrop, CA

Lead Archaeologist. Ms. Brehm conducted test trenching in a highly sensitive area for the purpose of establishing presence or absence of cultural or human remains. Taxonomic identification and excavation of human remains, report to tribe and authorities.

Newcastle Homes Construction
Newcastle, CA

Field Director. Ms. Brehm conducted a pedestrian survey over a private parcel prior to construction of single-family residences.

Tilden Nature Area Sediment Basin Dredging Project
Berkeley, CA

Archaeological Monitor. Ms. Brehm conducted archaeological monitoring for eight months during the redesign and dredging of three ponds and the construction of an environmental education area, all of which were located within a known historic site and the vicinity of prehistoric sites.

Collier SRRA Facilities Upgrade Project
Yreka, CA

Archaeological Monitor. Ms. Brehm conducted archaeological monitoring for 10 months during the installation of an updated waste water treatment system located within known pre-historic and historic sites.

Geophysical Investigation of Pearson Tract & Randall Island Levees
Courtland, CA

Archaeologist/Equipment Technician. Ms. Brehm conducted a geophysical investigation using mobile Electromagnetic Resistivity equipment to determine the location of disturbances within the levee structure.

Green Valley Road 2 Bridge Replacement Project
Placerville, CA
Archaeologist/Equipment Operator. Ms. Brehm conducted archaeological boring to determine presence or absence of cultural remains prior to the rebuilding of two bridges and a retaining wall.

Green Valley Road 2 Bridge Replacement Project
Placerville, CA

Archaeologist. Ms. Brehm provided archaeological excavation of units to determine if artifacts that were found during archaeological boring were primarily or secondarily deposited.

Yuba 20/70 ALD Project
Marysville, CA

Archaeological Monitor. Ms. Brehm conducted night monitoring of road electrical upgrading over the course of a week in a historically sensitive area.

Ukonom 3 Drainage Project
HWY 96, CA

Archaeologist. Ms. Brehm provided a pedestrian survey of 38 discontiguous locations running along an 80-mile stretch of the Klamath River Highway prior to culvert upgrade/replacement.

Three Humboldt Bridges Seismic Retrofit Project
Somes Bar, Arcata, and Willow Creek, CA

Archaeologist. Ms. Brehm provided pedestrian surveys over each of the bridges located at Camp Creek, G Street Overcrossing, and Willow Creek.

Newtown Bridge Replacement Project
Newtown, CA

Archaeologist. Ms. Brehm conducted test trenching in a culturally sensitive area for the purpose of preventing or minimizing damage to a prehistoric site located within the Area of Potential Effect of a bridge replacement project.

Walnut Grove Treated Storage Tank & Booster Station Project
Walnut Grove, CA

Archaeologist. Ms. Brehm conducted test trenching for the purpose of preventing or minimizing damage to any possible prehistoric/historic site located within the Area of Potential Effect of a new water storage tank installation.

Winters Putah Creek Nature Park Channel Realignment Phase 3
Winters, CA

Archaeologist. Ms. Brehm provided an intensive pedestrian survey to eschew damage or alteration of any cultural resources located in the project area prior to construction.

Natomas Basin (Reaches E, F, and G) of the American River Common Features Levee Project
Natomas Basin, CA

Archaeological Monitor. Located in Sacramento and Sutter counties, Ms. Brehm performed archaeological monitoring of geotechnical boring over the course of nine months on 34 locations along the Natomas Basin levee system. Monitoring was on behalf of the U.S. Army Corps of Engineers (USACE) for the purpose of identifying the possible presence of both historic, and prehistoric cultural sites that may be affected by future levee projects in the Natomas Basin area.

Mojave Survey Project
Field Technician. Ms. Brehm conducted a surface survey of 1700 acres of high desert parcels in rough terrain and harsh conditions. The presence, condition, and scale, of previously recorded sites were confirmed, as well as locating, mapping, and recording any new sites that were discovered.

Mendocino Headlands Test Project
Mendocino, CA

Field Technician. Ms. Brehm provided an evaluation and data recovery to determine the impact of public access, tourism, and on some occasions, very high foot traffic, on unexposed historic and prehistoric sites located at Mendocino Headlands State Park.

Goleta Data Recovery Project
Field Technician. Ms. Brehm conducted excavation of several control units, resulting in the recovery and classification of lithics and faunal remains. This recovery was facilitated through extensive wet screening of all fill; this was necessary due to the extreme density of the soil.

Fremont Test Project
Fremont, CA

Field Technician. Ms. Brehm conducted evaluations of a small-scale excavation of prehistoric hearths located in a protected wetland. Recovered artifacts were analyzed and classified.

Feather River Levee Project
Gridley, CA

Field Technician. Ms. Brehm provided preliminary site surveys, identification of surface artifacts and cultural features, test trenching of multiple sites to determine presence or absence of both historic and pre-historic cultural occupation, isolating human burial locations for future protection, and lithic analysis and classification.

Los Osos Wastewater Facilities Project
Los Osos, CA

Field Technician. Ms. Brehm conducted preliminary site surveys, provided identification of surface artifacts and cultural features, shovel test probes, and excavation of control units. Also conducted were lithic analysis and classification.

Feather River Levee Project
Yuba City, CA

Field Technician. Ms. Brehm performed excavation and removal of a large population of human remains for the purpose of protected reburial, including cultural artifacts and associated grave goods.

Evaluations of pre-historic sites at the United States Marine Mountain Warfare Training Center
Bridgeport, CA

Field Technician. Ms. Brehm provided evaluations, including preliminary site surveys, identification of surface artifacts and cultural features, shovel test probes, and excavations of control units at several sites on base. Also conducted were lithic analysis and classification.

APPENDIX C:
CONFIDENTIAL CCIC RECORDS SEARCH MAP RESULTS

CONFIDENTIAL MAPS REMOVED FROM FILE

NATIVE AMERICAN HERITAGE COMMISSION

CHAIRPERSON
Laura Miranda
Luiseño

VICE CHAIRPERSON
Reginald Pagaling
Chumash

PARLIAMENTARIAN
Russell Attebery
Karuk

COMMISSIONER
William Mungary
Paiute/White Mountain Apache

COMMISSIONER
Isaac Bojorquez
Ohlone-Costanoan

COMMISSIONER
Sara Dutschke
Miwok

COMMISSIONER
Buffy McQuillen
Yokayo Pomo, Yuki, Nomlaki

COMMISSIONER
Wayne Nelson
Luiseño

COMMISSIONER
Stanley Rodriguez
Kumeyaay

EXECUTIVE SECRETARY
Christina Snider
Pomo

NAHC HEADQUARTERS
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Suite 100
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(916) 373-3710
nahc@nahc.ca.gov
NAHC.ca.gov

November 01, 2021

Jaymie Brauer
QKInc

Submitted via Electronic Mail
Via Email to: jaynie.brauer@qkinc.com

Re: Native American Tribal Consultation, Pursuant to the Assembly Bill 52 (AB 52), Amendments to the California Environmental Quality Act (CEQA) (Chapter 532, Statutes of 2014), Public Resources Code Sections 5097.94 (m), 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2 and 21084.3, Twain Harte Sewer Pipeline Improvement Project, Tuolumne County

Dear Mr. Brauer:

Pursuant to Public Resources Code section 21080.3.1 (c), attached is a consultation list of tribes that are traditionally and culturally affiliated with the geographic area of the above-listed project. Please note that the intent of the AB 52 amendments to CEQA is to avoid and/or mitigate impacts to tribal cultural resources, (Pub. Resources Code §21084.3 (a)) ("Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource.")

Public Resources Code sections 21080.3.1 and 21084.3(c) require CEQA lead agencies to consult with California Native American tribes that have requested notice from such agencies of proposed projects in the geographic area that are traditionally and culturally affiliated with the tribes on projects for which a Notice of Preparation or Notice of Negative Declaration or Mitigated Negative Declaration has been filed on or after July 1, 2015. Specifically, Public Resources Code section 21080.3.1 (d) provides:

Within 14 days of determining that an application for a project is complete or a decision by a public agency to undertake a project, the lead agency shall provide formal notification to the designated contact of, or a tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, which shall be accomplished by means of at least one written notification that includes a brief description of the proposed project and its location, the lead agency contact information, and a notification that the California Native American tribe has 30 days to request consultation pursuant to this section.

The AB 52 amendments to CEQA law does not preclude initiating consultation with the tribes that are culturally and traditionally affiliated within your jurisdiction prior to receiving requests for notification of projects in the tribe's areas of traditional and cultural affiliation. The Native American Heritage Commission (NAHC) recommends, but does not require, early consultation as a best practice to ensure that lead agencies receive sufficient information about cultural resources in a project area to avoid damaging effects to tribal cultural resources.

The NAHC also recommends, but does not require that agencies should also include with their notification letters, information regarding any cultural resources assessment that has been completed on the area of potential effect (APE), such as:

1. The results of any record search that may have been conducted at an Information Center of the California Historical Resources Information System (CHRIS), including, but not limited to:

- A listing of any and all known cultural resources that have already been recorded on or adjacent to the APE, such as known archaeological sites;
- Copies of any and all cultural resource records and study reports that may have been provided by the Information Center as part of the records search response;
- Whether the records search indicates a low, moderate, or high probability that unrecorded cultural resources are located in the APE; and
- If a survey is recommended by the Information Center to determine whether previously unrecorded cultural resources are present.

2. The results of any archaeological inventory survey that was conducted, including:

- Any report that may contain site forms, site significance, and suggested mitigation measures.

  All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for public disclosure in accordance with Government Code section 6254.10.

3. The result of any Sacred Lands File (SLF) check conducted through the Native American Heritage Commission was negative.

4. Any ethnographic studies conducted for any area including all or part of the APE; and

5. Any geotechnical reports regarding all or part of the APE.

Lead agencies should be aware that records maintained by the NAHC and CHRIS are not exhaustive and a negative response to these searches does not preclude the existence of a tribal cultural resource. A tribe may be the only source of information regarding the existence of a tribal cultural resource.

This information will aid tribes in determining whether to request formal consultation. In the event that they do, having the information beforehand will help to facilitate the consultation process.

If you receive notification of change of addresses and phone numbers from tribes, please notify the NAHC. With your assistance, we can assure that our consultation list remains current.

If you have any questions, please contact me at my email address: Katy.Sanchez@nahc.ca.gov

Sincerely,

Katy Sanchez

Katy Sanchez
Associate Environmental Planner

Attachment

Native American Heritage Commission
Native American Contacts List
November 1, 2021

Chicken Ranch Rancheria of Me-Wuk Indians
Lloyd Mathiesen, Chairperson
P.O. Box 1159 Miwok - Me-wuk
Jamestown ,CA 95327
lmathiesen@crtribal.com
(209) 984-9066
(209) 984-9269

Nashville Enterprise Miwok-Maidu-Nishinam Tribe
Cosme A. Valdez, Chairperson
P.O. Box 580986 Miwok
Elk Grove ,CA 95758-001
valdezcome@comcast.net
(916) 429-8047 Voice/Fax
(916) 396-1173 Cell

North Fork Rancheria of Mono Indians
Elaine Bethel Fink, Chairperson
P.O .Box 929 Mono
North Fork ,CA 93643
efink@nfr-nsn.gov
(559) 877-5531
(559) 877-2467 Fax

Picayune Rancheria of Chukchansi Indians
Claudia Gonzales, Chairwoman
P.O. Box 2226 Chukchansi / Yokut
Oakhurst ,CA 93644
cgonzales@chukchansitribe.net
(559) 412-5590

Tule River Indian Tribe
Neil Peyron, Chairperson
P.O. Box 589 Yokuts
Porterville ,CA 93258
neil.peyron@tulerivertribe-nsn.gov
(559) 781-4271
(559) 781-4610 Fax

Tuolumne Band of Me-Wuk Indians
Andrea Reich, Chairperson
P.O. Box 699 Me-Wuk - Miwok
Tuolumne ,CA 95379
andrea@mewuk.com
(209) 928-5300 Office
(209) 928-1677 Fax

Washoe Tribe of Nevada and California
Serrell Smokey, Chairperson
919 Highway 395 North Washoe
Gardnerville ,NV 89410
Serrell.smokey@washoetribe.us
(775) 265-8600 Office
(775) 265-6240 Fax

Wuksache Indian Tribe/Eshom Valley Band
Kenneth Woodrow, Chairperson
1179 Rock Haven Ct. Foothill Yokuts
Salinas ,CA 93906 Mono
kwood8934@aol.com Wuksache
(831) 443-9702

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5080 California Avenue, Ste. 220 | Bakersfield, CA 93309

November 3, 2021

Representative Letter Sent to the Tribes

FROM: Twain Harte Community Services District

RE: Tribal Cultural Resources under the California Environmental Quality Act, AB 52 (Gatto, 2014). A Formal Notification of a Decision to Undertake a Project and Notification of Consultation Opportunity, pursuant to Public Resources Code § 21080.3.1 (hereafter PRC).

Dear Chairperson:

The Twain Harte Community Services District (District) has decided to undertake the Twain Harte Pipeline Improvement Project. The Twain Harte Community Services District is designated as a Lead Agency under the California Environmental Quality Act (CEQA).

The proposed project consists of the replacement of existing 4- to 10-inch diameter pipelines, within existing rights-of-way (ROW). These areas include the following:

- Adjacent to Twain Harte Lake;
- Two (2) located around Marquis Drive;
- Twain Harte Drive to Spruce Drive;
- Fuller to Manzanita Drive;
- Golf Club Drive (South);
- Sewer crossing of inlet to Twain Harte Lake;
- Willowood Drive and Tuolumne Drive; and
- Golf Club Drive.

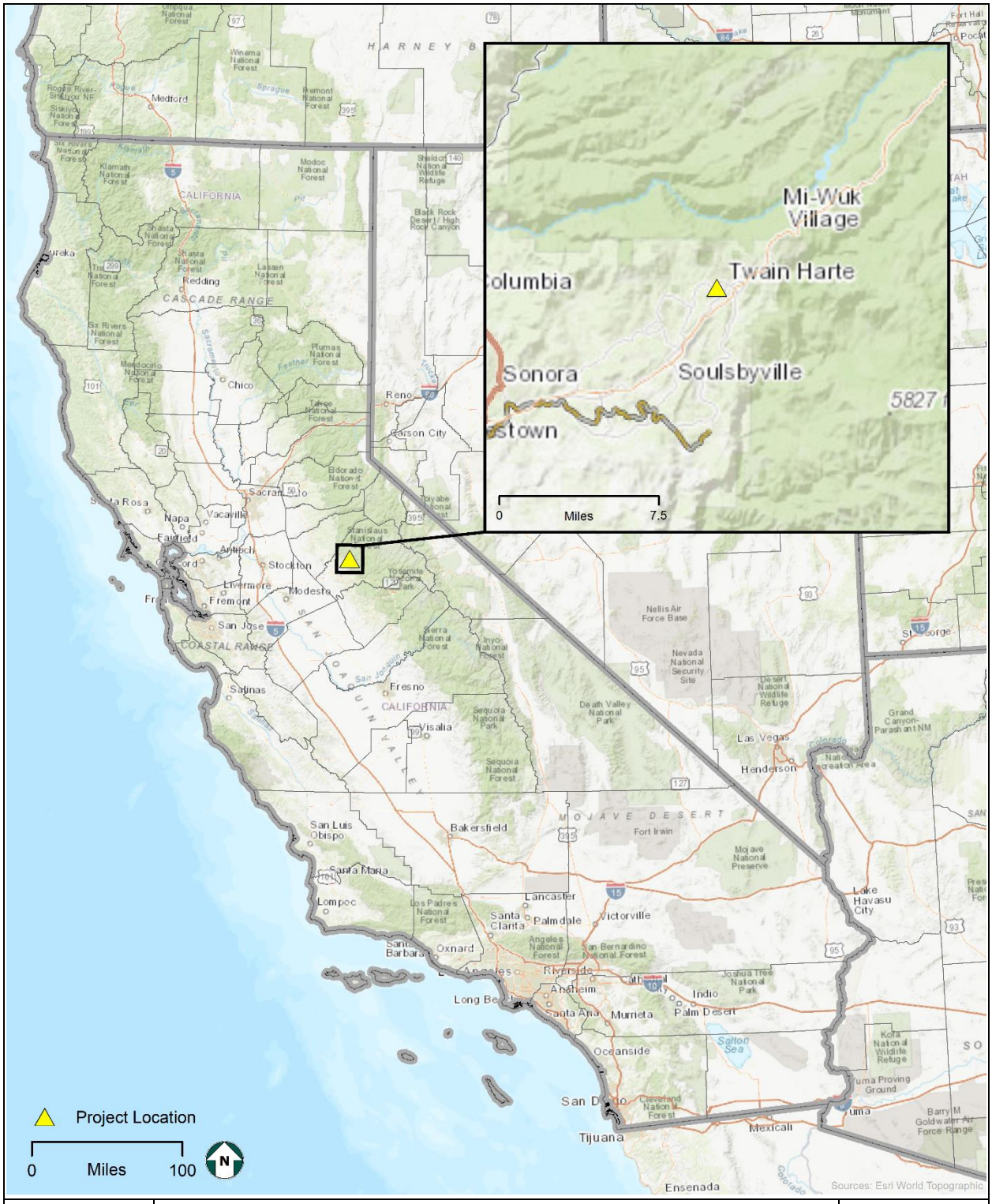
The District is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the areas listed above. Implementation of the proposed project will allow the District to maintain, replace, and upgrade its collection system so that it can continue to comply with regulations, avoid sanitary sewer overflows into critical waterways, provide adequate capacity, and protect groundwater and surface water quality. Construction is expected to take approximately 5 months, with construction anticipated to start in Quarter 2 of 2023 (depending on funding). The construction will require approximately 10 crew members. Construction equipment will include a backhoe, bobcat, trencher, generator, grader, dump truck, concrete truck, and three pickup trucks. Construction will include exposing the existing pipeline for removal and replacement. The depth of ground excavation or trenching will be no more than 6 ft below grade.

Pursuant to PRC § 21080.3.1 (b), you have 30 days from the receipt of this letter to request consultation, in writing, with the Twain Harte Community Services District. Should you have any comments or questions please contact our designated representative, Jaymie L. Brauer at (661) 616-2600 or at jaymie.brauer@QKinc.com

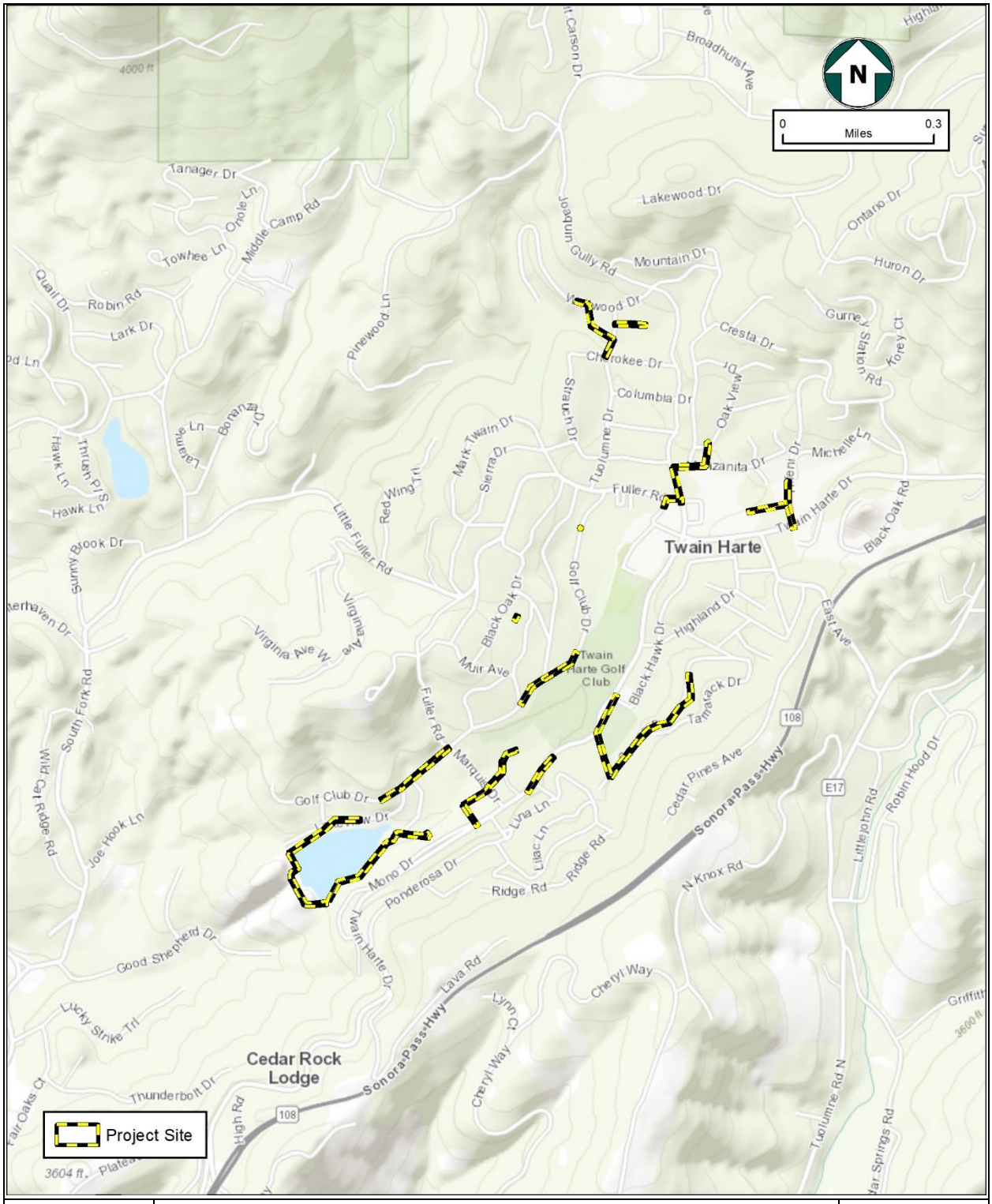
Very Respectfully,
Jaymie Brauer

Jaymie Brauer
Principal Planner

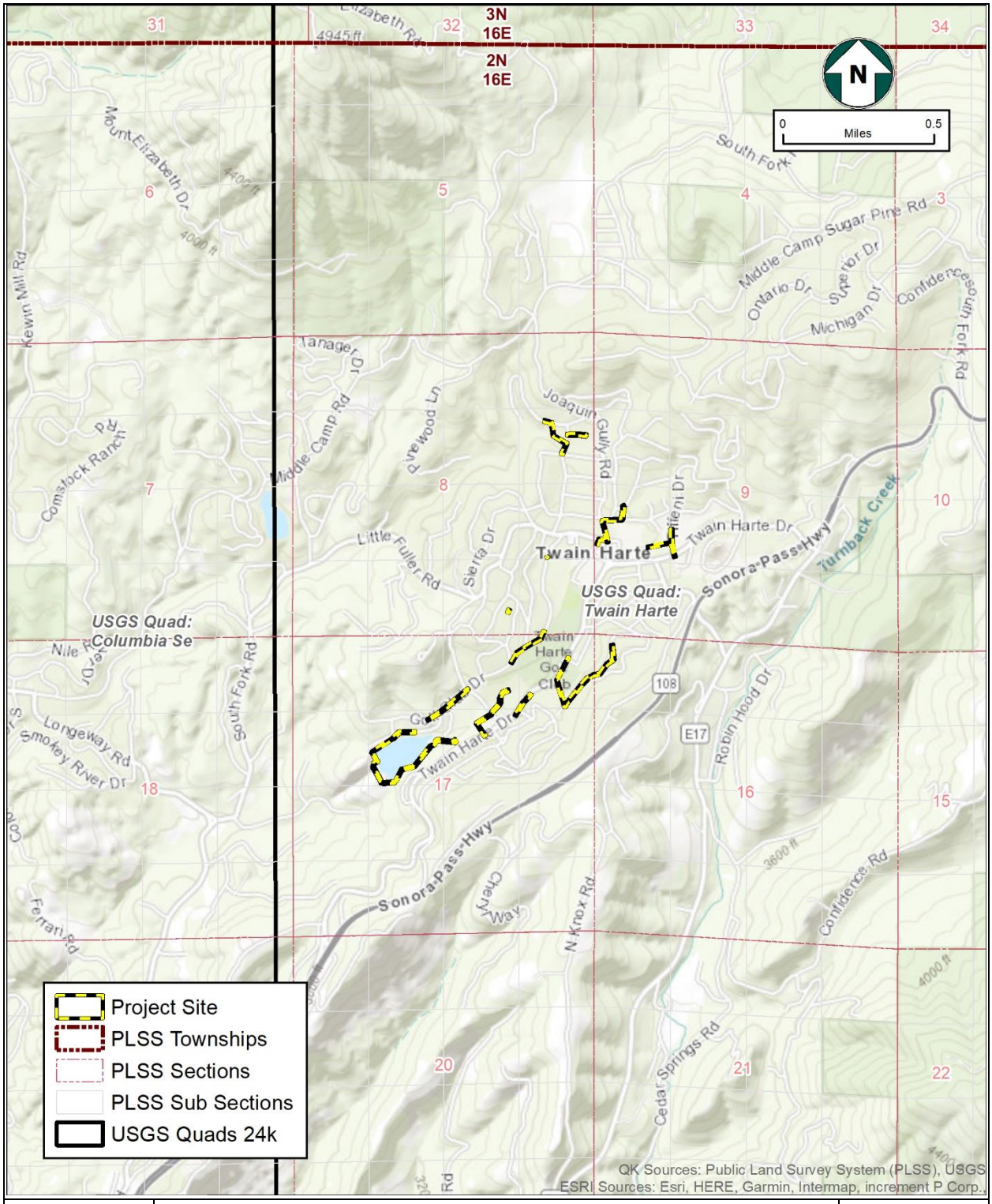
Enclosures: Figures 1-4



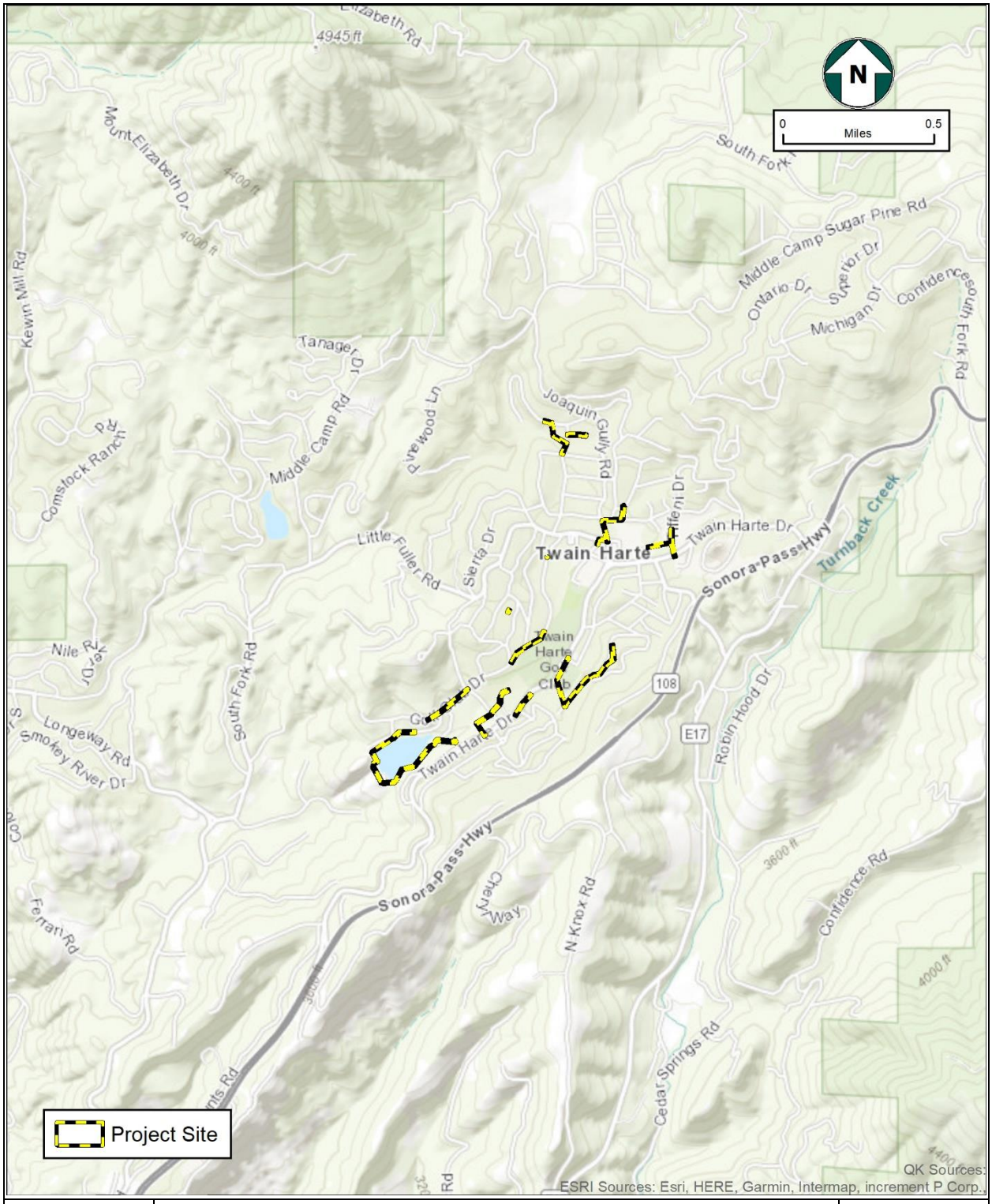
QK	**Regional Location**	**Figure 1**



QK	**Project Area**	**Figure 2**



QK	**PLSS/USGS**	**Figure 3**



QK	**Topo**	**Figure 4**

From: Waylon Coats
To: Jaymie Brauer
Subject: Re: [EXTERNAL]:Twain Harte Lake
Date: Wednesday, November 17, 2021 11:57:43 AM
Attachments: image001.png

Sorry didn't mean to send that just yet. Yes to have cultural monitors on site during the duration of the repairs and replacements. Can I get a copy of the report when it is finished? Thank you.

Get Outlook for iOS

From: Jaymie Brauer <Jaymie.Brauer@qkinc.com>
Sent: Wednesday, November 17, 2021 11:15:36 AM
To: Waylon Coats <wcoats@crtribal.com>
Subject: RE: [EXTERNAL]:Twain Harte Lake

CAUTION: This is an external email. Please take care when clicking links or opening attachments. When in doubt contact your IT Department.

Good morning Mr Coates-

We are aware of the cultural sensitivity of the area and the village site. There is a cultural resources team out there doing a survey of the project site and surrounding properties. The team is demarcating sensitive areas to avoid known resources.

Our standard mitigation would have archaeological and Native American monitors on site during initial ground disturbance activities. Is that what you mean by "being involved" or did you have something else in mind?

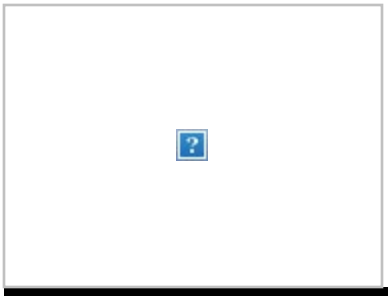
Please advise. If you wish to have a call, I am available.

Jaymie Brauer
Principal Planner
(661) 616-2600 Office
(661) 487-2991 Mobile
www.QKInc.com

From: Waylon Coats <wcoats@crtribal.com>
Sent: Wednesday, November 17, 2021 10:58 AM
To: Jaymie Brauer <Jaymie.Brauer@qkinc.com>
Subject: [EXTERNAL]:Twain Harte Lake

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Hello we would like to be involved in the piping project as that is a village site there.
209-213-9779



Cultural Resource Specialist Director
Chicken Ranch Rancheria of Me-Wuk
Indians of California

Office: (209) 984-9066
Cell:209-2123-9779
wcoats@crtribal.com
PO Box 1159/9195 Tribal Way
Jamestown, CA 95327

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Phone Call Log
Tribal Contact under AB 53 for the *Twaine Harte Community Services District* Twain Hate Pipeline Improvement Project, Tuolumne County, California

TRIBE CONTACT	DATE	COMMENTS
CHICKEN RANCH RANCHERIA OF ME-WUK INDIANS (209) 984-9066	**11/16/21**	**Asked if we would forward the email to the following recipients:** Joanna Portillo-hsu jportillo-hsu@crtribal.com Environment and Resource Management Cultural Coordinator Waylon Coats wcoats@crtibal.com The email was sent out 11/16/21 – Mr. Coats sent a request to be present for excavation on 11/17/21
NAHSVILLE ENTERPRISE MIWOK-MAIDU NISHINAM TRIBE 916-396-1173	**11/16/21**	**No answer, left a voicemail**
NORTH FORK RANCHERIA OF MONO INDIANS (559) 877-2461	**11/16/21**	**Will send a response if applicable.**
PICAYUNE RANCHERIA OF CHUKCHANSI INDIANS (559) 412-5590	**11/16/21**	**Will send a response if applicable.**
TULE RIVER INDIAN TRIBE (559) 781-4271	**11/16/21**	**Will send a response if applicable.**
TUOLUMNE BAND OF ME-WUK INDIANS (209) 928-5300	**11/16/21**	**Will send a response if applicable.**
WASHOE TRIBE OF NEVADA AND CALIFORNIA (775) 265-8600	**11/16/21**	**Will send a response if applicable.**
WUKSACHE INDIAN TRIBE/ESHOM VALLEY BAND (831) 443-9702	**11/16/21**	**No answer, left a voicemail**

APPENDIX D

PROJECT ENGINEERING REPORT

Inflow/Infiltration Identification and Reduction Project

Project Engineering Report

DRAFT

AUGUST 2021



Prepared for:
TWAIN HARTE COMMUNITY SERVICES DISTRICT
22912 Vantage Pointe Dr.
Twain Harte, CA 95383

Prepared by:
BLACK WATER CONSULTING ENGINEERS, INC.
602 Lyell Drive
Modesto, CA 95356
(209) 322-1820

BLACKWATER
CONSULTING ENGINEERS, INC.

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1 Introduction

This report has been prepared as part of the Twain Harte Community Services District (THCSD/District) Inflow/Infiltration Identification and Reduction Planning Project No. C-06-8408-110 (Project). This report includes references to the following documents previously completed as part of the Planning Project.

[1] Twain Harte Community Services District, (Planning Project No. C-06-110) Condition Assessment Summary, February 2021.
[2] Twain Harte Community Services District, (Planning Project No. C-06-110) Sewer System Hydraulic Model, April 2021.
[3] Twain Harte Community Services District, (Planning Project No. C-06-110) Sherwood Forest Evaluation, February 2021.

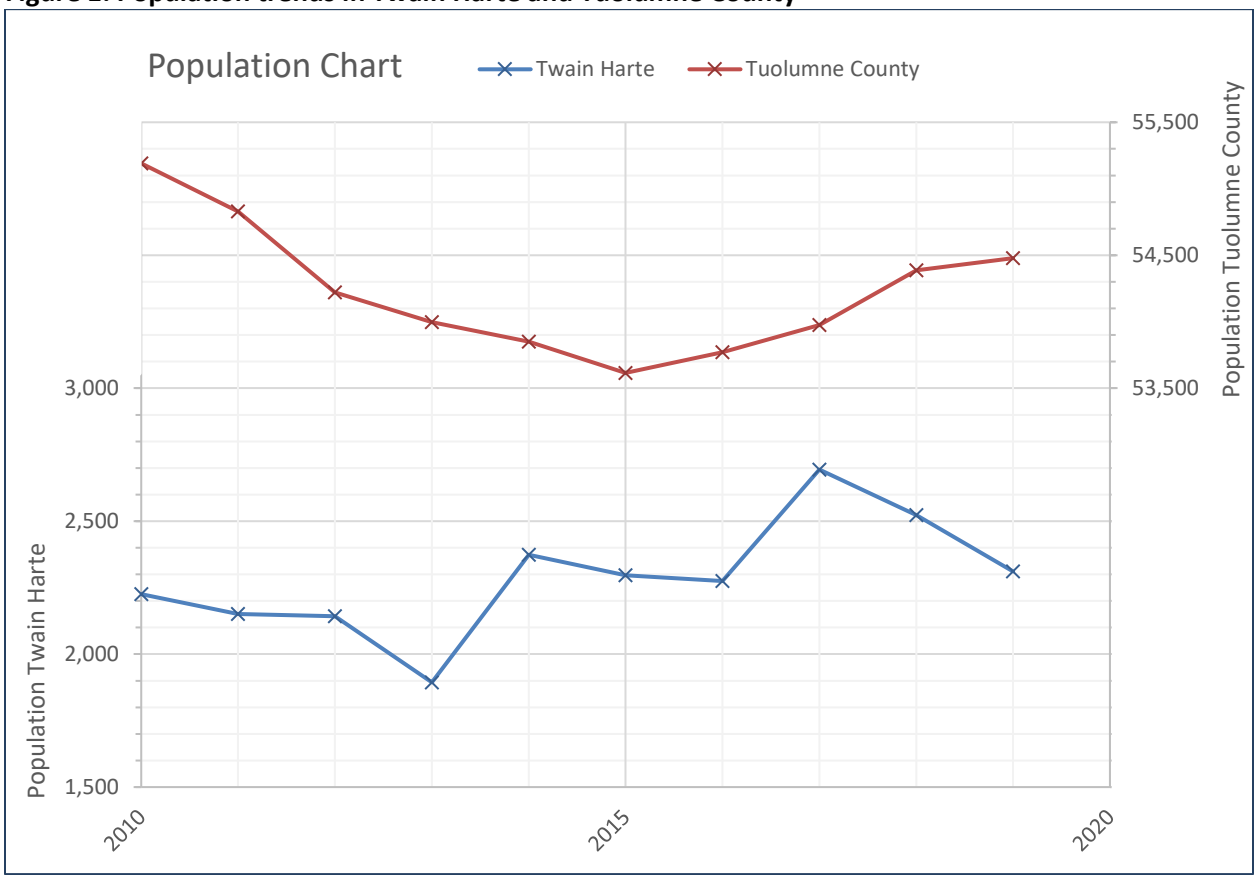
The Project utilizes various methods of evaluating the sewer system to develop a cost-effective, long-term plan to identify and reduce inflow and infiltration (I&I) into the system, identify damaged or deteriorated lines for repair or replacement, and provide sewer service to the Sherwood Forest area. Implementation of the Project recommendations will allow the THCSD to maintain, replace, and upgrade its collection system so that it can continue to comply with regulations, avoid sanitary sewer overflows (SSOs) into critical waterways, provide adequate capacity, and protect groundwater and surface water quality.

Disclosure Statement
Funding for this Project has been provided in full or in part through an agreement with the State Water Resources Control Board (State Board/SWRCB). California's Clean Water State Revolving Fund is capitalized through a variety of funding sources, including grants from the United States Environmental Protection Agency and state bond proceeds. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendations for use.

2 Project Area

The THCSD provides water, parks, recreation, and fire protection services and operates and maintains the sewer collection system serving the community of Twain Harte. THCSD serves an estimated population of 2,500 which includes a total of 1,607 equivalent single-family resident (ESFR) units and 1,436 physical connections (1,347 residential, 84 commercial, and 5 public facilities). **Figure 1** shows the population trends in Twain Harte and Tuolumne County.

Figure 1: Population trends in Twain Harte and Tuolumne County



3 Existing Conditions

Wastewater generated by the THCSD service area is collected and conveyed through the sewer mains to the Twain Harte Wastewater Treatment Plant (WWTP) which is owned and operated by the Tuolumne Utilities District (TUD). The sewage receives primary treatment before being conveyed via TUD's sewer interceptor lines to the Sonora Regional Wastewater Treatment Plant (SRWTP or Regional WWTP), which is also owned and operated by TUD. Wastewater that has been treated is conveyed to Quartz Reservoir. Refer to **Figure** 2 for a vicinity map showing the location of these facilities.

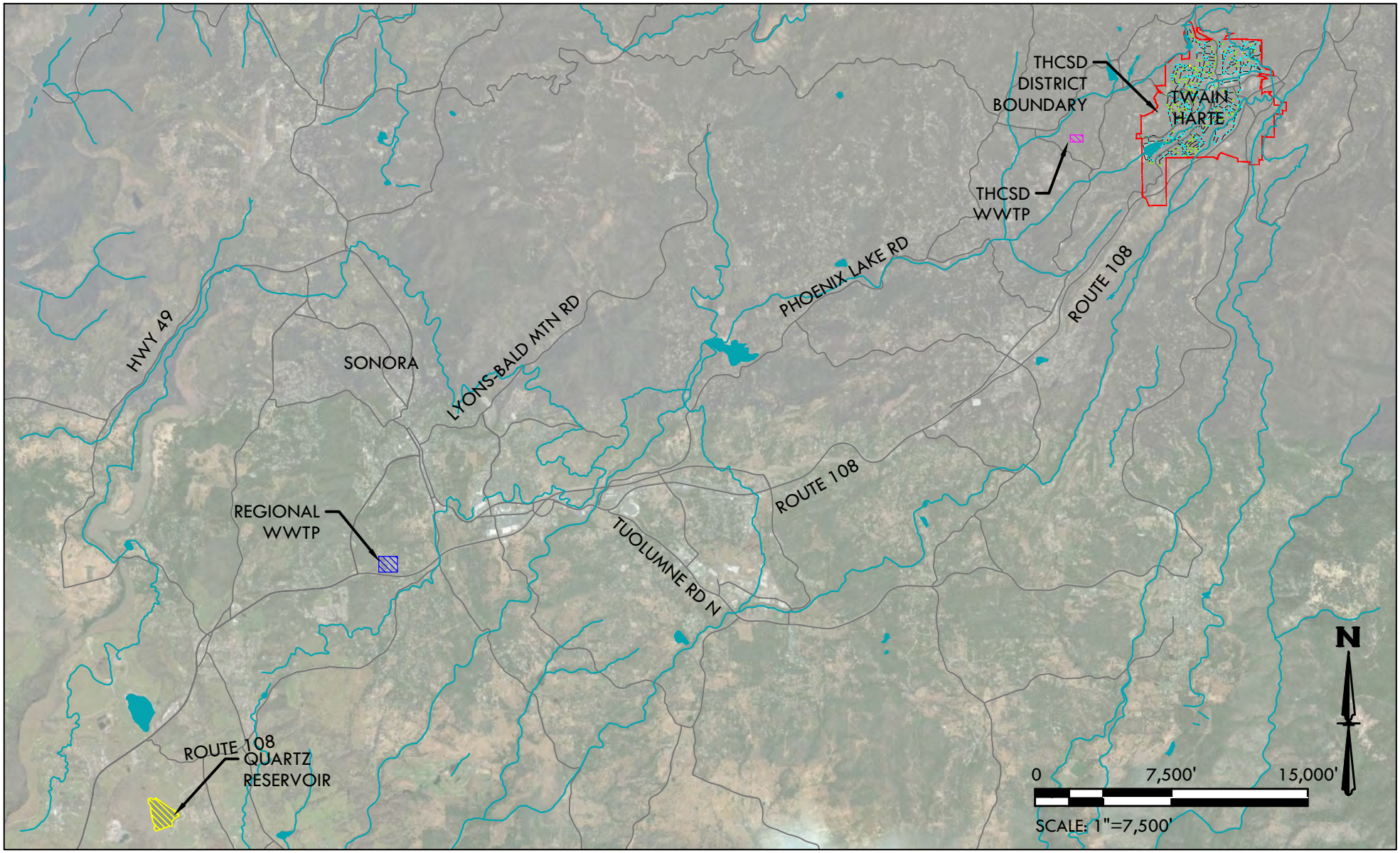


FIGURE 2: Vicinity map and service area map of THCSD

TWAIN HARTE COMMUNITY SERVICES DISTRICT
PROJECT ENGINEERING REPORT

LEGEND:

- THCSD District Boundary
- Waterways
- Roadways
- THCSD WWTP
- Regional WWTP
- Quartz Reservoir

BLACKWATER CONSULTING ENGINEERS, INC.
602 LYELL DRIVE, MODESTO, CA 95356 PH. 209.322.1820

I:\J17196 THCSD SEWER COLLECTIONS SRF PROJECT\CAD\TASK-07 SYSTEM EVALUATION\VICINITY MAP.DWG PLOT: 7/7/2021 2:06:23 PM BY TYLER LEE

The sewer collection system operated by THCSD is comprised of 4- to 10-inch diameter pipes. The majority of the sewer lines in use were constructed of vitrified clay pipe (VCP) in 1965. At the time of construction, manholes were installed using 2-foot diameter irrigation standpipes, and lampholes were installed using tees or elbows. Since its initial construction, THCSD operations staff has maintained and expanded the system which now includes welded steel (WSP) and polyvinyl chloride (PVC) pipes. A description of pipe materials currently in use are as follows:

- Vitrified clay pipe
    - Bell and spigot joints with five-foot lay lengths. The frequent joints on the VCP lines and surrounding trees in the area cause significant root intrusion along VCP lines. Lines require frequent jetting and maintenance (See **Figure 3**).
- Welded steel pipe cement mortar lined epoxy coated
    - Welded joints with 20-foot lay lengths. This pipe material is installed between MH49 and MH19 along the rock embankment of the Twain Harte Lake Dam (See **Figure 3**).
- Polyvinyl chloride pipe
    - Bell and spigot joints with 10 and 20 ft lay lengths.

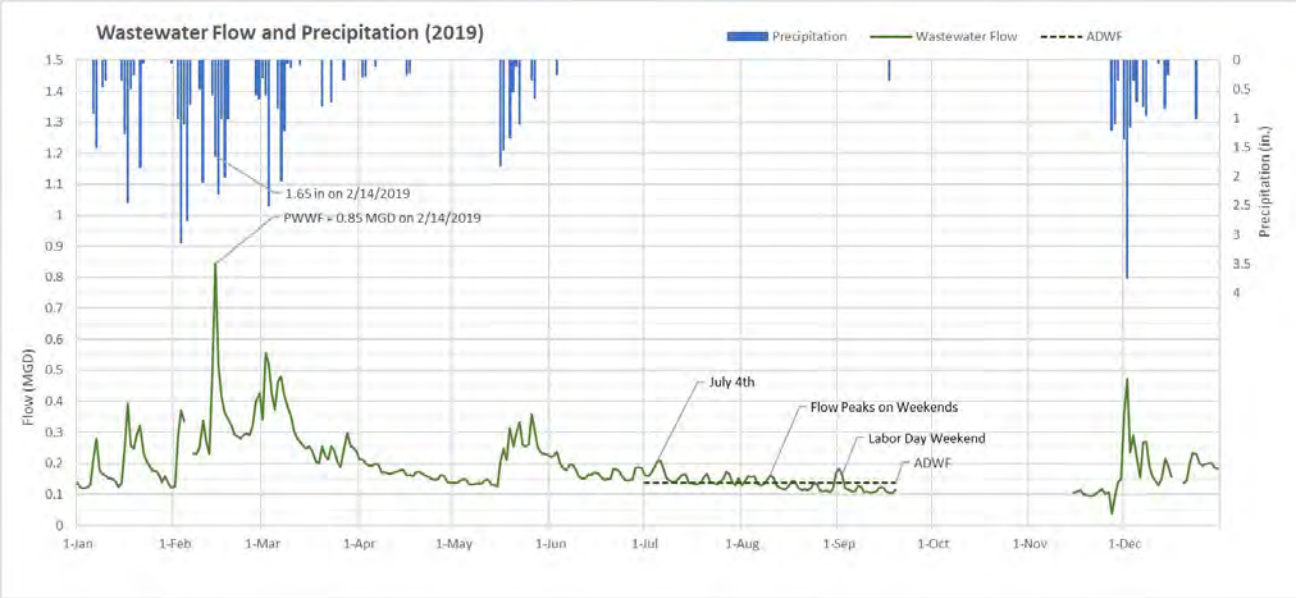
Figure 3: Vitrified Clay Pipe and Welded Steel Pipe



Observed root intrusion at joints of VCP (left). WSP on rock embankment of Twain Harte Lake (right).

It is estimated that the average dry weather flow (ADWF) for the system is 0.14 million gallons per day (MGD). The peak wet weather flow (PWWF) is recorded as 0.85 MGD and represents the highest flow through the system. The PWWF includes the hourly peaking factors, inflow, and infiltration. The recorded flow data at the WWTP is represented in **Figure 4**. The flow patterns in **Figure 4** show high flows following storm events. The Twain Harte collection system has a PWWF that is six times higher than the ADWF. Typically, the difference between the PWWF and the ADWF would be three to four times higher. This discrepancy indicates excessive inflow and infiltration within the collection system. Higher flows contribute to SSOs which can end up in local streams and water bodies.

Figure 4: TUD/Twain Harte Wastewater Treatment Plant Sewer Flow Data



4 Objectives

The focus of the Project has been to evaluate the existing wastewater collection system and identify improvements needed to reduce I&I and ensure that the THCSD continues to meet existing and future regulatory requirements for the collection and conveyance of wastewater. Identifying system deficiencies and implementing the recommended corrective actions and projects in this report will reduce the risk of SSOs near Twain Harte Creek which is a tributary of Sullivan Creek (a 303(d)) listed water body), a drinking water source, and the primary water source for the community's recreational swimming lake. Constructing a new sewer collection system in the Sherwood Forest subdivision will also improve the protection of groundwater and surface water from harmful bacteria and pollutants by reducing the number of septic systems in the area. Doing so is crucial to maintaining Turnback Creek which is tributary to a drinking water source and a critical resource to the Tuolumne Band of Mi-Wok Indians.

This report will evaluate existing sewer infrastructure, integrate the information developed under previous tasks, and provide a recommended five-year and 20-year Capital Improvement Plan (CIP). The success of the I&I reduction will be verified by an observed reduction in peak wet weather flow at the WWTP.

5 Results from Previous Tasks

As part of the THCSD Inflow/Infiltration Identification and Reduction Planning Project No. C-06-8408-110, four tasks have been completed which produced three reports described in Sections 5.1, 5.2, and 5.3 of this report.

5.1 Condition Assessment

The Condition Assessment, completed on March 30th, 2021, gives a detailed summary of the existing condition of the collection system based on a closed-circuit television (CCTV) inspection of pipelines and visual inspection of system manholes. The CCTV inspection of the existing system was completed between January 2020 and November 2020.

Concurrent with the CCTV survey, manhole (MH) surveys were performed. The Condition Assessment report provides an overview of the CCTV and MH surveys and describes the methodology used to analyze the data. The Condition Assessment provides a list of high priority and low priority improvements based on the following evaluation criteria:

- Indexes
  - Observed Structural Condition
  - Observed Operations and Maintenance Condition
  - Overall Condition (Combines Structural and Operations and Maintenance)
  - Likelihood of Failure
- Observations
  - Observed Infiltration
  - Manhole Location
  - Manhole Condition
  - Joint Offset Large
  - Pipe Collapse
  - Missing Wall
  - Inaccessible Pipes

The results of the analysis were used to assist with the development of criteria for a risk model used to refine and prioritize capital projects for a long-term Capital Improvement Plan to reduce inflow and infiltration. A summary of the results is provided in **Appendix A**.

5.2 Sherwood Forest Evaluation

The Sherwood Forest evaluation summarizes the history of the Sherwood Forest development and the limitations of the current on-site wastewater treatment systems/septic tanks (OWTS). The report also provided an evaluation of the potential for a gravity collection system to serve Sherwood Forest and connecting to the THCSD sewer. The evaluation was based on maintenance requirements, design constraints, potential environmental impacts, and construction costs. The report provided a recommended alternative and recommended that THCSD proceed to finalize the Planning Project by preparing 30% preliminary design documents. The recommended option to provide sanitary sewer collection is shown in **Figure 5**. This option had estimated a total cost of $5,336,170. Analysis data for the Sherwood Forest Evaluation can be viewed in **Appendix B**.

At the time of the evaluation memorandum, Sherwood Forest was recommended as an option for construction funding. However, following the additional investigations performed as part of the planning project, Sherwood Forest is no longer the highest priority for the District. This report presents a comparison matrix and prioritization of projects that explains the priority projects for which the District is seeking funding.

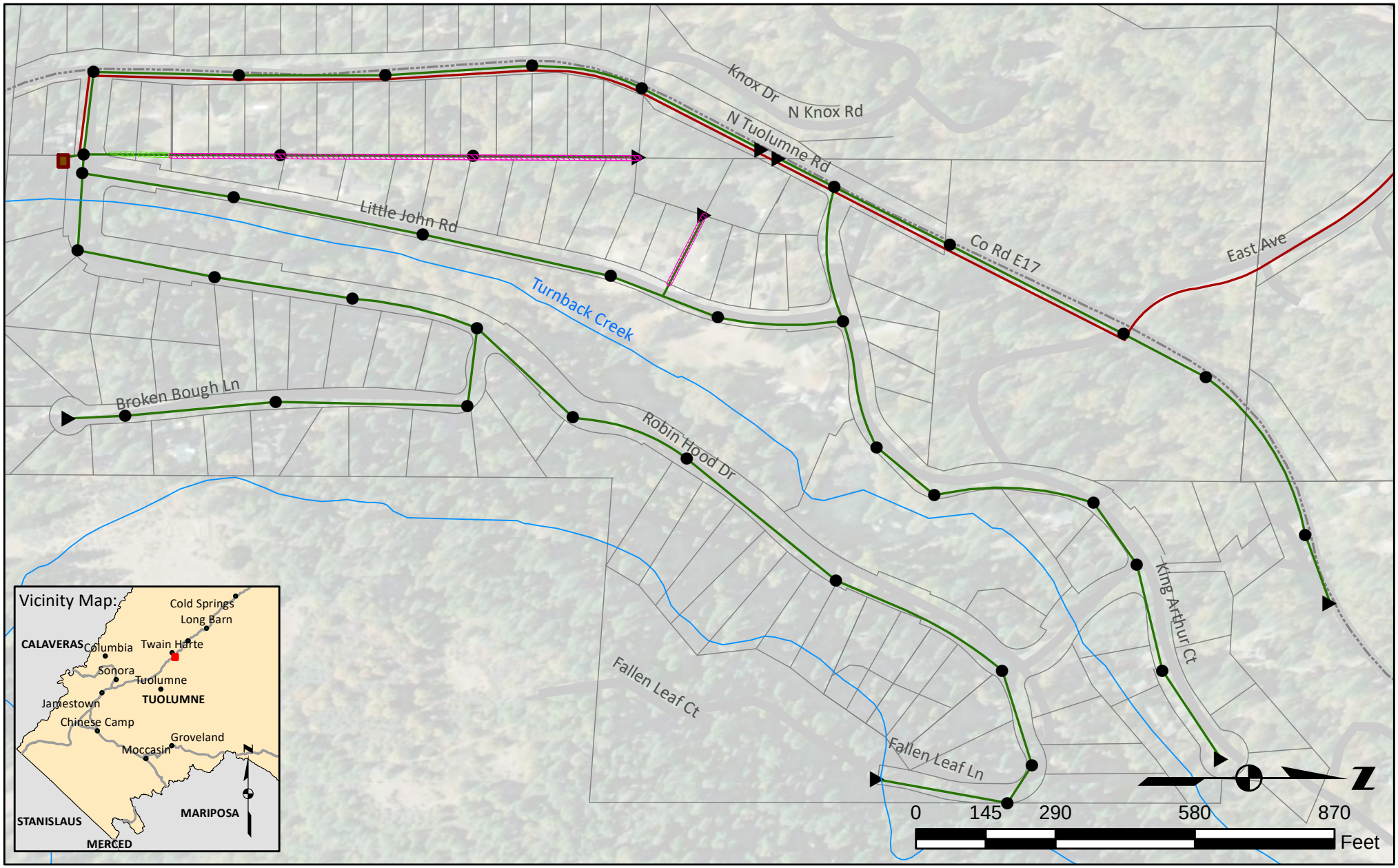


Figure 5: Sherwood Forest Conceptual Collection System - Option 1

TWAIN HARTE COMMUNITY SERVICES DISTRICT
PROJECT ENGINEERING REPORT

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- Cleanout
- Manhole
- Force Main
- Gravity Colleciton
- Lot Line
- Major Roadways
- Roads
- Waterways
- Sewer Easement
- PUE
- Pump Station

5.3 Hydraulic Model System Assessment

The Hydraulic Model System Assessment, completed on April 19th, 2021, identifies deficiencies and potential areas for capital improvement projects in the collection system. The deficiencies were identified using the GIS-based hydraulic model Innovyze InfoSewer. The pipe depth-over-diameter ratio, flow velocity, and manhole surcharge depth during peak flow in the system were calculated using the model. Sewer main depth and pipe slope were also evaluated using a simple spreadsheet. The results from the hydraulic model provided primary and secondary CIPs for the following conditions:

Primary CIP's

- Pipes with scouring velocities less than 1 ft/s (THCSD standard is 2 ft/s)
- Pipes with d/D greater than 0.7 during PWWF
- Adverse and horizontal (flat) slopes

Secondary CIP's

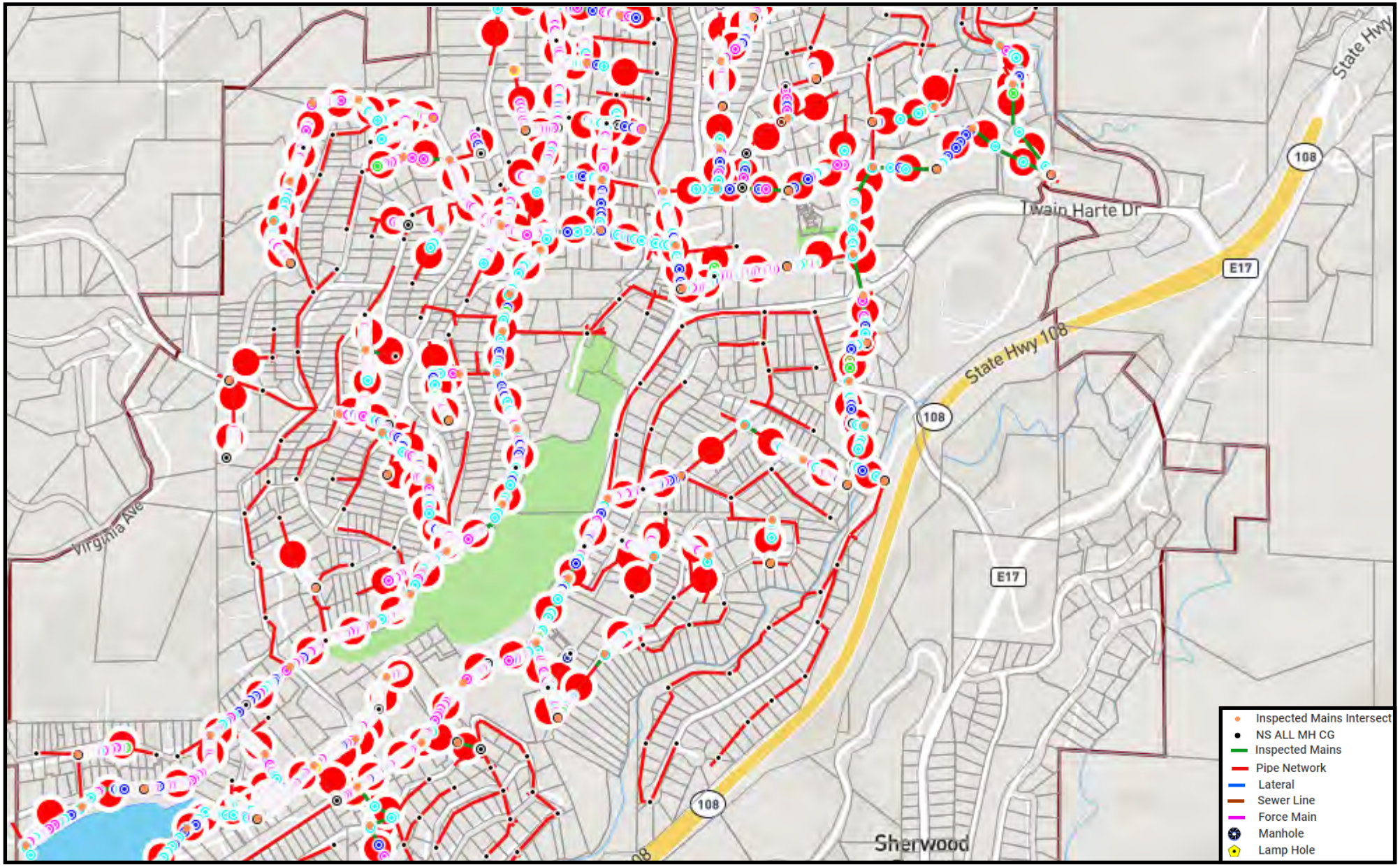
- Less than 2 ft of cover (THCSD standard is 3 ft of cover)
- Pipes with slopes less than THCSD Standards but not horizontal or adverse

The Hydraulic Model System Assessment is provided in **Appendix C**.

5.4 Sewer System Asset Identification

THCSD GIS data was consolidated to create a complete GIS database which includes pertinent asset information and will be utilized to identify and mitigate future risks within the collection system. A snapshot of this program is shown in **Figure 6**. The data included in the GIS online database includes MH Location, MH type, MH inspection notes, pipe location, pipe material, CCTV observations, CCTV indexes, and CCTV videos. This data will be used by THCSD to maintain the collection system and record maintenance events.

Figure 6: THCSD online GIS database includes topographic information and CCTV video files.



1" = 1080 ft	Sewer System Asset Identification	07/07/2021	

This map may represents a visual display of related geographic information. Data provided here on is not guarantee of acutual field conditions. To be sure of complete accuracy, please contact the responsible staff for most up-to-date information.

6 Project CIP Analysis

This section will evaluate the prioritized CIPs presented in the previous documents and will recommend a schedule. As a baseline, the recommended CIPs are compared against a no-action alternative. The no-action alternative would result in continued degradation of the existing collection system resulting in higher I&I, and detrimental impacts to water quality.

6.1 Climate Change

The primary objective of the Project is I&I reduction. Since climate change will affect the intensity and frequency of storm events and impact the observed I&I in the collection system, CIPs reducing I&I increase the functionality of the system which allows the WWTP and collection system to better address the impacts of climate change.

6.2 Risk Model and Cost Index

The CIP project schedule was organized based on a risk model/matrix which compared the following criteria:

- Relevance to the project objective of reducing I&I and protecting ground and surface water
- Proximity to waterways or groundwater
- Number of individuals/service connections affected by a system failure
- Cost of repair (See **Table 1** for the unit prices used in estimating project costs)

Table 1: Unit Prices Used to Evaluate and Compare Proposed CIPs

Item	Unit	Cost
6" PVC sewer	lf	$ 125
8"PVC sewer	lf	$ 140
10"PVC sewer	lf	$ 160
New MH	ea	$ 5,200
Replace/Construct MH	ea	$ 6,500
Above-ground pipe construction	lf	$ 250
Asphalt Restoration	sqft	$ 6.50

7 Recommended Maintenance

As a result of this project, it is recommended that the District revise their current maintenance policies to reduce root intrusion and the associated blockages. It is recommended that the District increase its jetting operations or consider alternative removal methods. Possible alternatives include chemical agents and mechanical cutters/augers.

When damage from root intrusion is repaired, it is recommended that copper sulfate or alternative chemicals be mixed with native soil surrounding the pipe to discourage future growth at the repaired location.

Several lines in the system have grease buildups and additional investigations should be performed to determine the source of the grease and require grease trap installations for the contributing parties.

8 Recommended CIPs

The recommended CIPs will be constructed using a design-bid-build process. After construction, the collection system will continue to be maintained by THCSD. The proposed sewer collection system is anticipated to have a useful life of 75 years.

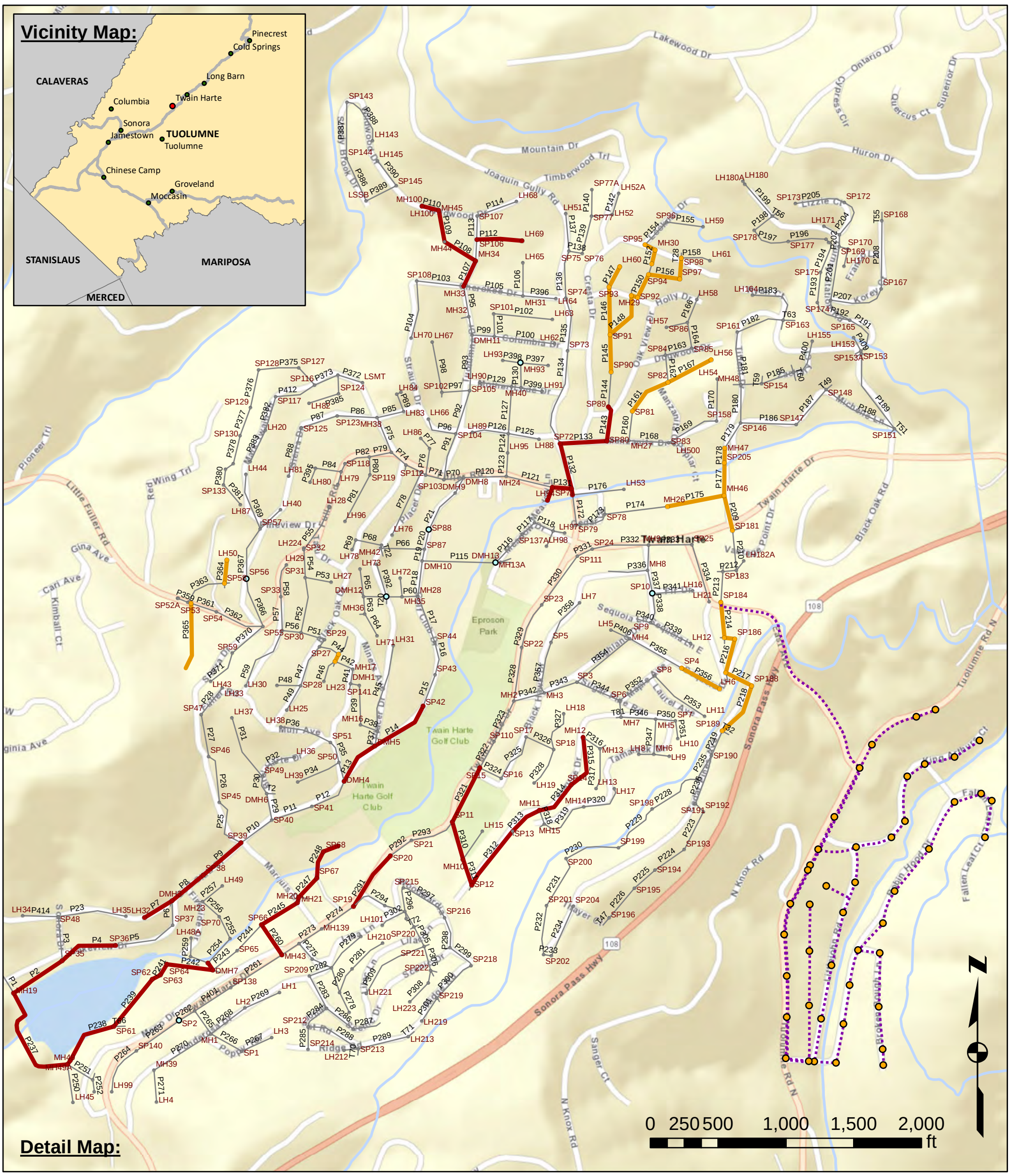
The recommend projects address the state planning priorities by improving existing infrastructure, protecting environmental resources, and preserving the forest and natural lands. Construction permits and approvals will be dependent on the individual CIP, but typical approvals and permits include the following:

- Storm Water Pollution and Prevention Plans
- Encroachment Permits
- Traffic Control Plans
- Building Permits

The majority of the collection system lines are located in the public right-of-ways or existing easements. The recommended improvement projects will replace existing lines in the same location to the greatest extent possible. For instances where the current location of an existing sewer line is the cause of I&I, the recommended CIP will endeavor to relocate the line or involve special construction to reduce I&I.

Figure 7 shows the locations of the various projects and the various lines to be replaced. The CIPs have been sorted into short-term (within 5 years) and long-term (6 - 20 years). The short-term CIPs are shown in red in **Figure 7**. While the long-term CIPs are shown in yellow and purple in **Figure 7**. The short-term CIPs are arranged in **Table 2**. The long-term CIPs are arranged in **Table 3.**

The implementation of the short-term and long-term CIPs will reduce the inflow and infiltration through the collection system, reduce the frequency of sanitary sewer overflows and maintenance issues, and protect adjacent water bodies from contamination. The cost estimates presented in **Tables 2** and **3** are limited to the construction costs. Additional costs not included in the table include construction contingencies, engineering design, bid period services, and assistance during construction and construction management.



Legend

- THCSD Sewer Collection System
- Long-term CIP (excluding Sherwood Forest)
- Short-term CIP/THCSD I&I Reduction Project
- Proposed Sherwood Forest Collection System
- Waterways

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

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Figure 7: Recommended CIPs

Table 2: Short-term CIP schedule and description of projects THCSD is seeking funding for.

Short-term CIP schedule and description of projects									
Year of CIP	CIP Name	Description	Items	Priority Matrix (0 to 5)					
				Construction Cost Est.	Relevance to Objective	Proximity to water	Connections Affected	Cost Class	Matrix Rating
1	Adjacent to Twain Harte Lake	Sewers adjacent to Twain Harte Lake which have overserved Infiltration and insufficient cover to be replaced with PVC pipe under 30" of cover and appropriate spacing from lake per DDW.	P237 (853ft of 10"Ø), P238 (440ft of 10"Ø), P239 (452ft of 10"Ø), P240 (68' of 10"Ø), P241 (92ft of 10"Ø), P242 (341ft of 10"Ø), P2 (431ft of 10"Ø), P4 (436ft of 10"Ø), **SP61**, **SP62**	$891,192	5	5	5	5	5.0
2	Around Marquis Drive	Sewer adjacent to the inlet of Twain Harte Lake with observed infiltration will be replaced with PVC.	P260 (267ft of 10"Ø),P245 (309ft of 6" Ø),P246 (43ft of 6"Ø), P247 (195ft of 6"Ø), P248 (205ft of 6"Ø), P249 (113ft of 6"Ø)	$353,385	5	4	4	5	4.5
2		Sewer with observed infiltration to be replaced.	P291 (466ft of 10"Ø)	$104,876	5	4	4	3	4.0
3	Twain Harte Dr to Spruce Dr	Joint offsets and MH in drainage swales	P321 (447ft of 8"Ø), P310 (288ft of 6"Ø), P311 (200ft of 6"Ø), P312 (501ft of 6"Ø), P313 (253ft of 6"Ø), P314 (319ft of 6"Ø), P315 (406ft of 6"Ø), *SP15, SP13, SP14, MH12, MH15*	$589,281	4	4	3	5	4.0
3	Fuller to Manzanita Dr	Sewer with observed infiltration and joint offsets and low velocities to be replaced.	P122 (104ft of 6"Ø), P131 (140ft of 8"Ø), P132 (342ft of 8"Ø), P133 (344ft of 8"Ø), P143 (258ft of 6"Ø), P171 (47ft of 8"Ø)	$245,935	5	3	2	4	3.5
4	Golf Club Drive (South)	Sewer with observed cracks and insufficient cover to be replaced.	P7 (204ft of 6"Ø), P8 (295ft of 10"Ø), P9 (369ft of 10"Ø)	$258,308	2	4	4	4	3.5
4	Sewer crossing of inlet to Twain Harte Lake	Sewer crossing in concrete encasement to be replaced with utility bridge and appropriate pipe.	P253 (63ft of 6"Ø)	$54,750	1	5	5	2	3.3

Short-term CIP schedule and description of projects									
Year of CIP	CIP Name	Description	Items	Priority Matrix (0 to 5)					
				Construction Cost Est.	Relevance to Objective	Proximity to water	Connections Affected	Cost Class	Matrix Rating
5	Willowood Dr and Tuolumne Dr	Sewer with collapsed pipe, exposed gasket, and stagnant flow to be replaced.	P107 (206ft of 6"Ø), P108 (269ft of 6"Ø), P109 (235ft of 6"Ø), P110 (125ft of 6"Ø), P112 (334ft of 6"Ø)	$325,915	4	3	2	4	3.3
5	Golf Club Dr (North)	Sewer with low capacity and stagnant flow to be replaced with pipe at appropriate slope and size	P13 (355ft of 10"Ø), P14 (475ft of 10"Ø)	$225,880	1	4	4	3	3.0
			Construction Cost:	**$3,049,522**					
			25% Construction Contingency:	$762,381					
			Preparation of Bid Documents:	$335,447					
			Consultant assistance during bidding:	$91,486					
			Engineering Services During Construction:	$91,486					
			Construction Management:	$121,981					
			Estimated Construction Costs:	**$4,452,302**					

Table 3: Long-term CIP Schedule and Description of Projects

Long-term CIP schedule and description of projects									
Year of CIP	CIP Name	Description	Items	Priority Matrix (0 to 5)					
				Construction Cost Est.	Relevance to Objective	Proximity to water	Connections Affected	Cost Class	Matrix Rating
10	Sherwood Forest	Construct a new collection system for Sherwood Forest	(15,750ft of 6 and 4"Ø)	$3,501,550	1	4	2	5	3.0
15		Infiltration through barrel.	*SP88*	$9,700	4	4	3	1	3.0
15	Tiffeni Dr	Multiple sags and joint offsets	P175 (425ft of 8"Ø), P209 (265ft of 8"Ø), P177 (243ft of 6"Ø), P178 (106ft of 6"Ø)	$308,939	1	3	3	4	2.8
15	East Ave to Cedar Pines	Sewer with adverse slope stagnant flow and low velocities to be replaced.	P214 (261ft of 8"Ø), P215 (76ft of 8"Ø), P216 (258ft of 8"Ø), P217 (213ft of 6"Ø), P218 (412ft of 6"Ø), *SP189*	$351,875	1	3	2	4	2.5
15	Black Oak Dr	Sewer with surface inflow at MH, negative slope and stagnant flow to be replaced.	P43 (60ft of 6"Ø), *SP27, SP28*	$59,825	5	1	2	2	2.5
20	Between Cresta Dr and Oak View Dr	Sewer with cracks joint offsets and insufficient cover to be replaced.	P145 (278ft of 6"Ø), P146 (350ft of 6"Ø), P147 (168ft of 6"Ø), P148 (359ft of 6"Ø), P149 (48ft of 6"Ø), P150 (189ft of 6"Ø), P152 (108ft of 6"), P153 (82ft of 6"Ø), P156 (231ft of 6"Ø), P157 (155ft of 6"Ø)	$579,580	2	1	2	5	2.5
20	P356	Sewer with joint offset to be replaced.	P356 (319ft of 6"Ø)	$61,169	2	4	1	3	2.5
20	Behind Dogwood Dr	Sewer with collapsed pipe and joint offsets to be replaced.	P161 (350ft of 6"Ø), P167 (359ft of 6"Ø)	$160,125	3	2	1	3	2.3
20	SP109	Bolt lid, relocate MH.	*SP109*	$9,700	3	3	2	1	2.3
20	P365	Sewer with multiple cracks to be replaced.	P365 (488ft of 6"Ø)	$79,200	3	1	1	3	2.0
20	MH13A	Replace rim and frame of MH.	*MH13A*	$9,700	2	4	1	1	2.0
20	SP2	MH in a poor location	*SP2*	$9,700	3	2	1	1	1.8

Long-term CIP schedule and description of projects									
Year of CIP	CIP Name	Description	Items	Priority Matrix (0 to 5)					
				Construction Cost Est.	Relevance to Objective	Proximity to water	Connections Affected	Cost Class	Matrix Rating
20	SP56	Construct culvert under the driveway or relocate or bolt MH.	*SP56*	$9,700	3	1	1	1	1.5
20	SP109	Replace MH ring and lid.	*SP10*	$9,700	2	2	1	1	1.5
20	P364	Sewer with horizontal slope to be replaced.	P364 (174ft of 6"Ø)	$34,750	1	1	1	2	1.3
20	MH93	Damaged MH, replace.	*MH93*	$9,700	2	1	1	1	1.3
			Construction Cost:	**$5,204,913**					
			25% Construction Contingency:	$1,301,228					
			Preparation of Bid Documents:	$335,447					
			Consultant assistance during bidding:	$91,486					
			Engineering Services During Construction:	$91,486					
			Construction Management:	$121,981					
			Estimated Construction Costs:	**$7,146,541**					

If the District wishes to group the CIPs into larger projects and reduce estimated costs using the economies of scale, THCSD could group the projects as follows (costs are shown as *Construction/Total*):

- Short Term CIPs / THCSD I&I Reduction Project ..... $ 3,050,000 / $ 4,453,000
- Long Term CIPs (excluding Sherwood Forest) ..... $ 1,704,000 / $ 2,339,000
- Sherwood Forest (using a 25% construction contingency) ..... $ 3,502,000 / $ 4,808,000

9 CWSRF Funding and CEQA

THCSD is seeking funding through the California's Clean Water State Revolving Fund (CWSRF) for the projects listed in **Table 4**. **Table 4** combines the short-term CIPs identified in **Table 2** into a singular project identified as the THCSD I&I Reduction Project. The proposed project will require CEQA work and approval by the State. It is estimated that the construction cost for the project is $3.05 million. Additional funds should be allotted for 25% contingencies and engineering design assistance during bidding, construction management and services during construction. It is estimated these associated expenses will result in a total $4.45 million. The CIPs included in the THCSD I&I Reduction Project are shown in red on **Figure 7**.

Table 4: Proposed THCSD I&I Project.

Item	Description	Replace ex MH (ea)	New MH (ea)	Lateral Conn. (ea)	Asphalt Rest. (ft^2)	Pipe (ft)	Construction / Total Cost Est.
THCSD I&I Reduction Project	Short term CIPs combined into a single large project for which THCSD is seeking CWSRF funding.	50	8	152	23,816	10,435	$ 3,049,522/ $ 4,452,302

Appendix A

Condition Assessment

BLACKWATER CONSULTING ENGINEERS, INC.

To: Tom Trott, P.E., Twain Harte Community Services District
Lewis Giambruno, Twain Harte Community Services District

From: Jeff Black, P.E., Black Water Consulting Engineers
Tyler Lee, E.I.T., Black Water Consulting Engineers



Subject: Twain Harte Community Services District
Condition Assessment Summary
Date: February 24, 2021

INTRODUCTION

As part of the Scope of Work for the Inflow/Infiltration Identification and Reduction Planning Project No. C-06-8408-110, Black Water Consulting Engineers, Inc. (Black Water) assisted with the solicitation of proposals to perform a Closed-Circuit Television (CCTV) survey of the Twain Harte Community Services District (THCSD) sanitary sewer collection system. Concurrent with the CCTV survey, manhole (MH) surveys were performed. This technical memorandum (TM) provides an overview of the CCTV and MH surveys and describes the methodology used to analyze the data. The results of the analysis will be used to assist with the development of criteria for a risk model that will be used to refine and prioritize capital projects for a long-term Capital Improvement Plan to reduce Inflow and Infiltration (I&I).

Funding for this project has been provided in full or in part through an agreement with the SWRCB. California's Clean Water State Revolving Fund is capitalized through a variety of funding sources, including grants from the United States Environmental Protection Agency and state bond proceeds. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendations for use.

REFERENCES

Engineering reports and documents reviewed and referenced in this TM include the following:

[1] Planning Project No. C-06-8408-110 Attachment 1 Plan of Study, October 2018.

INVENTORY DATABASE

The first step in a condition assessment is the review of existing data. The existing data provided is comprised of notes prepared by operations staff, geographical information, flow monitoring, and as-built records. A review of the existing information is used for and followed by prioritizing the CCTV inspections.

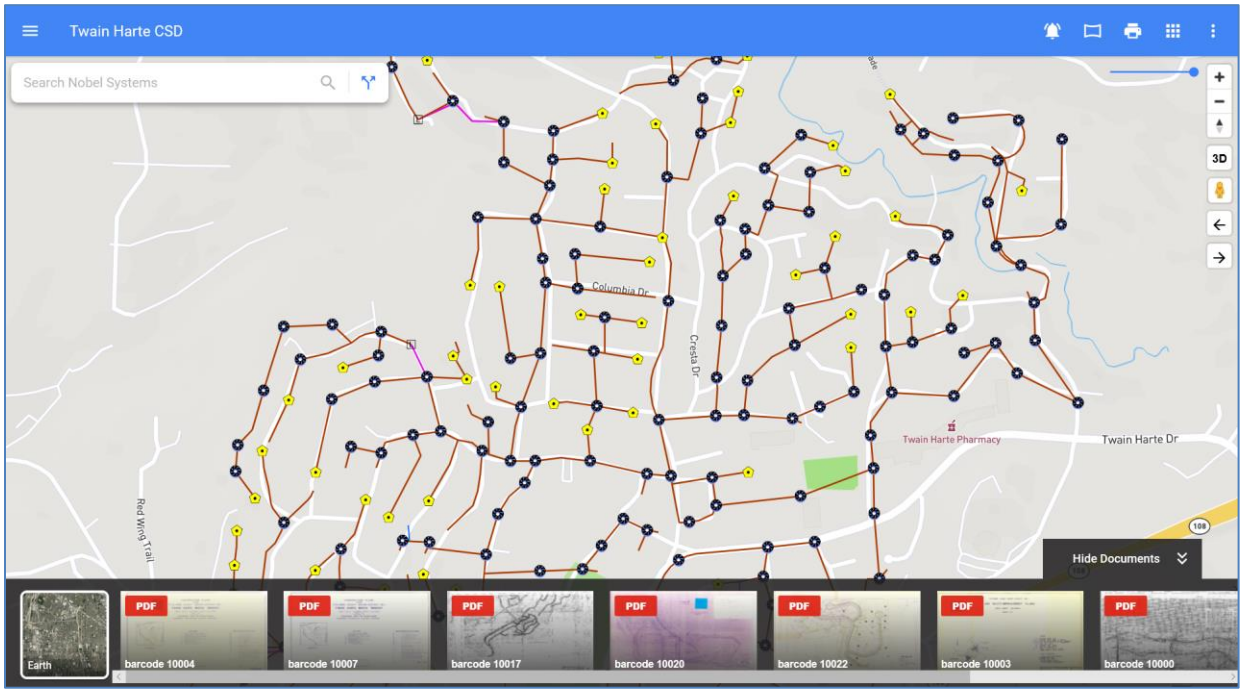
THCSD uses Geoviewer, an online Geographic Information System (GIS) based operations management program, to record regular maintenance and operations activities conducted by THCSD staff (See **Figure 1**). Horizontal and vertical data based on survey conducted in 2004 by Northstar Engineering Group had been entered into the program and was reviewed by Black Water. THCSD had also entered detailed information on construction projects into the program since the survey.

In addition to the physical data, the experiences from the staff at THCSD have provided abundant guidance on problematic areas/collection lines. Unlike many collection systems in the Central Valley, THCSD has steep reaches and resides in a highly forested area. As a result of the steep reaches, solids can separate from the wastewater stream and deposit in the collection system. The dense trees and brush throughout THCSD cause frequent root intrusion to both MHs and pipelines. The staff at THCSD aided in identifying lines that require frequent cleaning and maintenance.

THCSD has an established MH naming system for their collection system. MH's are identified as D-manhole (DMH), manhole (MH) or standpipe (SP) followed by the respective numbering. Lampholes and cleanouts are labeled as LH with the respective numbering system.

About two-thirds of the pipes in the sewer collection system had previously been numbered. Starting from the existing system, the remaining pipes were numbered.

Figure 1: Online GIS viewer used by the THCSD staff for maintenance tracking



PRIORITIZING ASSETS FOR INSPECTION

To ensure the budget afforded by the State for this task was optimized, the existing infrastructure was prioritized based on the following criteria:

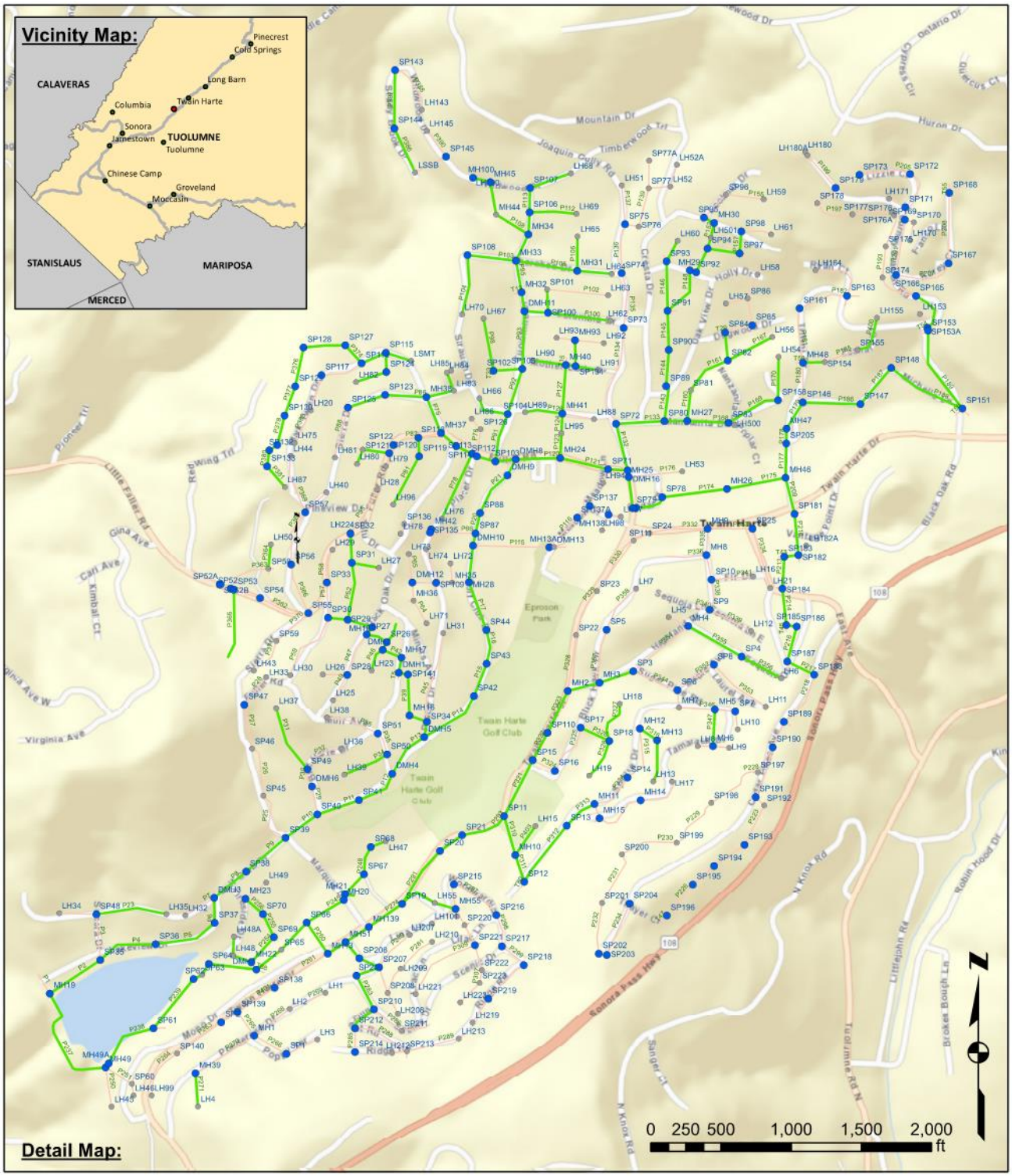
- High quantity of flow (The flow is proportional to the number of equivalent single-family residences [ESFRs] affected by a failure)
- Excessive or frequent maintenance issues (Issues may indicate existing and/or potential future defects in the pipe)
- Close proximity to waterways
- Reverse Slopes (Sags and reverse slopes accumulate solids and can cause plugged lines and exfiltration)
- MH with difficult accessibility (These MHs receive infrequent maintenance)

The system was divided into two categories based on the aforementioned priorities. The first category is comprised of lines with high priority. The second category was not CCTV'd and represents a low priority.

Figure 2 displays the extent of the CCTV. The total amount of linear ft CCTV'd was 48,364 ft (CCTV is shown as green in **Figure 2**).

CCTV MH surveys were performed for sections. Where time allowed additional manholes outside of the CCTV scope of work were also surveyed. Lastly, MH's not surveyed in roadways were evaluated using Google Earth for their location relative to drainage swales and ephemeral streams. All MHs that were identified and included in the study either through Google Earth or MH survey are shown in blue in **Figure 2**. The total number of MHs identified and evaluated using these methods is 127 MH Surveys, 92 Google Earth surveys, and 23 where only CCTV imaging was available. All combined, this accounts for 85% of the MHs in the THCSD system.

Figure 2: Categorization of the existing CCTV infrastructure before the inspection



PIPELINE INSPECTIONS

THCSD received bids for the CCTV inspection and the contract was awarded to Liberty Pipelines in December 2019. A preliminary meeting to discuss the scope of the project was conducted with staff from THCSD on January 10th, 2020 at the THCSD office. At this meeting, it was decided that THCSD personnel would perform jetting services in front of the Liberty Pipeline inspection team. Following the commencement of inspections on January 27, 2020, several lines were cleaned by THCSD and then inspected by Liberty Pipelines. On or around February 12, 2020, the camera used by Liberty Pipelines required repair. During this repair period, no CCTV inspections were performed. Liberty Pipelines was able to commence the inspection on March 24, 2020. Upon commencement of the inspection, the novel coronavirus had reached the United States and there was a statewide stay-at-home order in place. Concerns over the spread of coronavirus limited THCSD staff ability to perform only flushing services as opposed to the original jetting. As a result of the different cleaning methods, several lines that were simply flushed had observations of root intrusions and root balls. As a result of less than optimal cleaning methods, small and medium root intrusions were disregarded. The final deliverable was completed on November 4, 2020.

The CCTV inspections were performed following the National Association of Sewer Service Companies Pipeline Assessment Certification Program (NASSCO PACP) methodology. The NASSCO PACP method allows for the identification and scaling of defects based on priority. PACP by NASSCO is separated into two sections: the first being structural observations, and the second being operations and maintenance (O&M) observations. Structural observations are items that require repair or replacement. Structural defects would include collapsed pipes, cracked pipes, joint offsets, deformed pipes. O&M observations indicate actions that can be resolved through additional cleaning or flushing of the collection system. O&M conditions include root deposits, vermin, and grease buildup among a list of other observations. Additional information on the PACP methodology can be found in **Attachment H**.

Each of the observations, both structural and O&M, was assigned a grade. **Table 1** describes each grade category. The collection of grades on each line are combined into an index for each pipe section. The index takes the sum of all the grades per pipe and divides it by the number of observations per pipe. The pipe segment indexes are then used as a numerical method to prioritize repairs and maintenance schedules based on CCTV observations.

Table 1: Condition grade categories used in PACP

Grade	Description
5	Defects requiring immediate attention
4	Severe defects that will become Grade 5 defects within the foreseeable future
3	Moderate defects that will continue to deteriorate
2	Defects that have not begun to deteriorate
1	Minor Defects

Two images were provided of each condition and the CCTV files were provided to THCSD as a Microsoft Access Database on a portable hard drive. Three reports were generated which included the inspection summary, pipe run reports, and observations reports. Attached to this report (**Attachment F**) is the pipe run report with photos.

The CCTV data was combined and sorted using ArcMap 10.5.1. ArcMap allows for the amalgamation of the photographic, tabular, and geospatial data. The data were analyzed using four scoring systems. The PACP structural index, O&M index, and overall Index. The fourth scoring system used to evaluate the CCTV inspections was the likelihood of failure (LOF).

The structural index ranges from 1 to 5 with 1 being a pipe with minor defects (a score of zero indicates no structural defects detected). A high structural index indicates frequent observations such as pipe collapse, cracks, deformed pipes, holes in pipes, and joint offsets. In determining sources of infiltration, all of these structural defects are potential sources.

The O&M index ranges from 1 to 5 with 1 being minor observations (a score of zero indicates no O&M defects detected). A high O&M index may indicate frequent maintenance issues and includes such observations as root intrusion, infiltration, obstacles, sediment in the pipe, and vermin. While not every item in O&M will result in infiltration, the frequent observation throughout THCSD is that pipes with root intrusion and in close proximity to surface waterways can generate infiltration.

The third index is the overall index which ranges from 1 to 5 with 1 being minor defects. This index combines the two observation methods of structural and O&M. The sum of all the defects is divided by the number of defects.

LOF is based on the Quick Rating System and shows the priority of repairs. The Quick Rating System can get complex and a detailed description is outlined in **Attachment H-PACP methodology**. The LOF builds on the Quick Rating System. LOF ranges from 1 to 6 with 6 needing immediate repairs. Any collection lines with a grade 3 or higher rating were evaluated. In short, LOF takes the first two numbers of the Quick Rating and divides it by 10. The LOF has some additional parameters that build on it that guarantee that the value will always range from 1.0 to 6.0.

Finally, while the PACP rating method works well, there are many cases where a defect receives a lower grade or no grade proportional to the problem it presents (for example, bends or obstructions preventing CCTV often receive no rank). Items that were previously identified as needing immediate repair were also determined regardless of assigned ratings or indexes.

Each of these scores has limitations but a combined use of the three indexes and the LOF allows for the isolation of problematic lines. A map of the televised lines using each of these review strategies can be found in the following attachments:

- Attachment A – Structural Index
- Attachment B – O&M Index
- Attachment C – Overall Index
- Attachment D – LOF

MANHOLE INSPECTIONS

The MH inspection was performed by THCSD and Black Water staff to assess the structures condition and identify potential sources of I&I. Manhole inspections were performed in two periods: November 24 – 26 and February 4 – 5. Notes from the MH Inspection can be found in **Attachment G** of this TM.

MH Inspections evaluate MH type, condition, observations on I&I, location relative to roadway or surface water, flow path, depth of flow, and additional observations.

THCSD makes use of inflow dishes under MH lids to reduce inflow through vent holes and between the lid and frame. Inflow dishes have been demonstrated to reduce surface inflow but do not provide a completely watertight seal. A significant surface inflow during storm events is estimated to occur in manholes located in drainage swales and ephemeral streams. Manholes without dishes or that are located in areas subject to submergence or sheet flow will have significant inflow.

Figure 3 demonstrates the importance of location relative to surface runoff. Both images show surface runoff from either the street or drainage swale. In both cases, surface runoff can be seen entering manholes.

Figure 3: Surface runoff entering manholes in poor locations



Groundwater in and around THCSD typically has high concentrations of iron and manganese. The concentrations of iron will cause a rust color to appear on the concrete at locations that experience I&I. Locations that showed this rust coloring on the interior concrete walls are a telltale sign of infiltration. The majority of manholes in the THCSD collection system are shallow and constructed of irrigation standpipe or two-foot inside diameter (ID) concrete pipe. Although these pipes are easy to install and have continued in operation, the sidewalls, bench, and frame are connected through cold joints. These cold joints are sources of I&I during storm events. (See **Figure 4**). Cracks or breaks in pipe connections to manholes are also potential sources of I&I. The MH inspection evaluated THCSD's manholes to best determine and rate these sources of I&I.

Figure 4: L buildup of iron deposits from frequent infiltration at a cold joint. R cracked MH lid.



DATA ANALYSIS

Manhole Inspection Results

Figure 5 shows the MHs surveyed with their priority rating. Since this evaluation aims to identify sources of I&I, high priority (red) MHs either have defects in need of immediate repair or high inflow. Medium priority items (orange) are MH's with a significant amount of inflow and in need of repairs. Low priority (yellow) represents either minor inflow and or minor repairs.

Table 2 presents a list of MHs that were identified as potential sources of high I&I or in need of immediate repair. Repair options are listed in the table along with location and a description of the observation. Additional manholes with lower I&I sources and lower priority are included as part of **Attachment G**.

Figure 5: MH's showing urgency of repair. Red is a high priority, Orange medium priority, yellow low priority, and green no defects observed (See Attachment__).

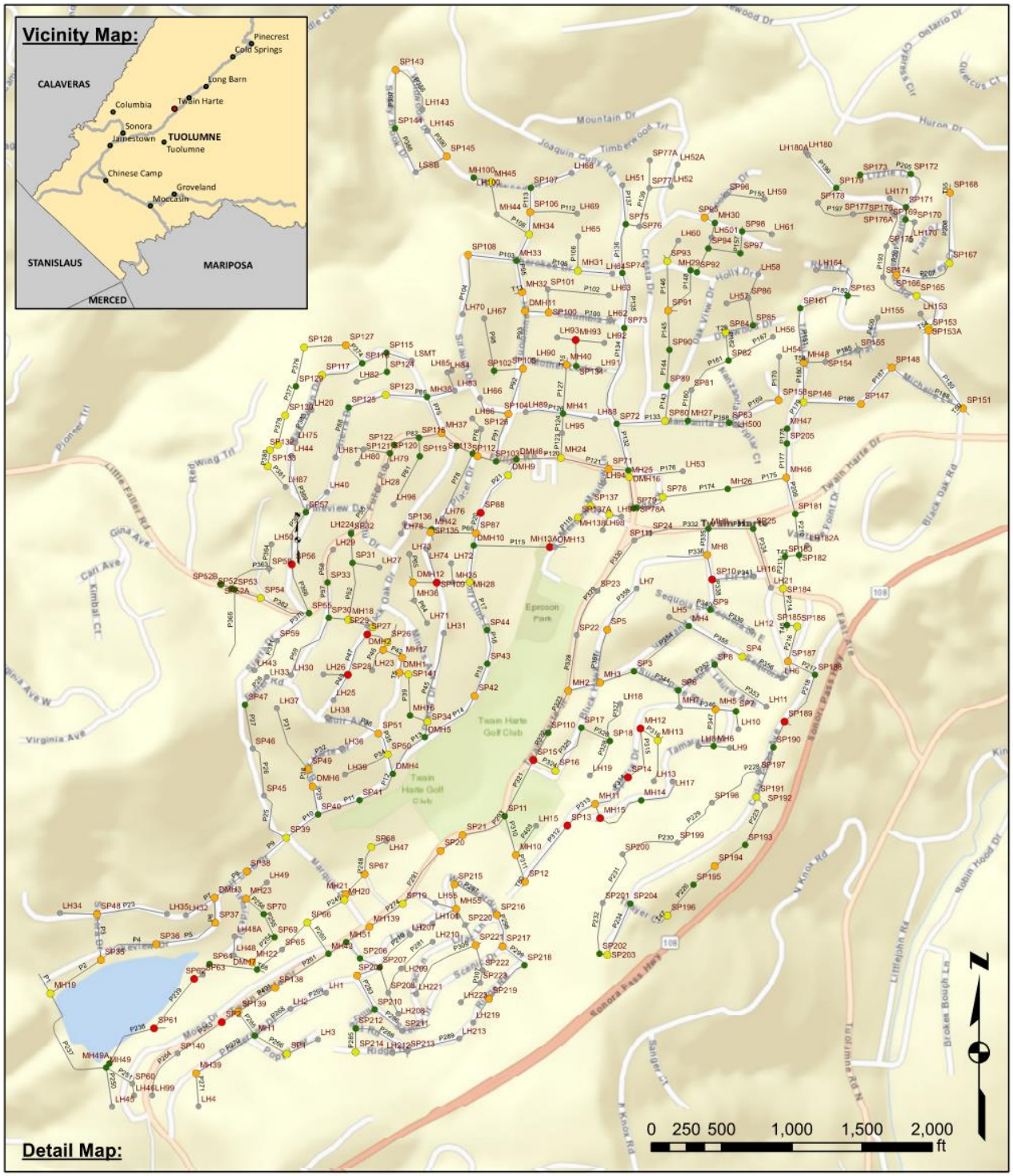


Table 2: Summary of MH's potentially contributing to I&I

MH #	Location	I&I Rating (1-5)	Description of observation	Possible solutions	Timeline
MH12	Uphill of driveway 22727	4	In drainage swale, bad location significant root intrusions on inlet channel. Raise MH 3" switch to eccentric cone and reconstruct inlet	Replace concentric cone w/ eccentric cone to move rim out of swale and up the embankment. Raise MH	High Priority
MH13A		1	MH raised, barrel and bench condition, the rim is loose	Replace Frame and Rim	High Priority
MH15		5	MH is in the low spot of the cul de sac. The drainage channel appears higher than the MH elevation.	Lower drainage channel. Remove berm	High Priority
MH93		1	The broken section in the lower barrel. A potential source for infiltration.	Damaged MH, Replace	High Priority
SP10	Intersection of Fir and Highland	3	Ring and MH lid fused. The ring came up when pulling the lid. No inspection performed	Replace MH ring and Lid	High Priority
SP109		5	Bad location in drainage swale at low point	Bolt Lid, relocate MH	High Priority
SP13	Uphill of Driveway 22623 Spruce Dr	5	Inflow from drainage swale.	Relocate Mh or add SD channel	High Priority
SP14	22695 Spruce Dr (Across street to the mailbox of address 22678 Spruce Dr)	5	Bad location significant inflow, the manhole is standpipe w/ cracked vcp as the channel	Move Manhole uphill to the driveway of 22695 spruce. Can raise Mh and no damage of plow	High Priority
SP15		5	Bad location. CCTV photo show possible rust from infiltration	Raise relocate or bolt. Possibly construct SD channel	High Priority
SP189		5	Significant puddle around MH. Ring slightly elevated. Switch to eccentric cone	Switch to eccentric to get MH away from the low point. Adjust asphalt. Bolt MH or relocate	High Priority
SP2		5	MH in a drainage swale	Move MH construct SD channel or Bolt lid	High Priority
SP27			MH not located during Inspection. Visible from Google Earth. MH was submerged under a puddle at the time of inspection. Significant Inflow was observed downstream of this MH.	Raise MH. Replace with Eccentric Cone to remove from the roadway. Or add an SD culvert under the roadway to remove the puddle.	High Priority
SP28		5	MH in drainage swale.	Relocate raise or bolt MH	High Priority
SP56		5	MH is in drainage swale in the lowest point	Construct culvert under the driveway or relocate or bolt MH	High Priority
SP61	Along Path by Lake	1	Heavy I&I observed at connections	Replace Manhole, not in the roadway	High Priority
SP62	22410 Mono Dr	1	Frame broken raise and repair	Replace Frame and Raise, not in the roadway	High Priority
SP88	22982 Golf Club Dr	3	Large Rust Buildup after lowest joint in the barrel.	Grout or Replace MH to eliminate I&I	High Priority

Pipeline Inspection Results

The lines requiring repair/replacement based on the aforementioned criteria can be seen in **Attachments A** through **D**. These findings are summarized in **Table 3**. The CCTV inspections for the pipes identified in **Tables 3, 4 and 5** can be seen in **Attachment E**.

Table 3: Pipes Recommended for Repair/Replacement

		Structural					
Pipe #	**Struc Index**	**O&M Index**	**Overall Index**	**LOF**	**Priority**	**Length**	**Size**
P161	**5.00**	1.00	2.33	**5.1**	High	350’	6”
P249	**3.50**	1.69	1.93	**5.1**	High	113’	6”
		Overall					
Pipe #	**Struc Index**	**O&M Index**	**Overall Index**	**LOF**	**Priority**	**Length**	**Size**
P109	0.00	**4.00**	**4.00**	0	High	269’	6”
P108	2.00	**4.00**	**4.00**	2.1	High	235’	6”
P177	0.00	**4.00**	**4.00**	1	High	243’	6”
P189	1.00	**4.00**	**4.00**	1.2	High	636’	6”
P209	0.00	**4.00**	**4.00**	1	High	269’	8”
P214	0.00	**4.00**	**4.00**	1	High	261’	8”
P216	0.00	**4.00**	**4.00**	1	High	258’	8”
P238	0.00	**4.00**	**4.00**	1	High	440’	10”
P239	0.00	**4.00**	**4.00**	1	High	452’	10”
P241	0.00	**4.00**	**4.00**	1	High	92’	10”
P242	0.00	**4.00**	**4.00**	1	High	341’	10”
		Operations and Maintenance					
Pipe #	**Struc Index**	**O&M Index**	**Overall Index**	**LOF**	**Priority**	**Length**	**Size**
P178	1	**4**	2.5	1.1	High	106’	6”
		Likelihood of Failure					
Pipe #	**Struc Index**	**O&M Index**	**Overall Index**	**LOF**	**Priority**	**Length**	**Size**
P4	2.50	1.00	1.19	**3.1**	Medium	427’	10”
P150	3.00	1.60	1.73	**3.1**	Medium	193’	6”
P157	2.33	1.40	1.52	**4.1**	High	152’	6”

Several structural defects are recommended for immediate repair regardless of the scores. A list of these items are as follows:

- Infiltration
- Joint Offset Large
- Pipe Collapse
- Missing Wall
- Inaccessible Pipes

A list of the pipes requiring replacement based on singular observations is shown in **Table 4**.

Tables 3 and **4** Provide a summary of pipes in need of repair or replacement. In addition to these pipes, the pipes shown in **Table 5** need repair or improvement projects, but their priority is lower than the pipes from **Tables 3** and **4**. Many of the lines shown in **Table 5** have bends that make portions of the pipe segment inaccessible to CCTV or maintenance.

Table 4: Pipes with Major Structural Defects

Pipe #	Immediate Repair Required Description	Priority	Length	Size
P107	Collapsed Pipe	High	206’	6”
P112	Crack Circumferential	High	334’	6”
P147	Crack Circumferential	High	168’	6”
P365	Crack x2	High	488’	6”
P9	Cracks top of Pipe missing	High	374’	10”
P85	Cracks x2	High	201’	6”
P310	Cracks x2	High	288’	6”
P132	Infiltration Observed	High	352’	8”
P245	Infiltration Observed	High	309’	6”
P291	Infiltration Observed	High	472’	10”
P175	Joint Offset Large x2	High	425’	8”
P312	Joint Offset Large x2	High	501’	6”
P375	Roots Ball Unknown by Lift Station	High	297’	6”
P8	Joint Offset Large	High	295’	10”
P54	Joint Offset Large	High	207’	6”
P87	Joint Offset Large	High	279’	6”
P127	Joint Offset Large	High	350’	6”
P143	Joint Offset Large	High	258’	6”
P145	Joint Offset Large	High	278’	6”
P148	Joint Offset Large	High	359’	6”
P152	Joint Offset Large	High	108’	6”
P167	Joint Offset Large	High	359’	6”
P260	Joint Offset Large	High	267’	10”
P313	Joint Offset Large	High	353’	6”
P356	Joint Offset Large	High	319’	6”
P396	Joint Offset Large	High	246’	6”
T39	Joint Offset Large	High	52’	
P321	Joint Offset Medium x2	High	447’	8”
P52	Minor Crack	High	411’	6”

Table 5: Lower Priority Pipe Improvement Recommendations

Minor Repairs/Replacement				
Pipe #	**Description**	**Priority**	**Length**	**Size**
P170	Joint Offset Large or Bend	Medium	310’	6”
P80	Bend (pipe inaccessible)	Medium	132’	6”
P124	Bend (pipe inaccessible)	Medium	140’	6”
P144	Bend (pipe inaccessible)	Medium	259’	6”
P156	Bend (pipe inaccessible)	Medium	231’	6”
P164	Bend (pipe inaccessible)	Medium	194’	6”
P237	Bend (pipe inaccessible)	Medium	853’	10”
P284	Bend (pipe inaccessible)	Medium	199’	6”
P294	Bend (pipe inaccessible)	Medium	282’	6”
P328	Bend (pipe inaccessible)	Medium	288’	8”
P385	Bend (pipe inaccessible)	Medium	227’	6”
P386	Bend (pipe inaccessible)	Medium	346’	6”

In addition to the previously discussed CCTV and MH Inspection results, the creek crossing between MH22 and DMH7 was observed to have erosion on the north side of the concrete encasement. River crossings are extensive, and it is recommended that this erosion be further evaluated in the Project Engineering Report.

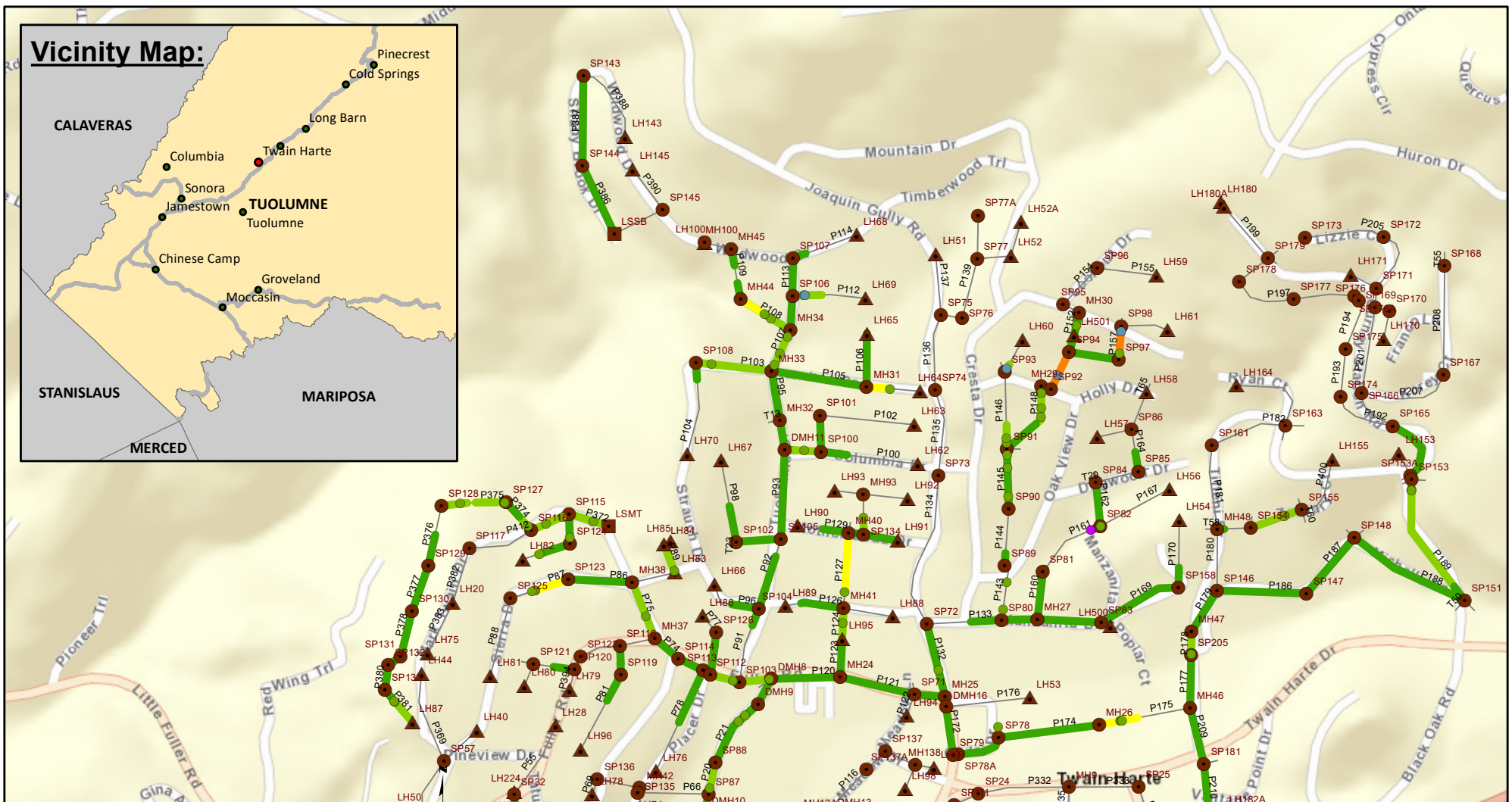
Additionally, several sewer pipes are adjacent to Twain Harte Lake. It is recommended that pipes adjacent to bodies of water currently constructed of Vitrified Clay Pipe be replaced with PVC, HDPE, or ductile iron to limit infiltration from the perennial high groundwater.

SUMMARY

A CCTV and manhole survey were completed for portions of the THCSD sanitary sewer collection system. The data collected were analyzed to assess the condition of the system and identify deficiencies. The most common pipeline deficiencies identified included large joint offsets, cracks, infiltration, and root balls. Defects in several manholes included cracks, joint gaps, and locations where I&I is probable. The results of this condition assessment will be integrated into a risk model that will assist with developing a long-term Capital Improvement Plan which will be detailed in a Project Engineering Report.

ATTACHMENT A - CCTV STRUCTURAL INDEX RESULTS

Detail Map:



TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

Condition Observations

- Collapsed Pipe
- Cracked Pipe
- Deformed Pipe
- Hole in Pipe
- Joint Offset/Separation

Structural Index

- 0.00
- 0.01 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 5.00
- Not Inspected

Sewer Structures

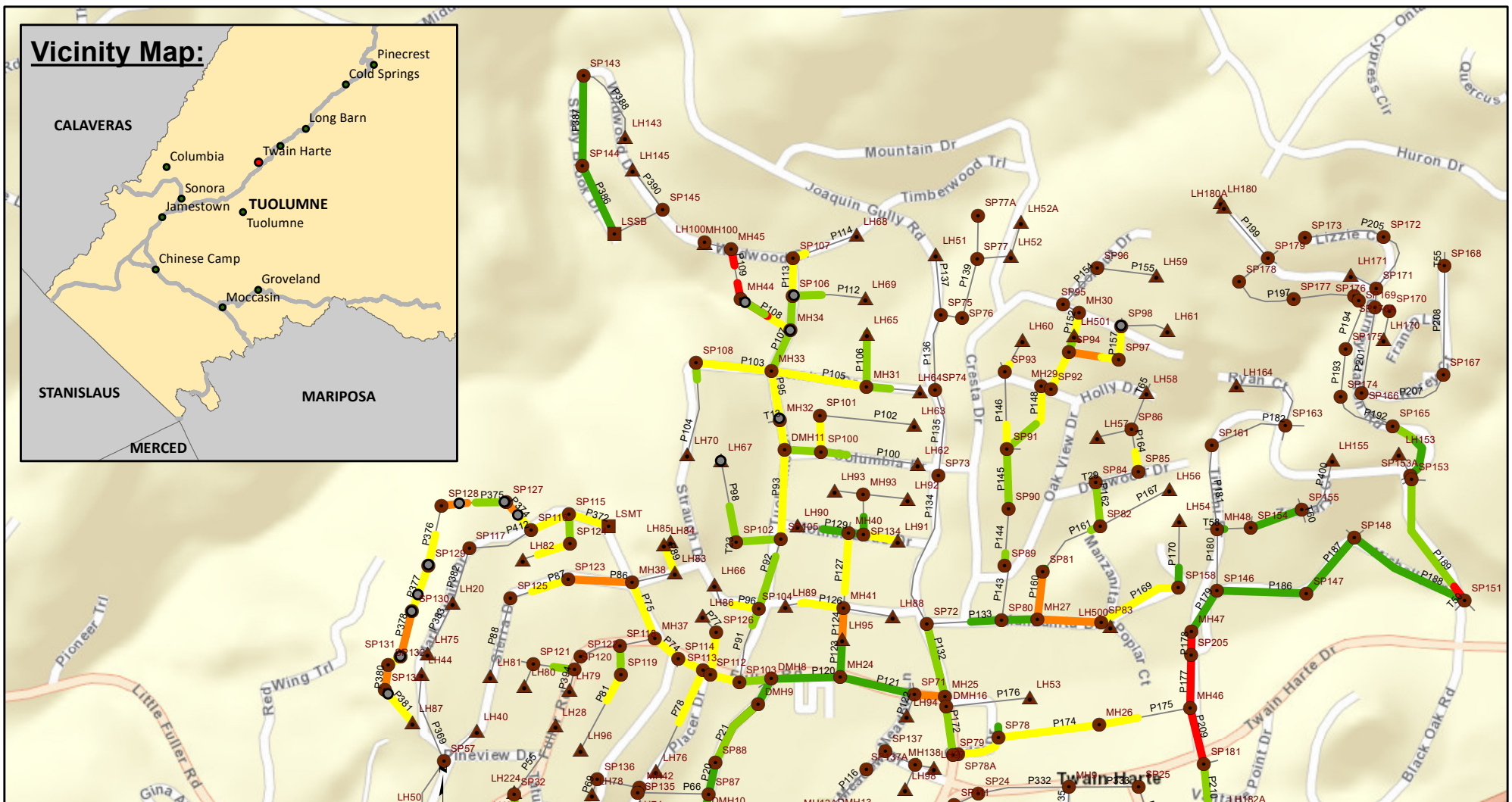
- LAMPHOLE
- LIFT STATION
- MANHOLE

I&I Identification Reduction Project
CCTV Structural Index

ATTACHMENT B - CCTV OPERATIONS AND MAINTENANCE

Vicinity Map:

Detail Map:





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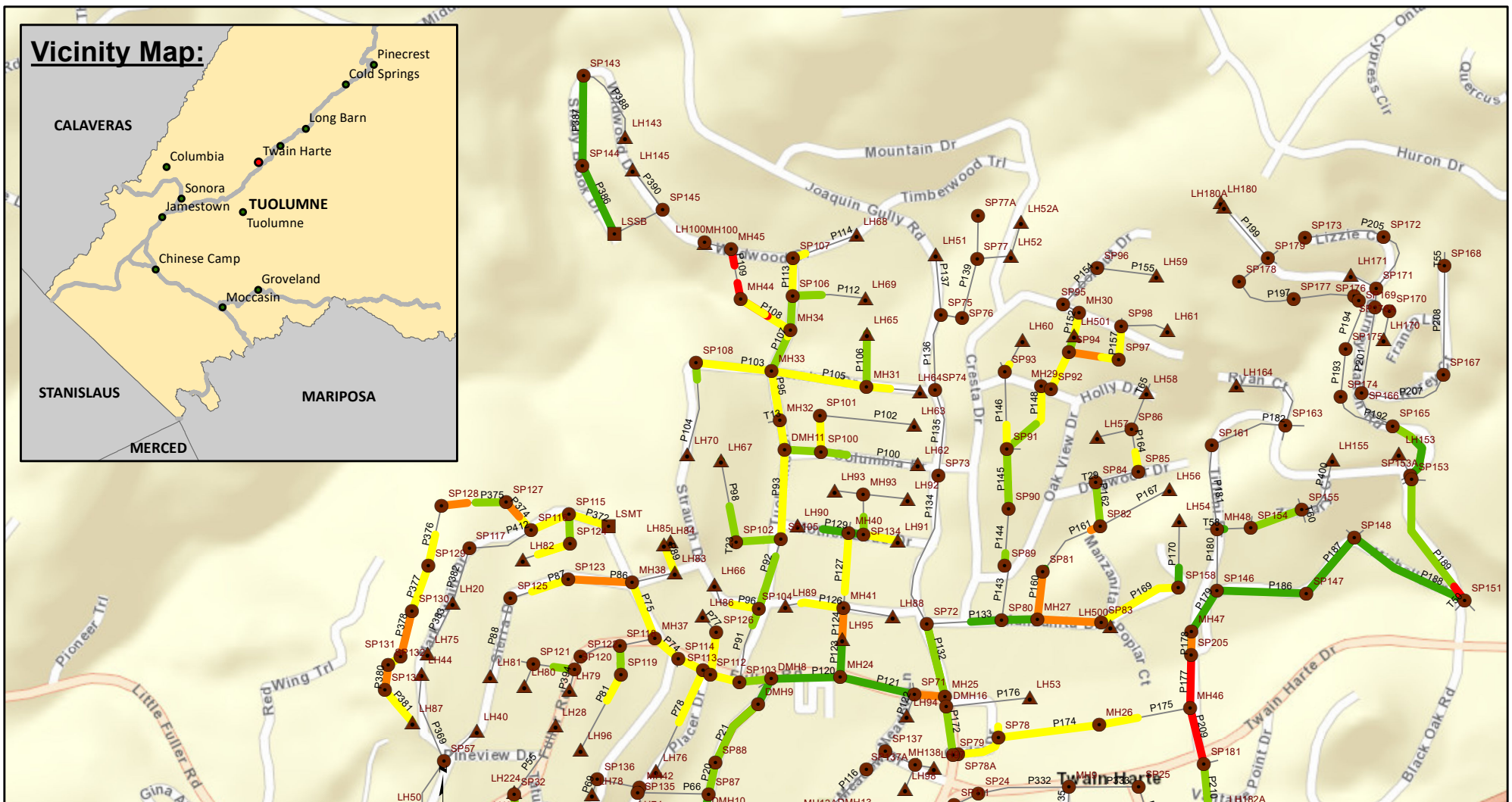
Condition Category	OM Index	Sewer Structures
Grout Test and Seal	0.00	LAMPHOLE
Vermin	0.01 - 1.00	LIFT STATION
Deposits in Pipe	1.01 - 2.00	MANHOLE
Infiltration	2.01 - 3.00	
Obstacle	3.01 - 5.00	
	Not Inspected	

I&I Identification Reduction Project
Operations and Maintenance Index

ATTACHMENT C - CCTV OVERALL INDEX

Vicinity Map:

Detail Map:



Overall Index

- 0.00
- 0.01 - 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.01 - 5.00
- Not Inspected

Sewer Structures

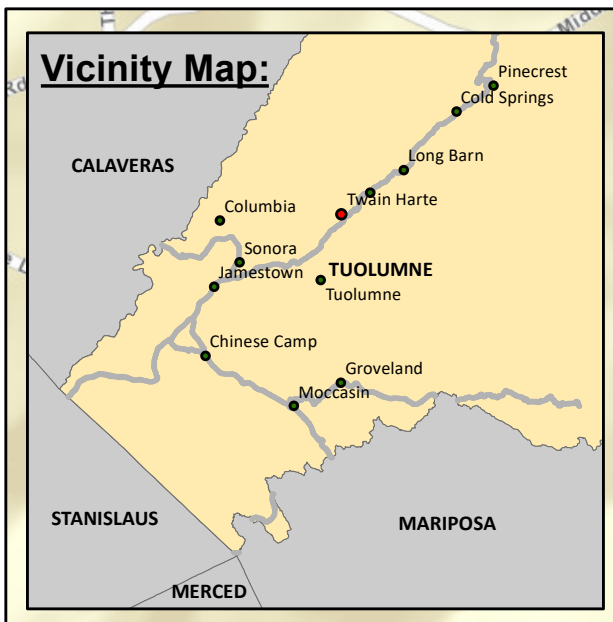
- LAMPHOLE
- LIFT STATION
- MANHOLE

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

I&I Identification Reduction Project
Overall Index

ATTACHMENT D - LIKELIHOOD OF FAILURE



Detail Map:

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

LOF

- 1.00
- 1.01 - 2.00
- 2.01 - 3.00
- 3.001 - 4.00
- 4.01 - 5.00
- Not Inspected

Sewer Structures

- LAMPHOLE
- LIFT STATION
- MANHOLE

I&I Identification Reduction Project
Likelihood of Failure

ATTACHMENT E –PRIORITY RUNS/OBSERVATIONS FROM CCTV INSPECTION

Removed from Engineering Report.
See Final Condition Assessment for details on Attachment E.

ATTACHMENT F – CCTV DOCUMENTATION

CCTV Scope

CCTV Bid Specification

CCTV Agreement Amendment

CCTV Main Inspections Pipe Run with Images

Removed from Engineering Report.
See Final Condition Assessment for details on Attachment F.

ATTACHMENT G – MH INSPECTION WITH PHOTOS



Detail Map:

0 250 500 1,000 1,500 2,000 ft

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

Sewer Structures Repairs

- High Priority
- Medium Priority
- Low Priority
- No Action
- Not Inspected
- Sewer Pipes

I&I Identification Reduction Project
MH Inspection Results

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH12	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	3'-0"	4	
Location:		**Priority:**	
Uphill of driveway 22727		High Priority	

Comments:
In drainage swale, bad location significant root intrusions on inlet channel. Raise MH 3" switch to eccentric cone and reconstruct inlet

Action:
Replace concentric cone w/ eccentric cone to move rim out of swale and up embankment. Raise MH

Photos:













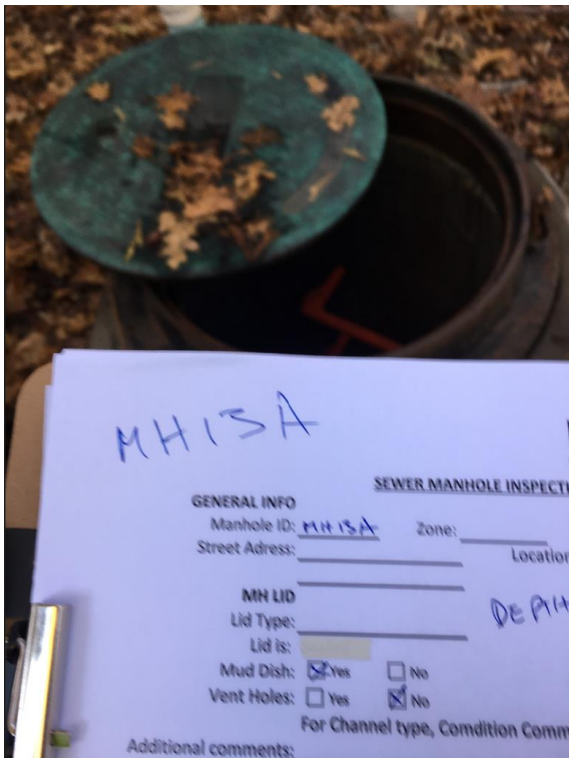
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH13A	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	9'-4"	1	
Location:		**Priority:** High Priority	

Comments:
MH raised, barrel and bench condition, rim is loose

Action:
Replace Frame and Rim

Photos:







BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH15	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 5	
Location:		**Priority:** High Priority	

Comments:
MH is in the low spot of the cul de sac. The drainage channel appears higher than the MH elevation.

Action:
Lower drainage channel. Remove berm

Photos:



BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH93	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"		1	
Location:		**Priority:** High Priority	
Comments: Broken section in lower barrel. Potential source for infiltration.			
Action: Damaged MH, Replace			

Photos:

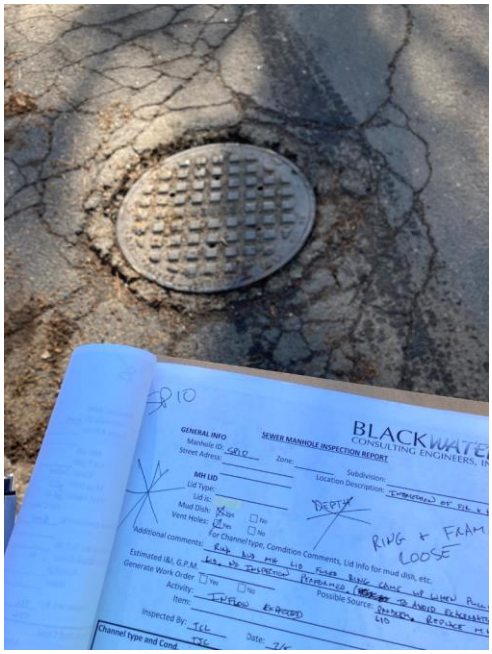
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP10	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:** 3	
Location: Intersection of Fir and Highland		**Priority:** High Priority	
Comments: Ring and MH lid fused. Ring came up when pulling lid. No inspection performed			
Action: Replace MH ring and Lid			

Photos:







BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP109	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		5	
Location:		**Priority:**	
		High Priority	
Comments:			
Bad location in drainage swale at lowest point			
Action:			
Bolt Lid, relocate MH			

Photos:





BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP13	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	2'-10"	5	
Location:		**Priority:**	
Uphill of Driveway 22623 Spruce Dr		High Priority	
Comments:			
Inflow from drainage swale.			
Action:			
Relocate Mh or add SD channel			

Photos:









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CONSULTING ENGINEERS, INC.

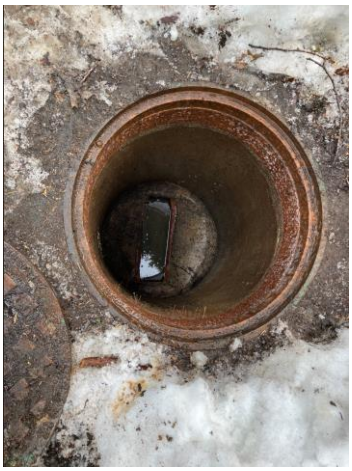
MH:	Inspection Type:	Date:	Inspected by:
SP14	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-11"	5	
Location:		**Priority:**	
22695 Spruce Dr (Across street to mailbox of address 22678 Spruce Dr)		High Priority	

Comments:
Bad location significant inflow, manhole is standpipe w/ cracked vcp as channel

Action:
Move Manhole uphill to driveway of 22695 spruce. Can raise Mh and no damage of plow

Photos:







MH:	Inspection Type:	Date:	Inspected by:
SP15	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 5	
Location:		**Priority:** High Priority	

Comments:
Bad location. CCTV photo show possible rust from infiltration

Action:
Raise relocate or bolt. Possibly construct SD channel

Photos:



BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP189	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	3'-11"	5	
Location:		**Priority:** High Priority	

Comments:
Significant puddle around MH. Ring slightly elevated. Switch to eccentric cone

Action:
Switch to eccentric to get MH away from low point. Adjust asphalt. Bolt MH or relocate

Photos:







MH:	Inspection Type:	Date:	Inspected by:
SP2	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 5	
Location:		**Priority:** High Priority	
Comments: MH in drainage swale			
Action: Move MH construct SD channel or Bolt lid			

Photos:



BLACKWATER
CONSULTING ENGINEERS, INC.

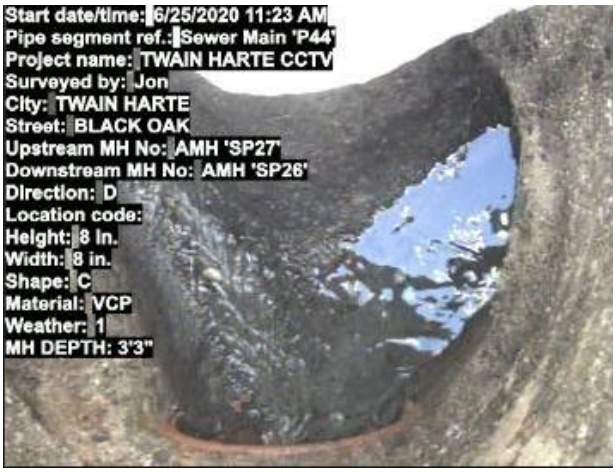
MH:	Inspection Type:	Date:	Inspected by:
SP27	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:** High Priority	

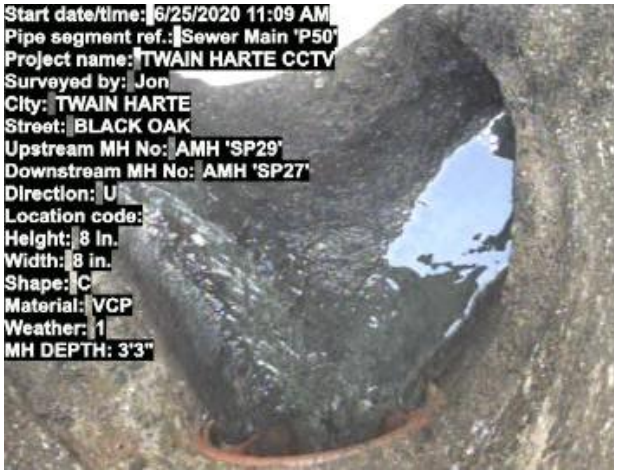
Comments:
MH not located during Inspection. Visible from Google Earth. MH was submerged under a puddle at time of inspection. Significant Inflow observed downstream of this MH.

Action:
Raise MH. Replace with Eccentric Cone to remove from roadway. Or add SD culvert under roadway to remove puddle.
Alternatively replace with 4'-0" eccentric cone and use eccentricity to place MH out of roadway (difficult but possible)

Photos:







MH:	Inspection Type:	Date:	Inspected by:
SP28	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 5	
Location:		**Priority:** High Priority	
Comments: MH in drainage swale.			
Action: Relocate raise or bolt MH			

Photos:



BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP56	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		5	
Location:		**Priority:**	
		High Priority	
Comments:			
MH is in drainage swale in lowest point			
Action:			
Construct culver under driveway or relocate or bolt MH			

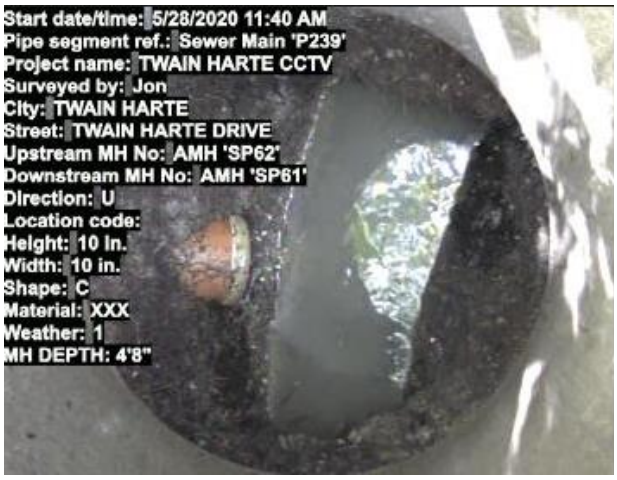
Photos:



BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP61	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-4"	1	
Location:		**Priority:**	
Along Path by Lake		High Priority	
Comments:			
Heavy I&I from upstream and downstream connections			
Action:			
Replace Manhole, not in roadway			

Photos:





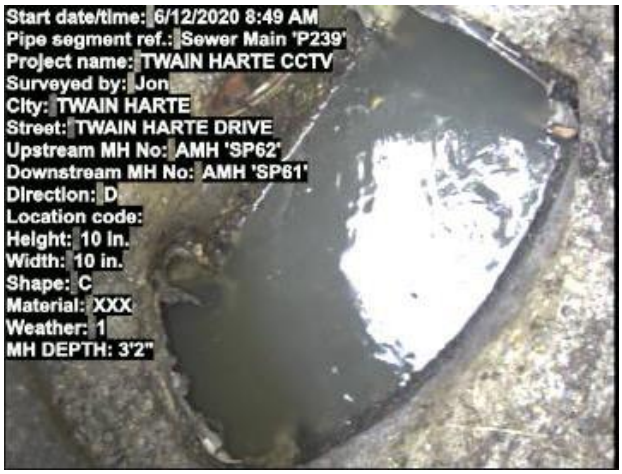
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP62	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	2'-10"	1	
Location:		**Priority:**	
22410 Mono Dr (By fence 3 posts from lake)		High Priority	
Comments:			
Frame broken raise and repair			
Action:			
Replace Frame and Raise, not in roadway			

Photos:







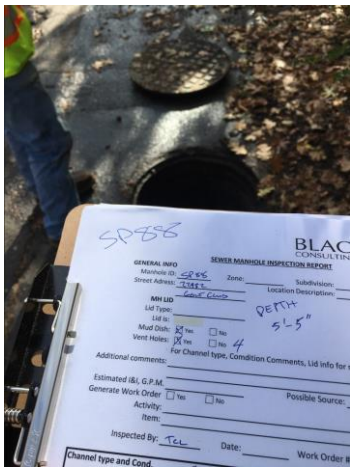
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP88	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	5'-5"	3	
Location:		**Priority:**	
22982 Golf Club Dr		High Priority	

Comments:
Large Rust Buildup after lowest joint in barrel.

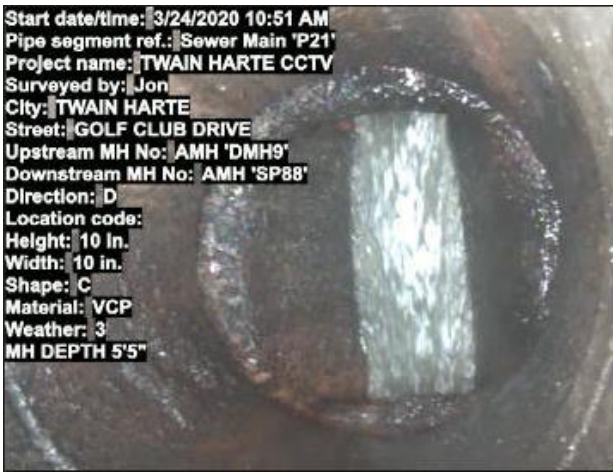
Action:
Grout or Replace MH to eliminate I&I

Photos:









BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH1	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Medium Priority	

Comments:
Obstructed flow in channel 20% d/D

Action:
Raise MH flush w/ roadway. Flip eccentricity to place MH in roadway to avoid inflow

Photos:

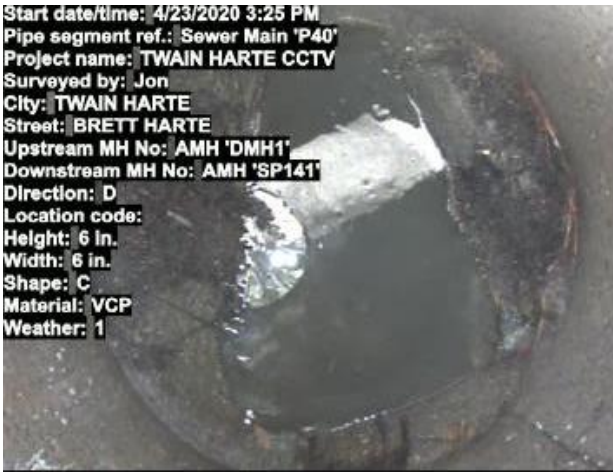


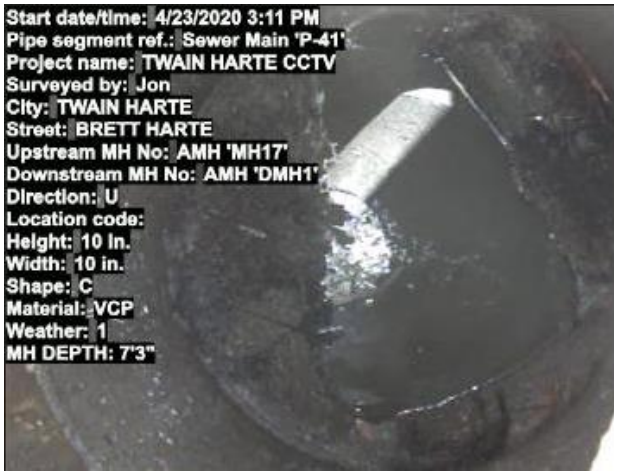









Start date/time: 4/23/2020 3:25 PM
Pipe segment ref.: Sewer Main 'P40'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: BRETT HARTE
Upstream MH No: AMH 'DMH1'
Downstream MH No: AMH 'SP141'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1


Start date/time: 4/23/2020 3:11 PM
Pipe segment ref.: Sewer Main 'P-41'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: BRETT HARTE
Upstream MH No: AMH 'MH17'
Downstream MH No: AMH 'DMH1'
Direction: U
Location code:
Height: 10 in.
Width: 10 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 7'3"

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH11	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	8'-2"	1	
Location:		**Priority:**	
23182 Tuolumne		Medium Priority	

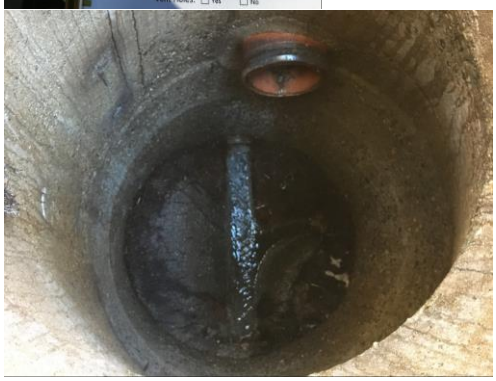
Comments:
Good condition but location next to drainage swale.

Action:
Construct SD channel or culvert under driveway

Photos:





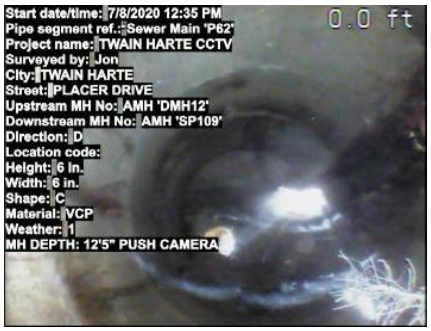


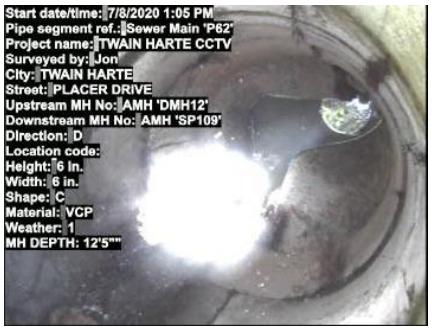




MH:	Inspection Type:	Date:	Inspected by:
DMH12	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Minor root intrusion. Good condition			
Action:			
NA			

Photos:





BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH2	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	9'-9"	1	
Location:		**Priority:** Medium Priority	

Comments:
Lots of root intrusion 2 to 3 inches of offset between cone and barrel. MH is raised and good location but poor condition

Action:
Align and or replace MH

Photos:









BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH3	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	14'	3	
Location:		**Priority:**	
22584 Golf Club Dr		Medium Priority	

Comments:
MH located in a small drainage swale.

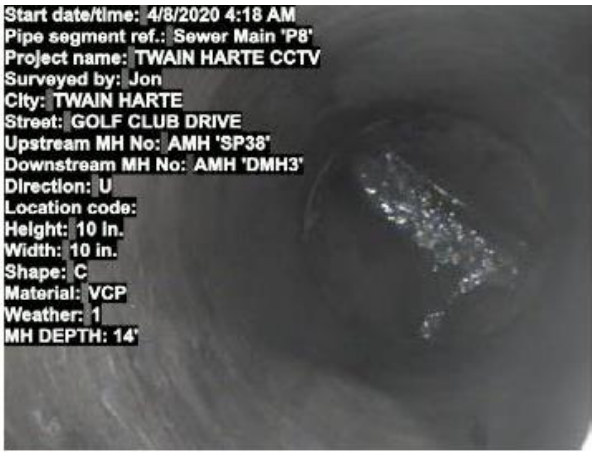
Action:
Construct SD Chanel, Flip eccentricity of cone and raise MH to move into roadway.

Photos:









MH:	Inspection Type:	Date:	Inspected by:
DMH6	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 5	
Location:		**Priority:** Medium Priority	

Comments:
Bad location in asphalt SD channel

Action:
If possible raise or use eccentricity to move lid out of asphalt channel. Possibly bolt MH

Photos:



BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH10	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	2'-11"	3	
Location:		**Priority:** Medium Priority	

Comments:
rusted reinforcement along bottom of cone (significant). MH could be raised (not in roadway)

Action:
patch grout or line MH. Around rusting reinforcement

Photos:















BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH11	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	2'-10"	3	
Location:		**Priority:**	
Across from 22654 Spruce Dr		Medium Priority	

Comments:
MH ring and frame not flush with grade. Rusting reinforcement showing. Indicative of infiltration.

Action:
Patch grout or line MH. Adjust MH frame w/ grade

Photos:





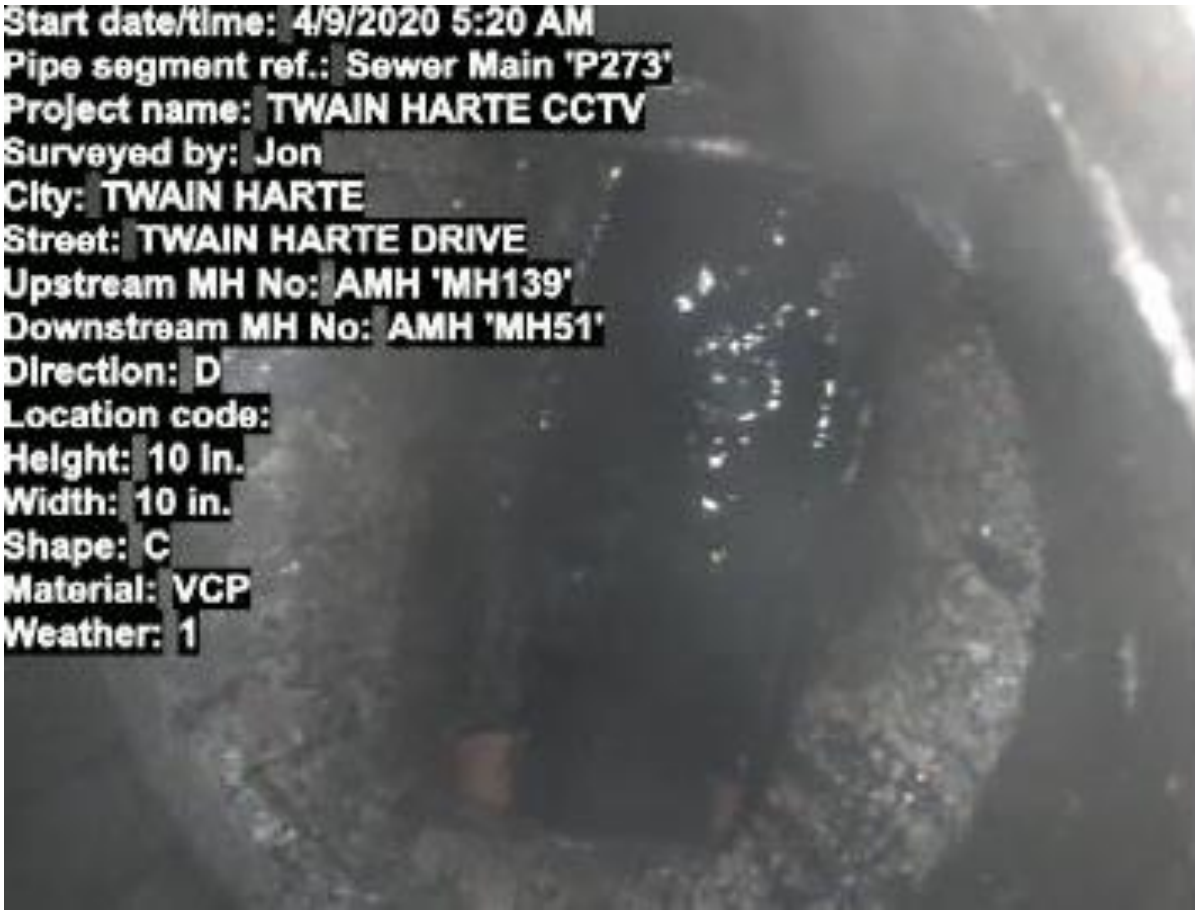




BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH139	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-7"	3	
Location:		**Priority:**	
Intersection of Marquis Dr and Twain Harte Dr		Medium Priority	
Comments:			
Not an ideal location but can't be raised			
Action:			
Bolt MH lid			

Photos:

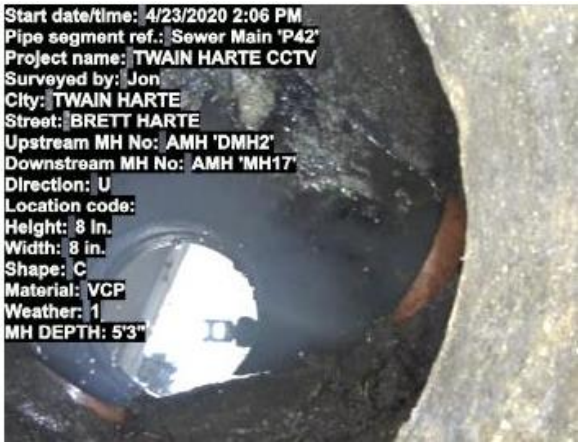


BLACKWATER
CONSULTING ENGINEERS, INC.

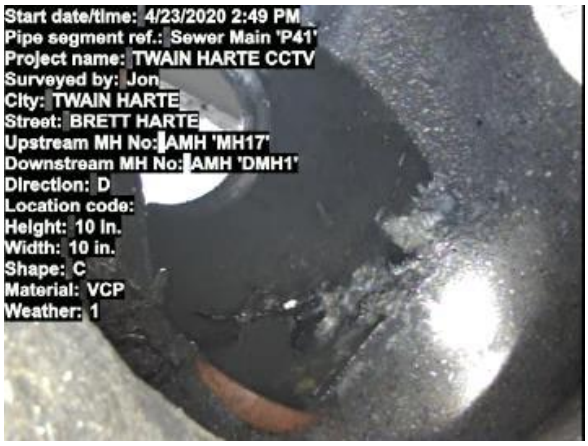
MH:	Inspection Type:	Date:	Inspected by:
MH17	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-0"	4	
Location:		**Priority:**	
22814 Brett Harte Dr		Medium Priority	
Comments:			
MH is in a depression in the path of the drainage swale			
Action:			
Flip eccentricity to place MH in road, replace or relocate			

Photos:







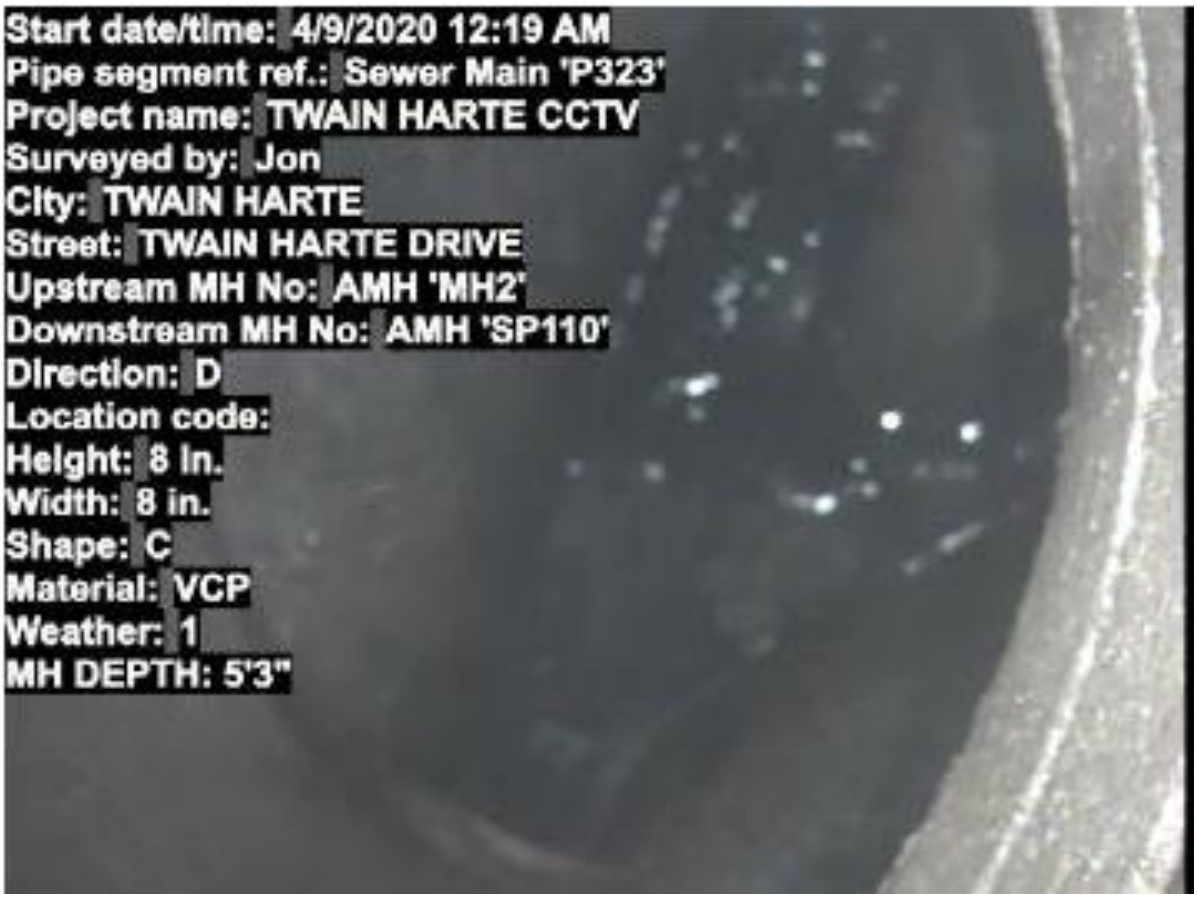


MH:	Inspection Type:	Date:	Inspected by:
MH2	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:** 5	
Location:		**Priority:** Medium Priority	

Comments:
Frame appears offset from CCTV shot. MH adjacent to drainage swale. Inflow during periods of high flow.

Action:
Relocate MH or bolt lid

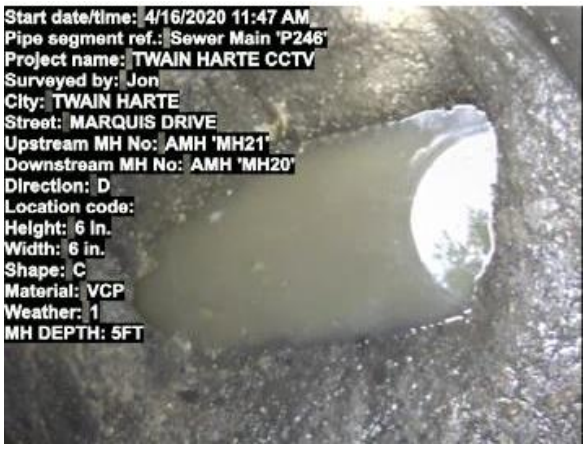
Photos:

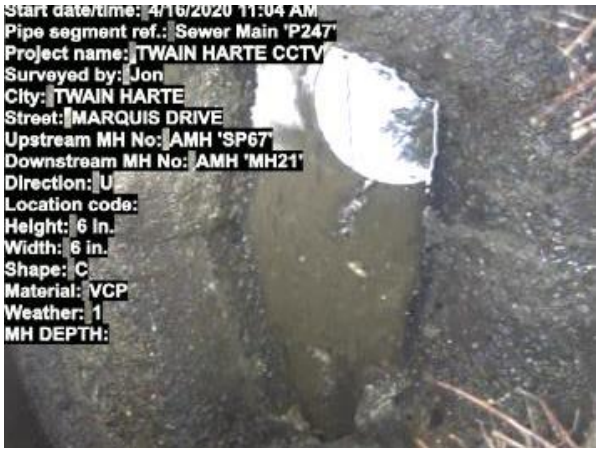


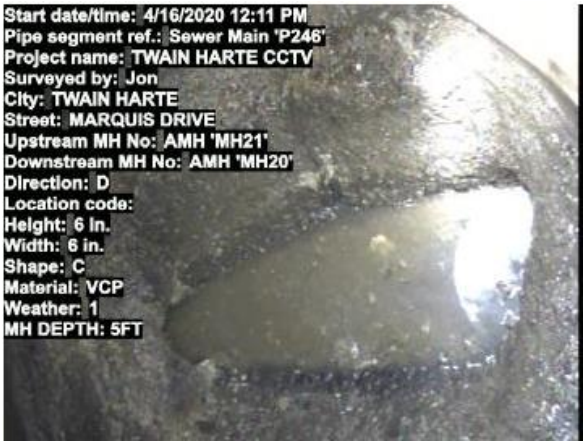
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH21	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	6'-4"	4	
Location:		**Priority:**	
Marquis Dr		Medium Priority	
Comments:			
Bad location, raise MH to reduce surface Inflow			
Action:			
Raise MH, not in roadway			

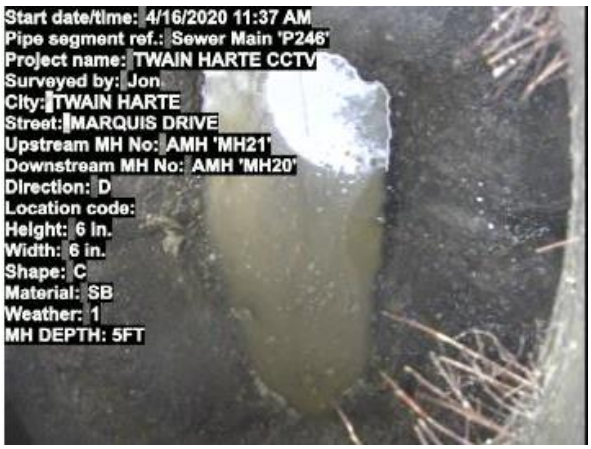
Photos:










Start date/time: 4/16/2020 11:37 AM
Pipe segment ref.: Sewer Main 'P246'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: MARQUIS DRIVE
Upstream MH No: AMH 'MH21'
Downstream MH No: AMH 'MH20'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: SB
Weather: 1
MH DEPTH: 5FT

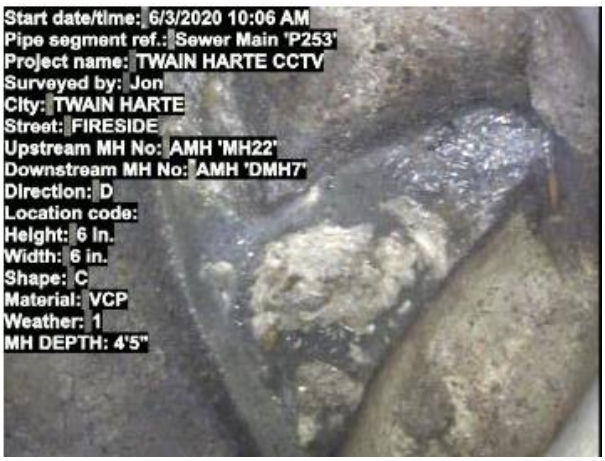
BLACKWATER
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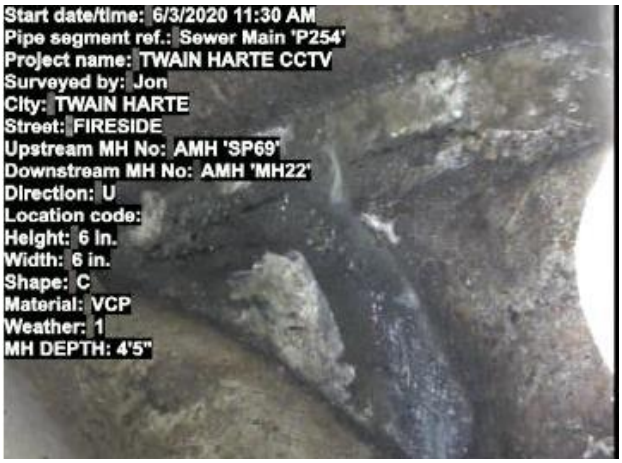
MH:	Inspection Type:	Date:	Inspected by:
MH22	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-4"	2	
Location:		**Priority:** Medium Priority	

Comments:
Upper concrete ring cracked. Signs of rust between cone and base minor infiltration suspected.

Action:
Replace Cracked concrete ring

Photos:





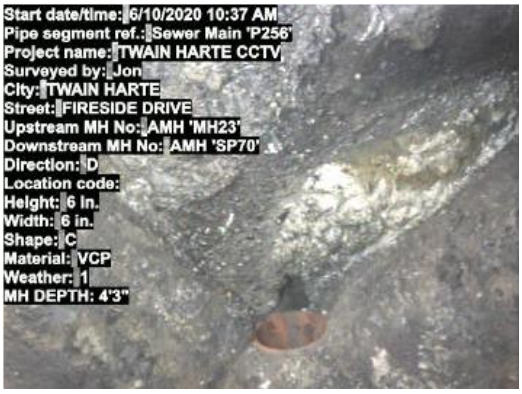
MH:	Inspection Type:	Date:	Inspected by:
MH23	MH INSPECTION		TCL,TJC
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Medium Priority	

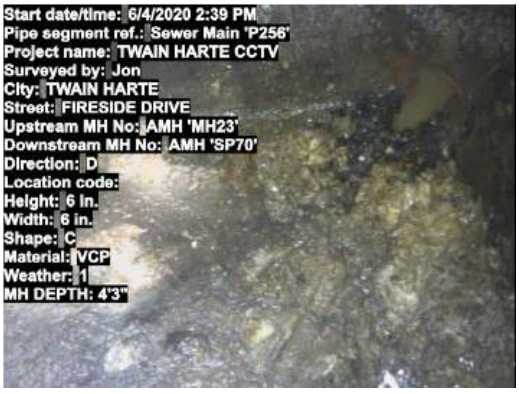
Comments:
Bad location, raise MH to reduce surface inflow

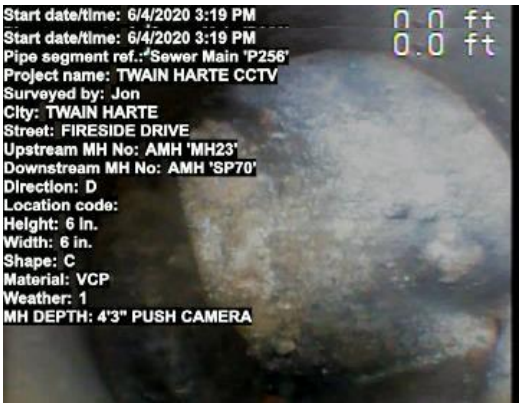
Action:
Raise MH add SD channel or bolt MH Lid

Photos:









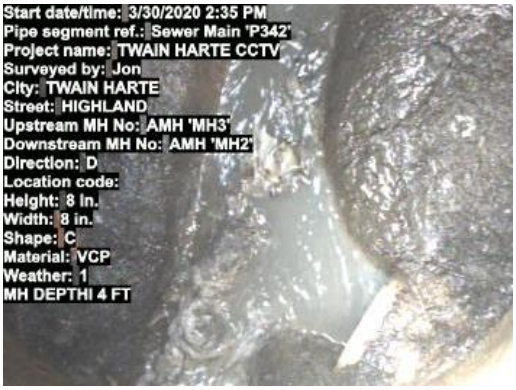
MH:	Inspection Type:	Date:	Inspected by:
MH3	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Medium Priority	

Comments:
Bad location. Low spot in roadway

Action:
Relocate MH, change cross slope of roadway or bolt lid

Photos:





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MH:	Inspection Type:	Date:	Inspected by:
MH32	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-10"	3	
Location:		**Priority:**	
23198 Tuolumne		Medium Priority	

Comments:
MH Adjacent to but slightly higher than drainage swale. Inflow during high surface runoff

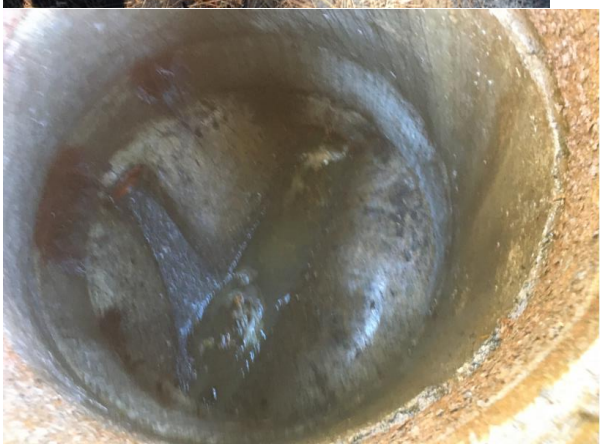
Action:
Construct SD channel

Photos:



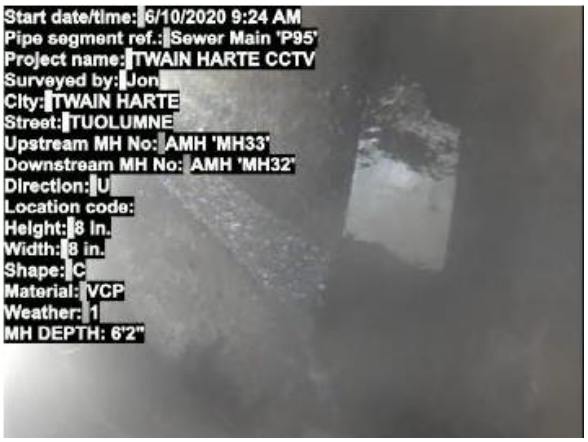









Start date/time: 2/4/2020 3:02 PM
Pipe segment ref.: Sewer Main 'P94'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: TUOLUMNE
Upstream MH No: AMH 'MH32'
Downstream MH No: AMH 'DMH11'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH 6 FT


Start date/time: 6/10/2020 9:24 AM
Pipe segment ref.: Sewer Main 'P95'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: TUOLUMNE
Upstream MH No: AMH 'MH33'
Downstream MH No: AMH 'MH32'
Direction: U
Location code:
Height: 8 in.
Width: 8 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 6'2"

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MH:	Inspection Type:	Date:	Inspected by:
MH37	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"		4	
Location:		**Priority:**	
Intersection of Fuller Rd and Mark Twain DR		Medium Priority	

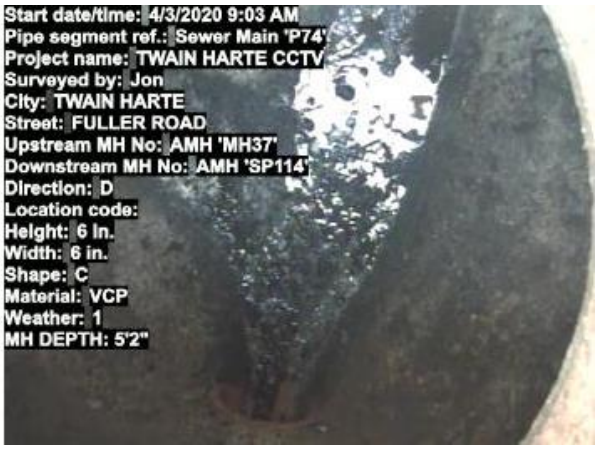
Comments:
MH in drainage swale at intersection. Rusted Reinforcement along barrel indicative of infiltration.

Action:
Grout ,line or replace Bench to eliminate infiltration. Bolt MH lid if necessary

Photos:







Start date/time: 4/3/2020 9:03 AM
Pipe segment ref.: Sewer Main 'P74'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: FULLER ROAD
Upstream MH No: AMH 'MH37'
Downstream MH No: AMH 'SP114'
Direction: D
Location code:
Height: 6 In.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 5'2"

MH:	Inspection Type:	Date:	Inspected by:
MH39	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: Bad location in drainage swale			
Action: Relocate MH or bolt lid			

Photos:



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MH:	Inspection Type:	Date:	Inspected by:
MH40	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-6"	1	
Location:		**Priority:**	
18678 Mother Lode		Medium Priority	
Comments:			
Good location. Minor I/I suspected from black stain at base of barrel			
Action:			
Rehabilitate MH, line or patch			

Photos:








Distance: 69.4 ft.
AMH - Manhole
Clock from:
Clock to:
Rating:
Dimension 1:
Dimension 2:
%:
MH40




Start date/time: 2/6/2020 10:41 AM
Pipe segment ref.: Sewer Main 'P-127'
Project name: TWAIN HARTE CCTV
Surveyed by: Jan
City: TWAIN HARTE
Street: MOTHER LODE
Upstream MH No: AMH 'MH40'
Downstream MH No: AMH 'MH4
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1

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MH:	Inspection Type:	Date:	Inspected by:
MH46	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	15'-4"	1	
Location:		**Priority:** Medium Priority	

Comments:
Infiltration observed along break-in connection in upper barrel

Action:
patch and or grout break in connection

Photos:












Distance: 269.1 ft.
AMH - Manhole
Clock from:
Clock to:
Rating:
Dimension 1:
Dimension 2:
%:
MH46

BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
MH48	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	

Comments:
MH adjacent to long stretch of asphalt curb before storm drainage.

Action:
Move curb further from roadway. Bolt Lid. Place MH outside of Curb

Photos:





MH:	Inspection Type:	Date:	Inspected by:
MH5	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		4	
Location:		**Priority:**	
		Medium Priority	

Comments:
In asphalt swale. Bad location

Action:
Relocate MH, or bolt lid

Photos:





MH:	Inspection Type:	Date:	Inspected by:
MH55	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	

Comments:
Adjacent to swale and at lowest point.

Action:
Bold Lid, relocate MH or use eccentricity to relocate and raise

Photos:





BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
MH8	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-3"	3	
Location:		**Priority:**	
Intersection of Black Hawk and Highland		Medium Priority	
Comments:			
Adjacent to drainage swale rust along cone suspect minor infiltration.			
Action:			
Deepen drainage swale on side of road			

Photos:





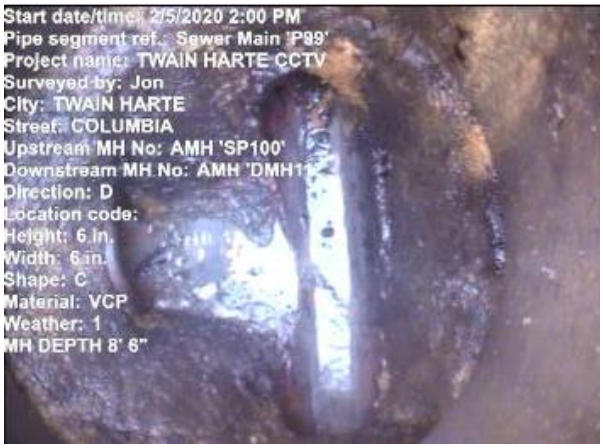




BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP100	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Medium Priority	
Comments:			
Multiple rust stains from infiltration			
Action:			
Line grout or replace			

Photos:





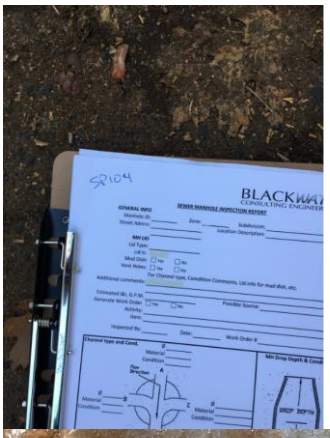
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP104	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-10"	1	
Location:		**Priority:**	
23077 Strauch Dr		Medium Priority	

Comments:
Adjacent to drainage swale. Runoff will enter MH during high runoff.

Action:
Construct SD swale or culvert across intersection

Photos:











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MH:	Inspection Type:	Date:	Inspected by:
SP105	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-10"	4	
Location:		**Priority:** Medium Priority	

Comments:
Bad location

Action:
Construct SD channel

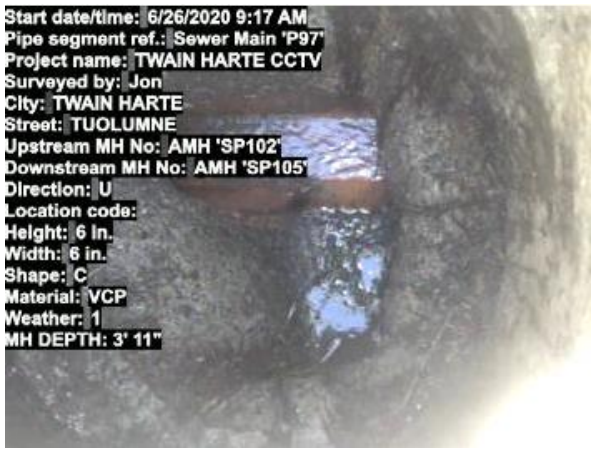
Photos:











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MH:	Inspection Type:	Date:	Inspected by:
SP106	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-2"	4	
Location:		**Priority:** Medium Priority	

Comments:
MH in drainage swale. Rusted Collar

Action:
Construct SD Chanel and Raise MH

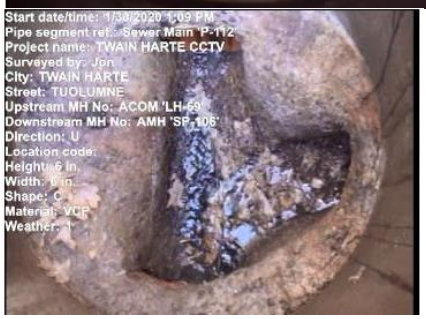
Photos:











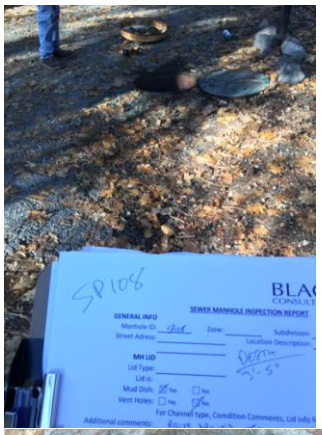
BLACKWATER
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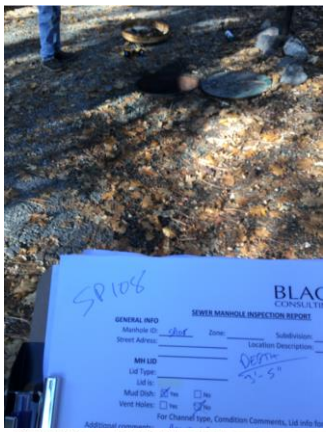
MH:	Inspection Type:	Date:	Inspected by:
SP108	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-5"	1	
Location:		**Priority:** Medium Priority	

Comments:
Roots intrusion around collar/frame

Action:
Infiltration from Roots Grout Root gaps

Photos:











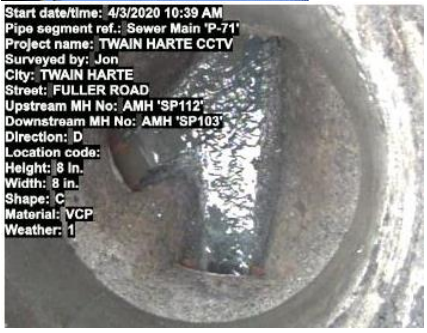
BLACKWATER
CONSULTING ENGINEERS, INC.

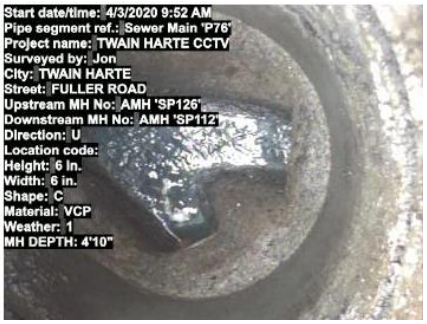
MH:	Inspection Type:	Date:	Inspected by:
SP112	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-9"	1	
Location:		**Priority:**	
Intersection of Placer Dr and Fuller Rd		Medium Priority	
Comments:			
Gap in joint of MH			
Action:			
Fix joint gaps			

Photos:









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MH:	Inspection Type:	Date:	Inspected by:
SP12	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-6"	4	
Location:		**Priority:** Medium Priority	

Comments:
Bad location, side of road under snow melt. Lower spot on the road

Action:
Relocate MH Raise (if possible) or slope road

Photos:



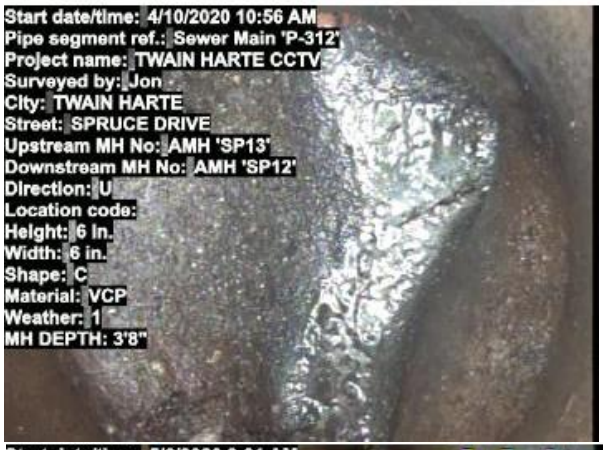











Start date/time: 4/10/2020 10:56 AM
Pipe segment ref.: Sewer Main 'P-312'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: SPRUCE DRIVE
Upstream MH No: AMH 'SP13'
Downstream MH No: AMH 'SP12'
Direction: U
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 3'8"


Start date/time: 4/10/2020 11:16 AM
Pipe segment ref.: Sewer Main 'P311'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: SPRUCE DRIVE
Upstream MH No: AMH 'SP12'
Downstream MH No: AMH 'MH10'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1

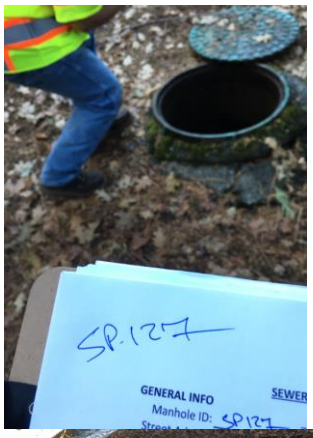

Start date/time: 5/6/2020 8:31 AM
Pipe segment ref.: Sewer Main 'P311'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: SPRUCE DRIVE
Upstream MH No: AMH 'SP12'
Downstream MH No: AMH 'MH10'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
PUSH CAMERA
0.0 ft


Start date/time: 5/6/2020 9:54 AM
Pipe segment ref.: Sewer Main 'P312'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: SPRUCE DRIVE
Upstream MH No: AMH 'SP13'
Downstream MH No: AMH 'SP12'
Direction: U
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 3'10"
0.0 ft

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MH:	Inspection Type:	Date:	Inspected by:
SP127	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-9"	2	
Location:		**Priority:** Medium Priority	
Comments: MH raised slightly. Reinforcement rusted			
Action: Grout, line or Replace MH			

Photos:





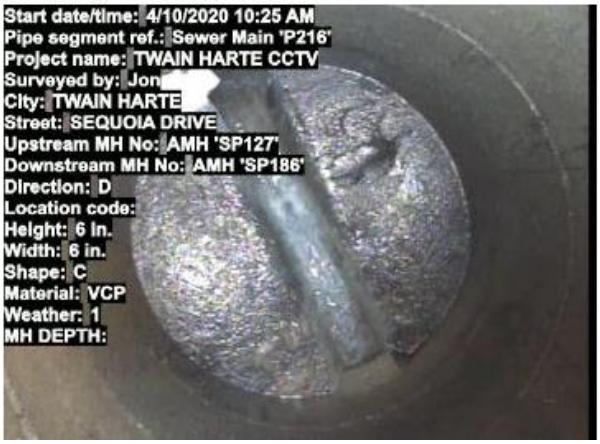









Start date/time: 6/5/2020 9:09 AM
Pipe segment ref.: Sewer Main 'P375'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: MARK TWAIN
Upstream MH No: AMH 'SP128'
Downstream MH No: AMH 'SP127'
Direction: U
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 3'9" PUSH CAMERA
0.0 ft


Start date/time: 4/10/2020 10:25 AM
Pipe segment ref.: Sewer Main 'P216'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: SEQUOIA DRIVE
Upstream MH No: AMH 'SP127'
Downstream MH No: AMH 'SP186'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH:


Start date/time: 6/5/2020 8:37 AM
Pipe segment ref.: Sewer Main 'P374'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: MARK TWAIN
Upstream MH No: AMH 'SP127'
Downstream MH No: AMH 'SP116'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 3'9" PUSH CAMERA
0.0 ft

MH:	Inspection Type:	Date:	Inspected by:
SP135	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	

Comments:
MH is located next to SD catch basin but slightly higher. If the Catch Basin becomes clogged or inundated Inflow will be severe

Action:
Raise MH, Relocate or Bolt lid

Photos:



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MH:	Inspection Type:	Date:	Inspected by:
SP138	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Medium Priority	
Comments: Adjacent to drainage swale. Only inflow during periods of high flow			
Action: Bolt lid or relocate MH			

Photos:



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MH:	Inspection Type:	Date:	Inspected by:
SP139	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: In drainage swale.			
Action: Relocate MH or bolt lid			

Photos:



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MH:	Inspection Type:	Date:	Inspected by:
SP143	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	9'-7"	3	
Location:		**Priority:** Medium Priority	

Comments:
Good location but cone could be raised to reduce minor surface inflow. Roots in barrel

Action:
Raise MH align cone.

Photos:







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MH:	Inspection Type:	Date:	Inspected by:
SP145	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	2'-8"	1	
Location:		**Priority:** Medium Priority	
Comments: MH cone misaligned			
Action: MH Cone Misaligned			

Photos:

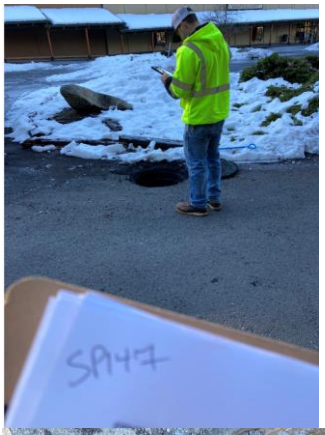
BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP147	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-9"	4	
Location:		**Priority:** Medium Priority	

Comments:
Off the side of road in a depression can't raise. Good condition

Action:
Bolt MH lid

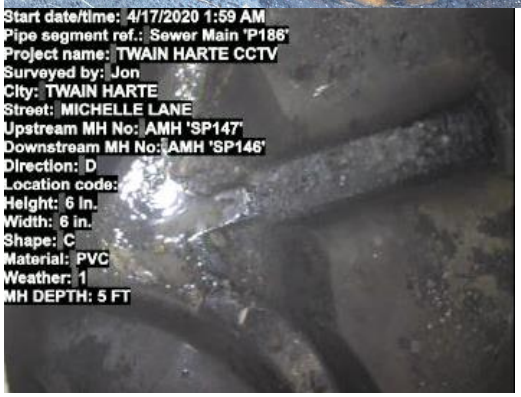
Photos:











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MH:	Inspection Type:	Date:	Inspected by:
SP148	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-3"	3	
Location:		**Priority:**	
1920 Michelle Ln 8' off side of road		Medium Priority	

Comments:
Bad location in a depression off road raise MH ring/cover. Root intrusion

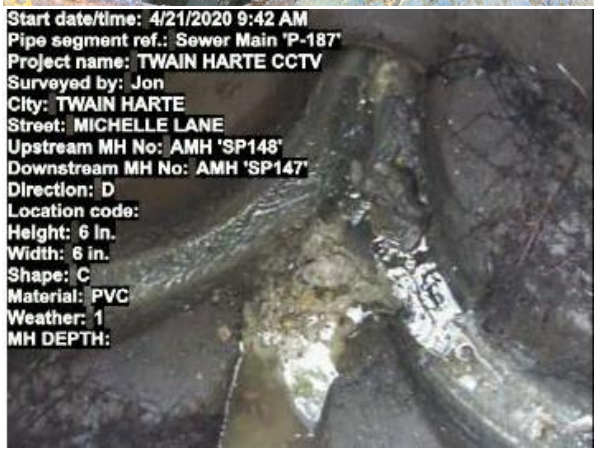
Action:
Raise MH

Photos:









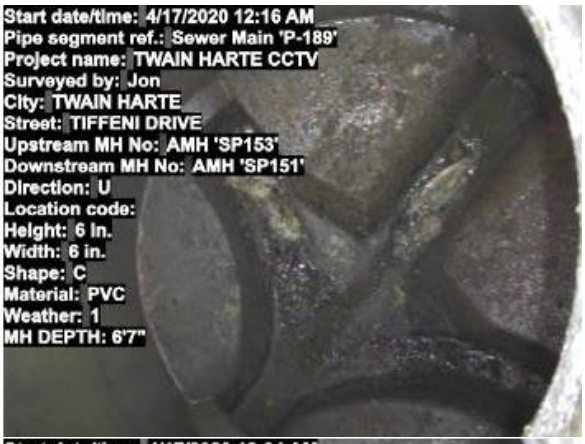


BLACKWATER
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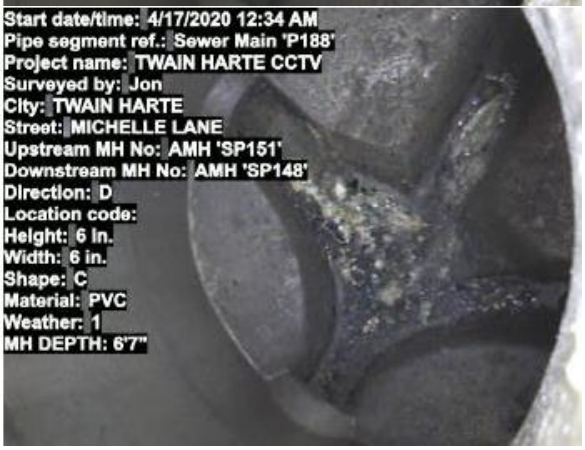
MH:	Inspection Type:	Date:	Inspected by:
SP151	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	6'-6"	2	
Location:		**Priority:**	
Intersection of Tiffeni Dr and Michelle Ln		Medium Priority	
Comments:			
Can't raise rust along bottom of cone from I&I			
Action:			
Rehabilitate MH Cone, line and or grout			

Photos:









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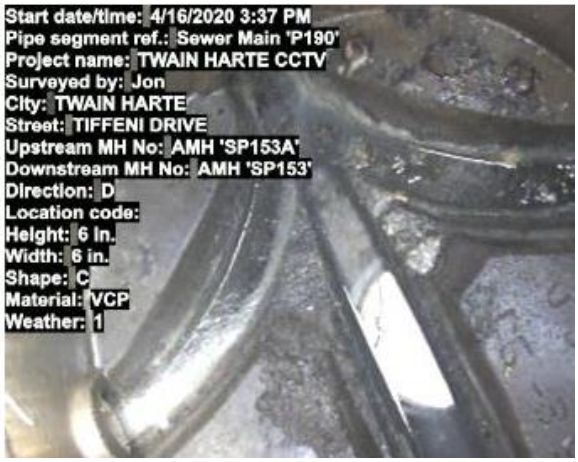
MH:	Inspection Type:	Date:	Inspected by:
SP153	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:** 4'-2"	**I&I Rating:**	
Location:		**Priority:** Medium Priority	

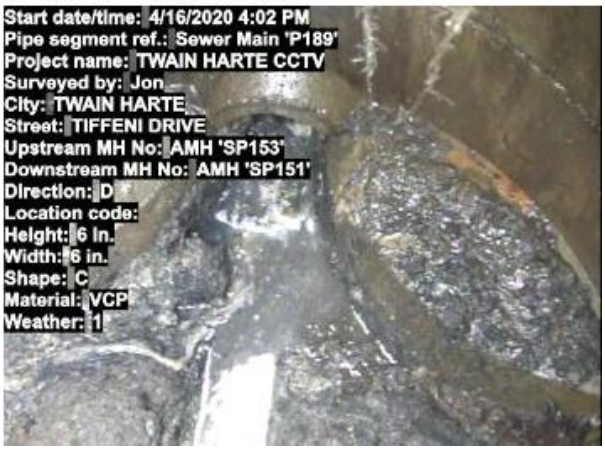
Comments:
Bad location next to asphalt cement curb, I&I along barrel multiple locations

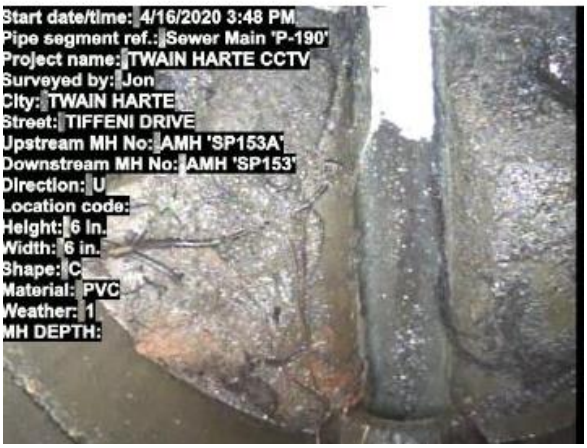
Action:
Rehabilitate MH, line patch or grout. Bolt MH lid

Photos:









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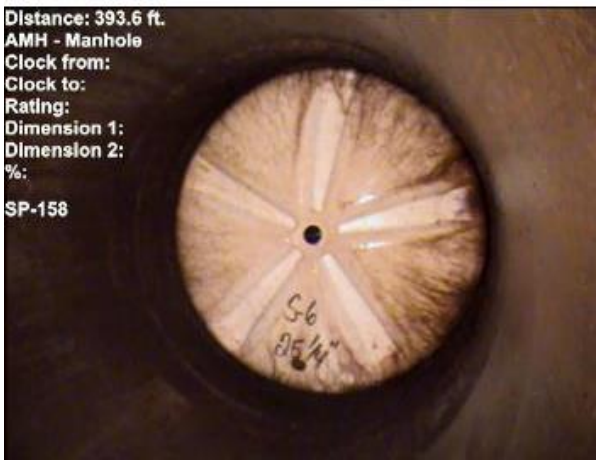
MH:	Inspection Type:	Date:	Inspected by:
SP158	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	

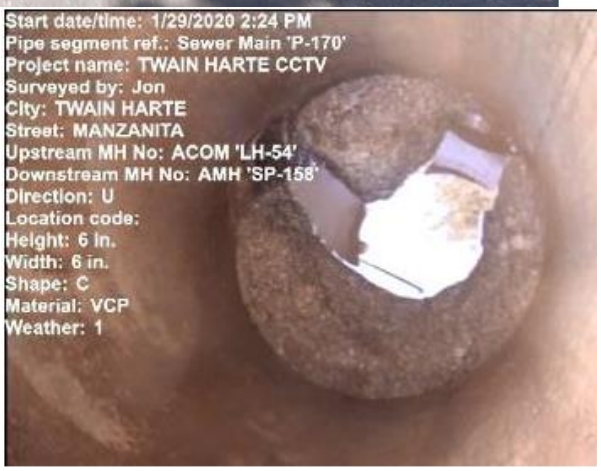
Comments:
Bad location adjacent to and same elevation as drainage swale

Action:
Relocate or Raise MH, bolt lid

Photos:







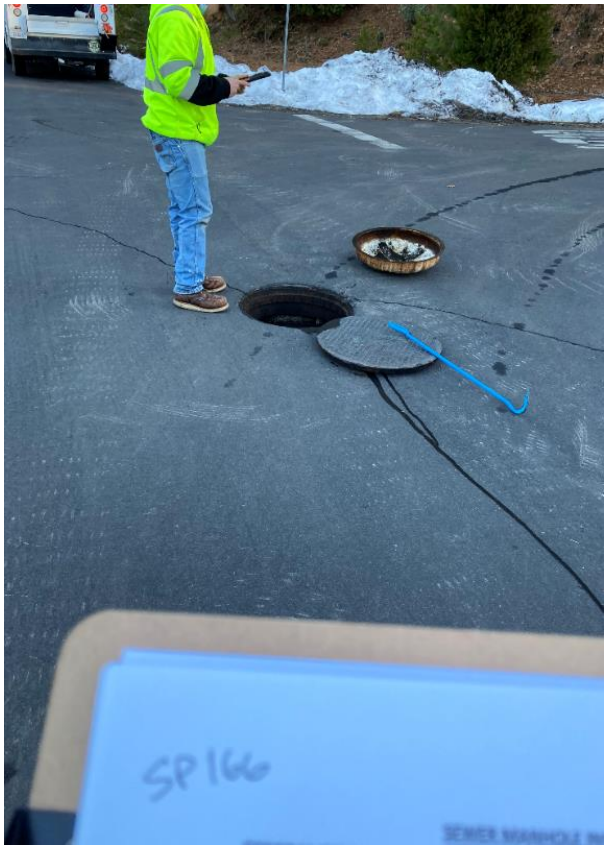
BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP166	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	6'-2	1	
Location:		**Priority:** Medium Priority	

Comments:
Severe rood intrusion, gap between MH ring and cone

Action:
Remove roots and patch gap between ring and cone

Photos:











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MH:	Inspection Type:	Date:	Inspected by:
SP168	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-9	4	
Location:		**Priority:** Medium Priority	

Comments:
Surface Runoff stops at MH. Minor Inflow around cone rust observed

Action:
Bolt MH lid

Photos:











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MH:	Inspection Type:	Date:	Inspected by:
SP187	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	9'-6"	3	
Location:		**Priority:**	
18192 Sequoia Dr		Medium Priority	

Comments:
Root intrusion, install French drain around retaining wall or raise MH

Action:
Raise MH

Photos:












Start date/time: 5/7/2020 3:09 PM
-6.7 ft
Pipe segment ref.: Sewer Main 'P216'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: SEQUOIA DRIVE
Upstream MH No: AMH 'SP187'
Downstream MH No: AMH 'SP186'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH: 9'6" PUSH CAMERA


Start date/time: 5/7/2020 2:44 PM
0.0 ft
Pipe segment ref.: Sewer Main 'P217'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: CEDAR PINES AVENUE
Upstream MH No: AMH 'SP188'
Downstream MH No: AMH 'SP187'
Direction: U
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: PVC
Weather: 1
MH DEPTH: 7'6" PUSH CAMERA

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MH:	Inspection Type:	Date:	Inspected by:
SP194	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-8"	3	
Location:		**Priority:**	
Behind houses along Cedar Pines Rd		Medium Priority	
Comments:			
Good condition, good location but ring is offset 2"			
Action:			
Align ring			

Photos:







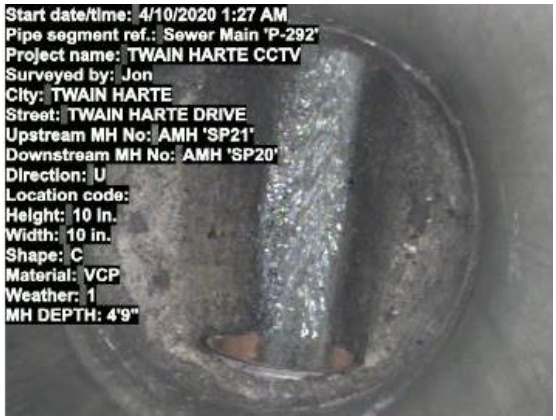


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MH:	Inspection Type:	Date:	Inspected by:
SP20	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: MH in drainage swale.			
Action: Relocate raise or bolt MH			

Photos:







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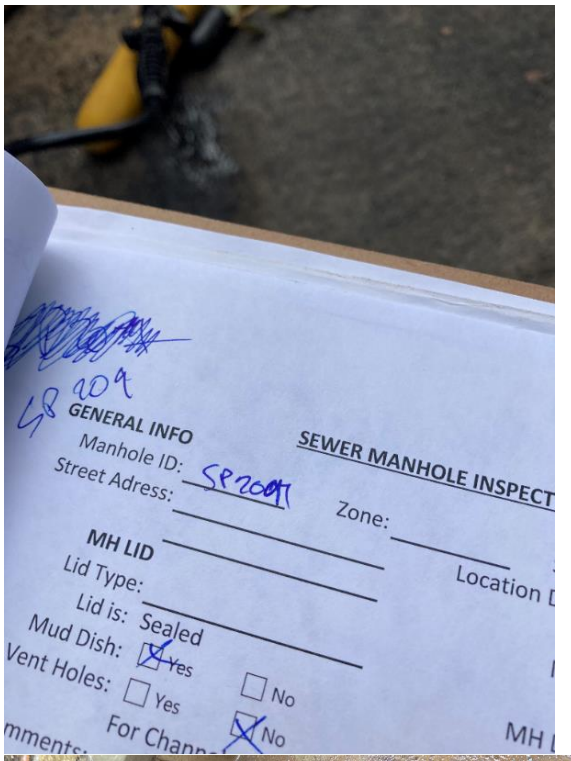
MH:	Inspection Type:	Date:	Inspected by:
SP209	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	3'-6"	3	
Location:		**Priority:** Medium Priority	

Comments:
Switch to eccentric MH to move out of roadway and raise

Action:
Switch to eccentric MH to move out of roadway and raise

Photos:













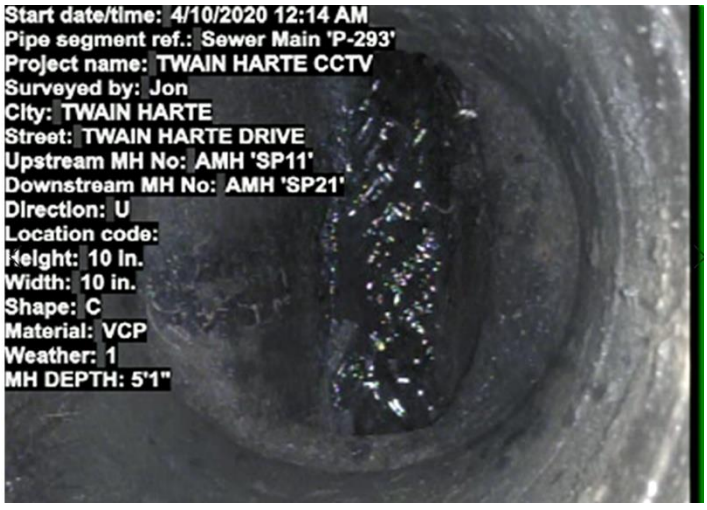

Start date/time: 5/11/2020 1:03 PM
Pipe segment ref.: Sewer Main 'P282'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: LINA
Upstream MH No: AMH 'SP209'
Downstream MH No: AMH 'SP207'
Direction: D
Location code:
Height: 6 in.
Width: 6 in.
Shape: C
Material: PVC
Weather: 1
MH DEPTH: PUSH CAMERA
-4.9 ft

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MH:	Inspection Type:	Date:	Inspected by:
SP21	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:** Medium Priority	
Comments: MH in drainage swale.			
Action: Relocate raise or bolt MH			

Photos:





MH:	Inspection Type:	Date:	Inspected by:
SP215	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: MH is in the drainage swale			
Action: Relocate MH or bolt lid			

Photos:



MH:	Inspection Type:	Date:	Inspected by:
SP216	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: MH is in the drainage swale			
Action: Relocate MH or bolt lid			

Photos:



MH:	Inspection Type:	Date:	Inspected by:
SP217	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: MH is in the drainage swale			
Action: Relocate MH or bolt lid			

Photos:



MH:	Inspection Type:	Date:	Inspected by:
SP219	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Medium Priority	
Comments: Bad location in drainage swale			
Action: Relocate MH or bolt lid			

Photos:



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MH:	Inspection Type:	Date:	Inspected by:
SP221	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Medium Priority	
Comments:			
MH adjacent to alluvial stream			
Action:			
Construct SD channel or culver across road			

Photos:

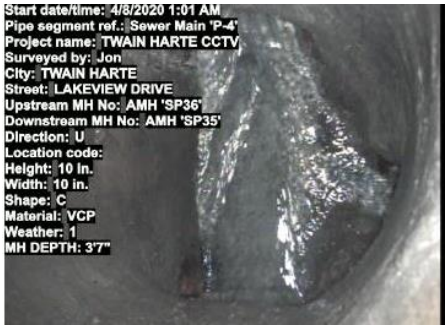


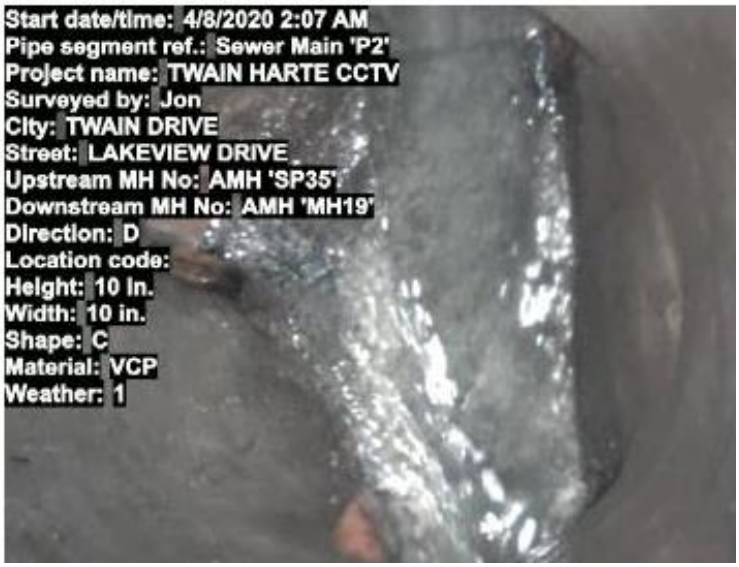
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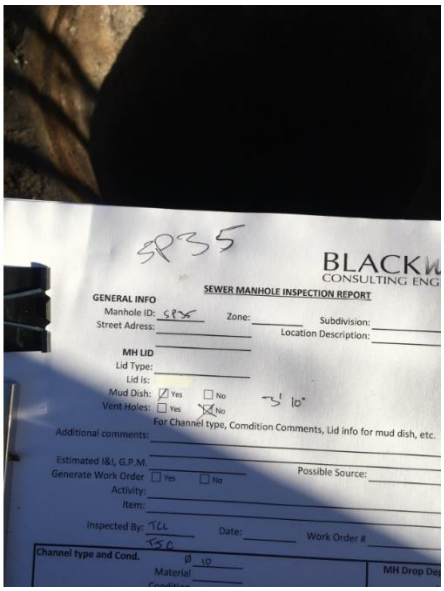
MH:	Inspection Type:	Date:	Inspected by:
SP35	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-10"	5	
Location:		**Priority:**	
Next to lake by bike rack opposite of Sonora Dr		Medium Priority	
Comments:			
Significant inflow observed during CCTV			
Action:			
Resurface asphalt to redirect runoff and raise MH			

Photos:









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MH:	Inspection Type:	Date:	Inspected by:
SP36	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-4"	4	
Location:		**Priority:**	
18232 Lakeview Dr		Medium Priority	

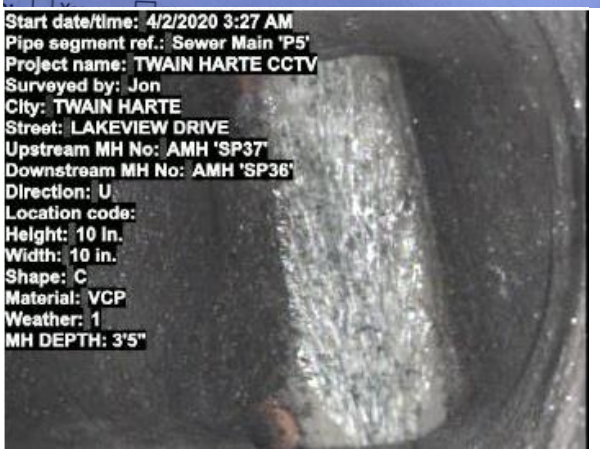
Comments:
In a slight depression in a driveway off Lakeview dry adjacent to drainage swale. Runoff will enter MH during high runoff flows.

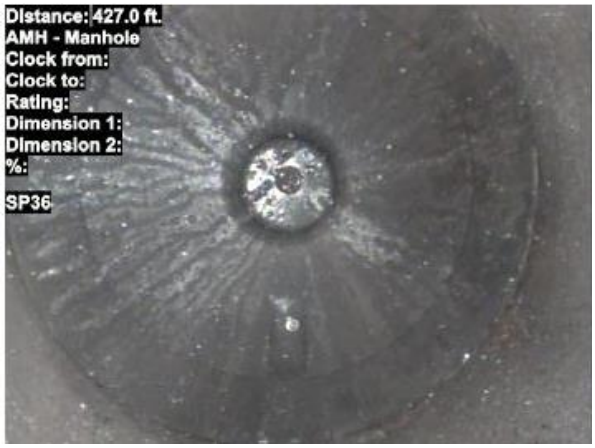
Action:
Construct SD Chanel or culvert under driveway, Raise MH and adjacent driveway.

Photos:





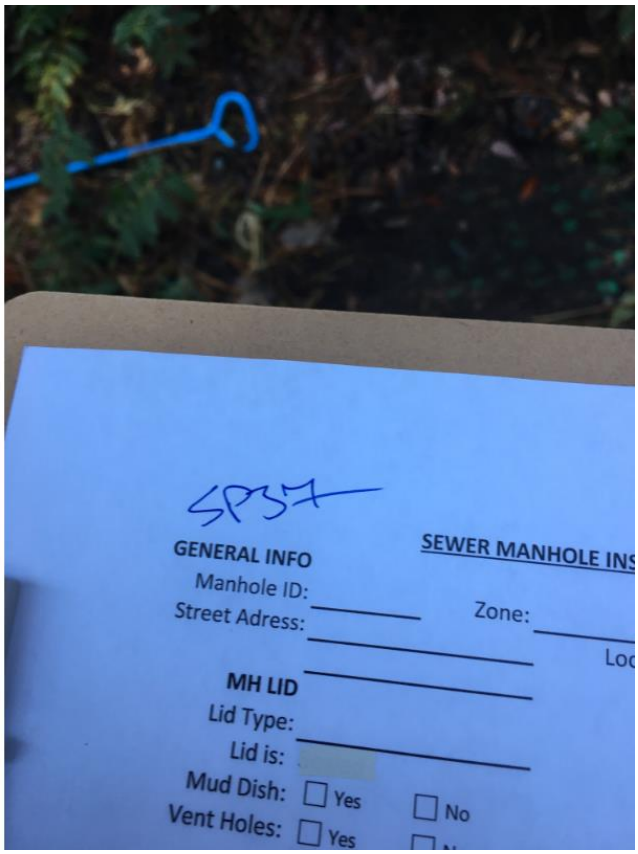


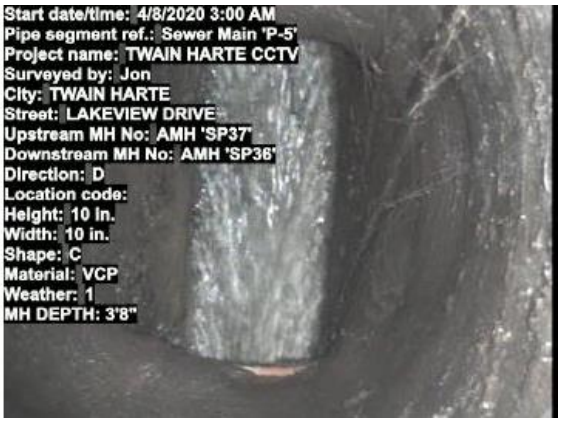


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MH:	Inspection Type:	Date:	Inspected by:
SP37	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-9"	4	
Location:		**Priority:**	
18281 Lakeview Dr		Medium Priority	
Comments:			
In the drainage swale			
Action:			
Construct SD Chanel, Possibly Raise MH			

Photos:

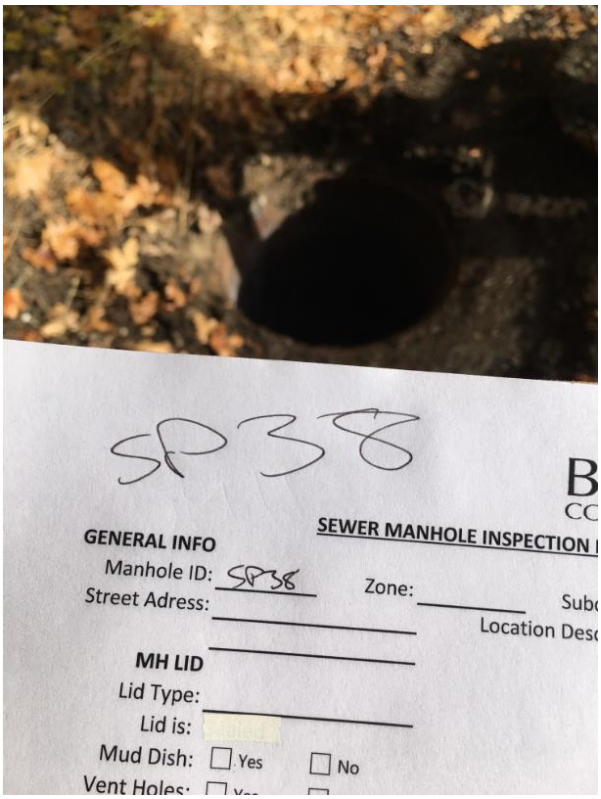




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MH:	Inspection Type:	Date:	Inspected by:
SP38	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-10"	3	
Location:		**Priority:**	
22600 Golf Club Dr		Medium Priority	
Comments:			
MH was buried under 3" of dirt.			
Action:			
Lower drainage swale or raise MH.			

Photos:











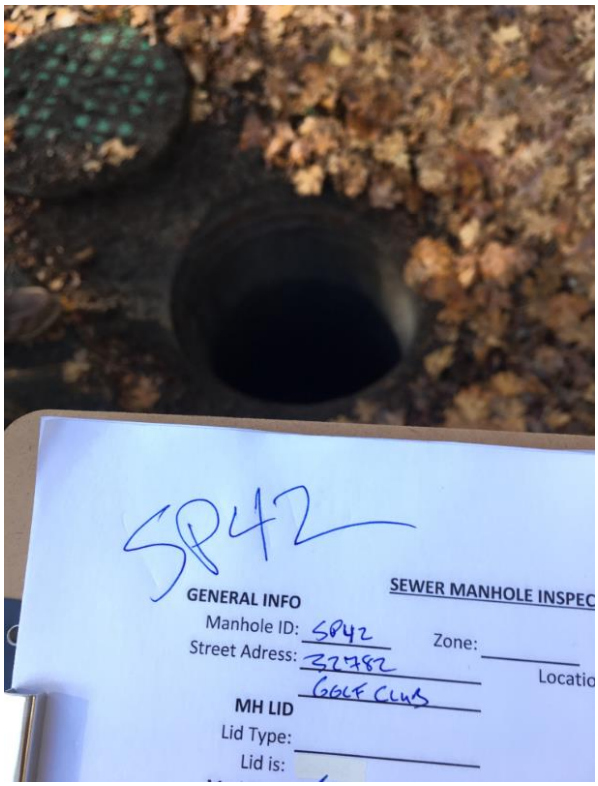
BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP42	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-2"	4	
Location:		**Priority:**	
32782 Golf Club Dr		Medium Priority	

Comments:
in the drainage swale off the side of the road. Slight grease buildup

Action:
Construct SD channel, raise MH, bolt MH lid

Photos:





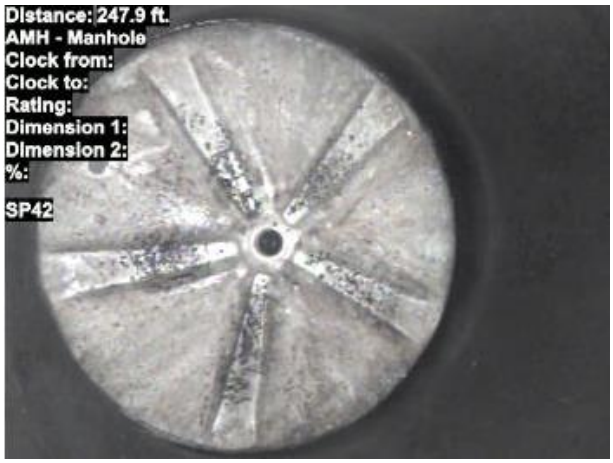









Start date/time: 4/1/2020 12:47 AM
Pipe segment ref.: Sewer Main 'P14'
Project name: TWAIN HARTE CCTV
Surveyed by: Jon
City: TWAIN HARTE
Street: GOLF CLUB DRIVE
Upstream MH No: AMH 'SP42'
Downstream MH No: AMH 'DMH5'
Direction: D
Location code:
Height: 10 In.
Width: 10 in.
Shape: C
Material: VCP
Weather: 1
MH DEPTH 9'10"


Distance: 247.9 ft.
AMH - Manhole
Clock from:
Clock to:
Rating:
Dimension 1:
Dimension 2:
%:
SP42

MH:	Inspection Type:	Date:	Inspected by:
SP48	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: Bad location.			
Action: Slope road away from MH or construct SD channel			

Photos:



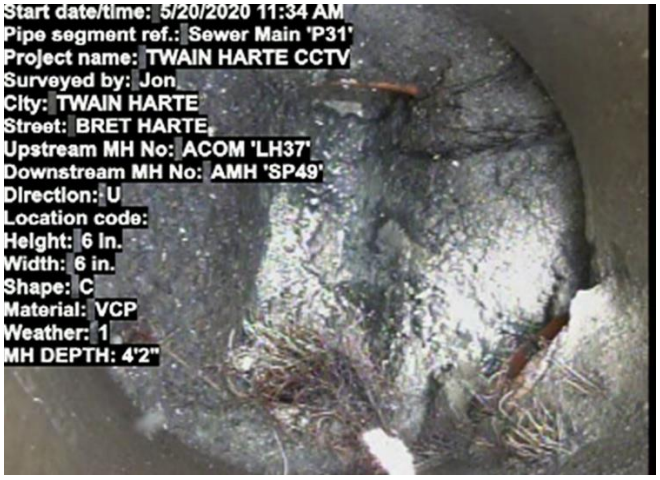


BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP49	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: MH in drainage swale			
Action: Relocate MH. Construct SD channel or bolt lid			

Photos:





BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP5	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		4	
Location:		**Priority:**	
		Medium Priority	
Comments:			
MH in drainage swale			
Action:			
Bolt lid or relocate			

Photos:



BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP51	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 4	
Location:		**Priority:** Medium Priority	
Comments: MH in depression in roadway			
Action: Raise MH and immediate roadway			

Photos:



BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP67	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	2'-10"	4	
Location:		**Priority:** Medium Priority	
Comments: In a depression of side of driveway. MH needs to be raised. No flow observed in MH			
Action: Raise MH, adjacent to driveway out of road			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
SP71	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Medium Priority	
Comments: MH adjacent to SD catch basin			
Action: Raise MH and immediate area or slope roadway			

Photos:



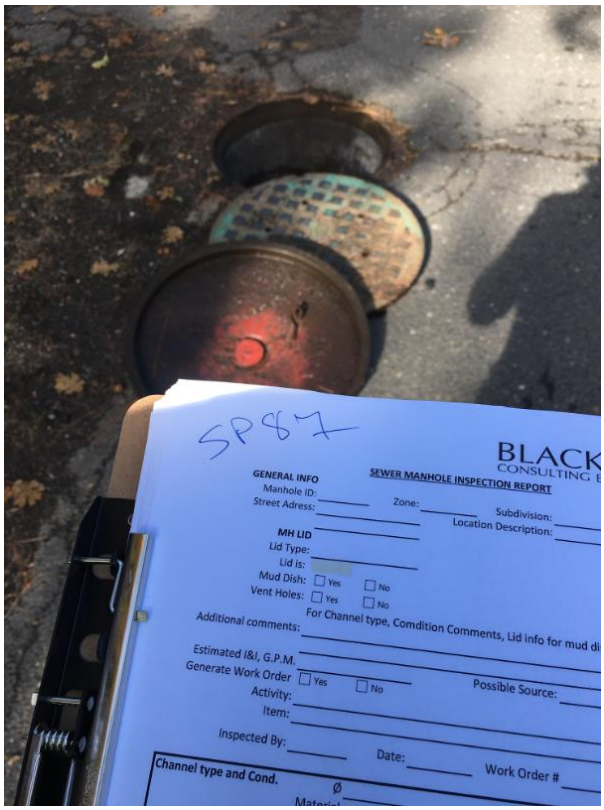
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP87	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	5'-7"	3	
Location:		**Priority:**	
22958 Golf Club Dr		Medium Priority	

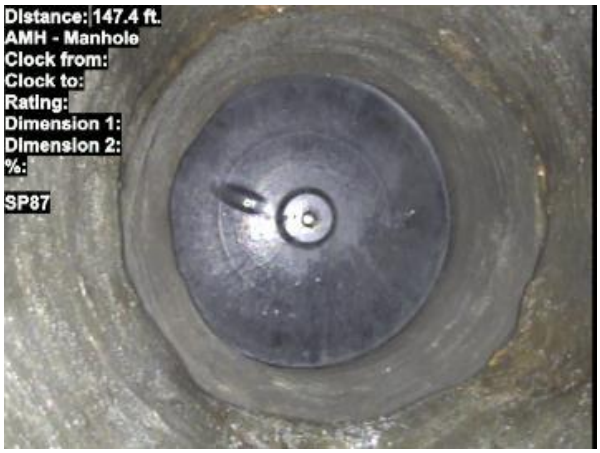
Comments:
Good Location, grouted MH, rust from infiltration observed in barrel and along invert

Action:
Line MH, replace MH

Photos:









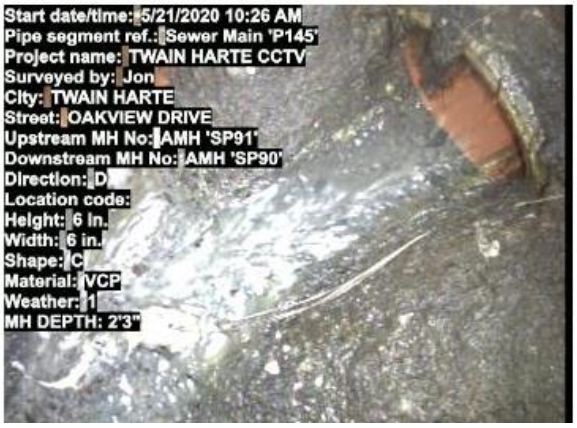
BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP91	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
		Medium Priority	
Comments:			
Rim and frame offset from collar			
Action:			
replace MH collar ring and frame			

Photos:













BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
SP95	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Medium Priority	

Comments:
Bad location drainage from Lookout Dr during High flows

Action:
Deepen swale along lookout

Photos:





BLACKWATER
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MH:	Inspection Type:	Date:	Inspected by:
DMH16	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
		Low Priority	

Comments:
Good location, looks like some rust in MH possibly infiltration.

Action:
Investigate rust or roots

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH9	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	6'-4"	2	
Location:		**Priority:**	
		Low Priority	

Comments:
Joint gaps in MH collar, minor rust observed on the bench from infiltration

Action:
Fix joint gaps in MH Collar and either grout or rehab bench

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH13	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"		3	
Location:		**Priority:**	
		Low Priority	

Comments:
Channel obstructed recommend jetting. MH raised good location. Rusted reinforcement showing

Action:
Grout patch replace or line MH

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH138	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
Adjacent to SD			
Action:			
Relocate MH or bolt lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH18	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
Condition unclear but rust on barrel from surface inflow			
Action:			
Add mud dish. Investigate further			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH19	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	7'-4"	3	
Location:		**Priority:**	
By lake on Lakeview drive		Low Priority	
Comments:			
In a slight depression			
Action:			
Raise MH and immediate roadway.			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH20	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-10"	3	
Location:		**Priority:**	
Marquis Dr		Low Priority	

Comments:
70% d/D stagnant. MH adjacent to drainage swale. MH could be raised to reduce inflow since not in roadway

Action:
Possible to Raise MH, adjacent to SD channel not in roadway

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH24	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:** Low Priority	
Comments: Ring slightly offset from frame, condition unclear			
Action: Align MH Frame			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH28	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	6'-6"	2	
Location:		**Priority:**	
22902 Golf Club Dr		Low priority	
Comments:			
Rust from infiltration observed on the outlet			
Action:			
Patch outlet, Line MH			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH31	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	4'-7"	2	
Location:		**Priority:**	
18683 Cherokee Dr		Low Priority	
Comments:			
Rust from infiltration on cone.			
Action:			
Replace line or grout cone.			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH34	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-0"	3	
Location:		**Priority:**	
		Low Priority	

Comments:
Drainage swale is routed around MH but MH is in a depression

Action:
Raise frame and collar or bolt MH

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH45	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	10'-6"		
Location:		**Priority:** Low Priority	
Comments: Stagnant Flow, surcharged			
Action: MH and incoming line need adjustment. Move MH out of roadway if replaced			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP1	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
Adjacent to swale but elevated			
Action:			
Move MH or bolt lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP117	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	2'-10"	1	
Location:		**Priority:**	
		Low Priority	
Comments:			
Good location. Ring cover offset from barrel. Root intrusion			
Action:			
Align MH ring			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP123	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
MH adjacent to drainage swale.			
Action:			
Relocate MH or bolt lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP128	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	2'-6"	1	
Location:		**Priority:**	
		Low Priority	
Comments:			
Good location. No I&I but MH ring could be raised			
Action:			
Possible to raise MH			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP130	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-0"	1	
Location:		**Priority:**	
		Low Priority	
Comments:			
Good location could be raised			
Action:			
Possible to raise MH			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP131	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	2'-3"	3	
Location:		**Priority:**	
		Low Priority	

Comments:
Good location could be raised

Action:
Possible to raise MH not in roadway

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP132	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Low Priority	
Comments: Good location could be raised			
Action: Possible to raise MH not in roadway			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP133	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Low Priority	
Comments: Good location could be raised			
Action: Possible to raise MH not in roadway			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP137	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	

Comments:
MH located in a depression adjacent to drainage swale

Action:
Raise MH and immediate roadway

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP137A	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
MH barely inside SD channel			
Action:			
Bolt lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP141	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"		3	
Location:		**Priority:**	
		Low Priority	

Comments:
Decent location but MH not in roadway and could be raised to avoid drainage channel

Action:
Raise MH

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP146	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:** 3	
Location:		**Priority:** Low Priority	

Comments:
In a depression in roadway. Raise if possible

Action:
Raise MH

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP153A	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-1"		
Location:		**Priority:**	
Intersection of Tiffeni and Gurney		Low Priority	
Comments:			
Good MH recent construction, gaps between ring and cone.			
Action:			
Patch w/ grout and or line			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP16	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	

Comments:
Adjacent to drainage swale. Slightly higher

Action:
Resurface and or adjust MH frame to match slope

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP165	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-8"	1	
Location:		**Priority:**	
		Low Priority	

Comments:
Good MH Recent Construction, Location is in the Middle of the Goad. Gap between ring and cone

Action:
Patch w/ grout and or line

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP167	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-9	1	
Location:		**Priority:**	
		Low Priority	

Comments:
Good location in the middle of the road. Gap between MH ring and metal

Action:
Patch w/ grout and or line MH

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP184	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	3'-10"	3	
Location:		**Priority:**	
22897 East Ave 12' off roadway		Low Priority	

Comments:
Significant root intrusion. Raise 3 to 6". Suspect minor infiltration from root intrusion. Flow 10% d/D

Action:
Raise MH and remove root intrusion potentially patch.

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP186	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	15'-5"	1	
Location:		**Priority:**	
18918 Sequoia Dr		Low Priority	

Comments:
Good location, good condition, some minor offsets along barrel, MH rim raised, obstructions in channel

Action:
Align Barrels

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP19	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-8"	4	
Location:		**Priority:**	
Intersection of Twain Harte Dr and Woodwardia		Low Priority	
Comments:			
Bad location. Can't be raised			
Action:			
Add SD Chanel across driveway, Bolt MH Lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP191	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-6"	3	
Location:		**Priority:**	
Uphill of 22661 Cedar Pines (side of road)		Low Priority	

Comments:
Adjacent to asphalt curb, root intrusion. Switch eccentric cone to move MH into the roadway minor concern MH is pretty good.

Action:
Flip cone

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP196	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-1"	1	
Location:		**Priority:**	
Adjacent to Thayer 18759		Low Priority	
Comments:			
Raise Cone, good location, light infiltration between bottom of cone and bench			
Action:			
grout, line or replace MH			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP203	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"		3	
Location:		**Priority:**	
22499 Cedar Pines 10' off court 4' off driveway		Low Priority	
Comments:			
MH in depression not in roadway should be raised, root intrusion			
Action:			
raise MH			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP214	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
MH adjacent to drainage swale.			
Action:			
Relocate MH or bolt lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP26	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-5"	3	
Location:		**Priority:**	
		Low Priority	
Comments:			
10% d/D			
Action:			
Raise MH ring and Frame			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP29	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-5"	3	
Location:		**Priority:**	
		Low Priority	

Comments:
Minimal flow at this point suspect inflow entering at SP27 under puddle of water.

Action:
Resurface to match road and if replacing MH then use eccentric to place ring and frame in roadway

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP34	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-0"	3	
Location:		**Priority:**	
Across from 22735		Low Priority	

Comments:
Good location but adjacent to drainage swale. Clear water with high flow suspect high inflow upstream of this MH

Action:
If replacing use eccentric to place MH in roadway and higher relative to drainage swale

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP39	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-10"	3	
Location:		**Priority:**	
Intersection of Golf Club Dr and Marquis		Low Priority	
Comments:			
MH is in the drainage swale			
Action:			
Resurface intersection, add culvert under intersection, or add bolted lid.			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP4	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
Adjacent but higher than drainage swale.			
Action:			
bolt lid or relocate			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP50	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
MH in minor drainage swale			
Action:			
Raise MH bolt lid or divert SD around			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP54	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
Decent location but proximity to asphalt curb			
Action:			
widen curb or relocate MH			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP63	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	3'-0"	1	
Location:		**Priority:**	
		Low Priority	

Comments:
Good condition. MH frame cracked and could be raised

Action:
Raise MH, not in roadway

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP65	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-0"		
Location:		**Priority:**	
		Low Priority	
Comments:			
Raise MH			
Action:			
Raise MH, not in roadway			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP66	MH INSPECTION		TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-4"	1	
Location:		**Priority:**	
		Low Priority	
Comments:			
Good location but possible to raise MH			
Action:			
Raise MH, not in roadway			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP68	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	2'-3"	3	
Location:		**Priority:** Low Priority	
Comments: MH rim could be raised to minimize minor inflow			
Action: Possible to raise MH, behind house			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP78	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
MH in SD channel			
Action:			
Raise MH, route SD channel around MH, bolt lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP80	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	

Comments:
MH on slope and adjacent to low point. 2 to 3" offset of cone to collar from CCTV photos

Action:
Align MH

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP84	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
		Low Priority	
Comments:			
MH in small drainage swale			
Action:			
Relocate MH or bolt lid			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP93	MH INSPECTION		TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
		2	
Location:		**Priority:**	
		Low Priority	
Comments:			
Minor rust infiltration along barrel joint offset			
Action:			
Align MH joints			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH10	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	9'-0"	1	
Location:		**Priority:**	
22935 Golf Club Dr			
Comments:			
good condition, rust observed under drop inlet likely from low flow			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH4	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	11'-6"	1	
Location:		**Priority:**	
Intersection of Muir Ave and Golf Club Dr			
Comments:			
Good Location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH5	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	9'-9"	1	
Location:		**Priority:**	
NW of intersection of Placer Dr and Golf Club Dr			
Comments:			
Good location. Drop connection.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH7	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	8'-5"	1	
Location:		**Priority:**	
Comments:			
Good location already raised. Root intrusion 35% d/D subcritical			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
DMH8	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Limited visibility can't determine condition from CCTV			
Action:			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
MH1	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good Location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH100	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-0"	1	
Location:		**Priority:**	
Comments:			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH14	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH16	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	8'-1"	1	
Location:		**Priority:**	
Comments:			
Raised MH, good condition, good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH25	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good condition, good location			
Action:			
NA			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
MH26	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Good Condition			
Action:			
NA			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
MH27	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Photo insufficient to determine condition			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH29	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location, condition unclear from cctv			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH30	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		2	
Location:		**Priority:**	
Comments:			
Good Location, possible rust visible from CCTV photo			
Action:			
inspect further			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH33	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	6'-6"	4	
Location:		**Priority:**	
Intersection of Cherokee and Tuolumne			
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH38	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-5"	1	
Location:		**Priority:**	
Intersection of Sierra Dr and Mark Twain Dr			
Comments:			
Good location. Frame rusted.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH4	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good Location, root intrusion			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH41	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	

Comments:
Good location. No defects from CCTV photos

Action:
NA

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH42	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location no inflow.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH43	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Under snow pack in winter bad location			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH47	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Photo insufficient to determine condition			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH49	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	3'-11"	1	
Location:		**Priority:**	
Comments:			
Good location already raised			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH49A	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	3'-9"	1	
Location:		**Priority:**	
Comments:			
Good location. 50% d/D			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH51	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Root intrusion. Limited view from CCTV photo overall condition unclear.			
Action:			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
MH6	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
MH9	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	5'-11"	1	
Location:		**Priority:**	
Comments:			
Good location, good condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP102	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	

Comments:
Good location. MH was surcharged during inspection no additional comments from inspection. MH was jetted as a result.

Action:
NA

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP103	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-9"	1	
Location:		**Priority:**	
Intersection of Tuolumne Dr and Fuller Rd			
Comments:			
Roots in channel			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP107	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-5"		
Location:		**Priority:**	
Intersection of Wildwood and Tuolumne			
Comments:			
Good location.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP11	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good Location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP110	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP113	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	5'-2"	1	
Location:		**Priority:**	
Intersection of Placer Dr and Fuller Rd			
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP114	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-7"	1	
Location:		**Priority:**	
Intersection of Black Oak Dr and Fuller Rd			
Comments:			
Good location. Lots of roots in MH minor infiltration suspected from root intrusion in MH.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP115	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-11"	1	
Location:		**Priority:**	
Comments:			
Good location. Rusted frame			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP116	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-9"	1	
Location:		**Priority:**	
Comments:			
Rusted frame.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP118	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location Good condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP119	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Condition unclear from CCTV photo			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP120	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP122	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP124	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good condition from CCTV photo			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP125	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
MH adjacent to drainage but higher			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP129	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-2"	1	
Location:		**Priority:**	
Comments:			
Root intrusion.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP134	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-2"	1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP144	MH INSPECTION	11/24/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	3'-4"	1	
Location:		**Priority:**	
Comments:			
Good location, good condition, minor roots			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP161	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP163	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP169	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP17	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Photo insufficient to determine condition			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP171	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP172	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP173	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP179	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP18	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Photo from CCTV insufficient to determine condition			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP181	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	6'-6"	1	
Location:		**Priority:**	
Behind THCSD office			
Comments:			
Minor root intrusion. Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP182	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-11"		
Location:		**Priority:**	
Adjacent to creek behind THCSD fire training ladder storage.			
Comments:			
Significant root intrusion, ring slightly elevated, good location no rust observed. Stagnant flow 50% d/D			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP183	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	3'-4"	3	
Location:		**Priority:**	
In path behind red house			

Comments:
MH could be raised 3 to 6" not in roadway. Good condition. Minimal root intrusion. Surface Inflow since it is the low point. Flow 10% d/D

Action:
NA

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP185	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	3'-3"	1	
Location:		**Priority:**	
18918 Sequoia Dr			
Comments:			
Root intrusion along barrel. MH slightly raised already good location, good condition.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP188	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	7'-4"	1	
Location:		**Priority:**	
Side of Road slightly raised location			
Comments:			
Good condition, good location			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP190	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-9"	1	
Location:		**Priority:**	
22709 Cedar Pines			
Comments:			
In street but raised, good location and good condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP193	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"		1	
Location:		**Priority:**	
Behind and left of 22611 Cedar Pines			
Comments:			
Raised MH, good condition			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP195	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-9"	1	
Location:		**Priority:**	
Behind and left of 2257 Cedar Pines Rd			
Comments:			
Raised MH, good condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP202	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"		1	
Location:		**Priority:**	
End of Cedar Pines Adjacent to transformer			
Comments:			
Raised MH in excellent condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP204	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	5'-9"	1	
Location:		**Priority:**	
Intersection of Thayer and Cedar Pines Drive			
Comments:			
Good location and good condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP205	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP206	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-8"	1	
Location:		**Priority:**	
18448 Hilcrest			
Comments:			
Raise Mh w/ collar good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP207	MH INSPECTION	2/8/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"		1	
Location:		**Priority:**	
Opposite of 22468 Lita			
Comments:			
Good Location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP210	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
Comments:			
Adjacent to drainage swale in a low point			
Action:			
place a culver under roadway			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP212	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Good condition from CCTV photo			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP218	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP25	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	4'-1"	1	
Location:		**Priority:**	
Intersection of East Ave an Twain Harte Dr			
Comments:			
Good condition, good location with concrete ring			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP3	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good Location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP30	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
Comments:			
Good location road slopes away from MH			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP31	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Condition unclear from CCTV			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP32	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good condition good location.			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP33	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good Location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP40	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-8"	1	
Location:		**Priority:**	
Intersection of Golf Club Dr and Brett Harte Dr			
Comments:			
Good location w/ concrete rim			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP41	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-7"	1	
Location:		**Priority:**	
Golf Club Dr			
Comments:			
Good location w/ concrete rim			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP43	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-8"	1	
Location:		**Priority:**	
22806 Golf Club Dr			
Comments:			
Minor roots, grease buildup			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP44	MH INSPECTION	11/23/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-6"	1	
Location:		**Priority:**	
Comments:			
Good Location, grouted MH			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP47	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP52	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP52A	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP52B	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP53	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
SP55	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP57	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP6	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP64	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
	2'-7"	1	
Location:		**Priority:**	
Comments:			
Good location, stagnant flow, MH is shallow and adjacent to creek 30% d/D			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP69	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
4'-0"	4'-1"	1	
Location:		**Priority:**	
Comments:			
Good location and condition already raised			
Action:			
NA			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
SP7	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP70	MH INSPECTION	11/25/2020	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"		1	
Location:		**Priority:**	
22511 Fireside Dr			
Comments:			
Good location already raised			
Action:			
NA			

Photos:

MH:	Inspection Type:	Date:	Inspected by:
SP72	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location and condition from CCTV			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP73	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP74	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP75	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP78A	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP79	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location good condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP8	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP82	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Condition unknown			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP83	G PRO, CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location, good condition from CCTV			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP85	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		1	
Location:		**Priority:**	
Comments:			
Good location, good condition			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP89	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Good conation from CCTV photo			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP9	MH INSPECTION	2/5/2021	TCL,TJC
Diameter:	**Depth:**	**I&I Rating:**	
2'-0"	3'-5"	1	
Location:		**Priority:**	
Intersection of Highland and Sequoia			
Comments:			
Cracked Ring, good location, root intrusion			
Action:			
NA			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP90	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Root intrusion condition unclear from CCTV photo			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP92	GOOGLE EARTH PRO		TCL
Diameter:	**Depth:**	**I&I Rating:**	
		3	
Location:		**Priority:**	
Comments:			
Good location			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP94	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Condition unclear from CCTV			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP97	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Condition unclear from CCTV			
Action:			

Photos:

BLACKWATER
CONSULTING ENGINEERS, INC.

MH:	Inspection Type:	Date:	Inspected by:
SP98	CCTV		
Diameter:	**Depth:**	**I&I Rating:**	
Location:		**Priority:**	
Comments:			
Condition unclear from CCTV			
Action:			

Photos:

ATTACHMENT H – DETAILED DESCRIPTION OF PACP METHODOLOGY

APPENDIX B

PAC Program© Condition Grading System

Grading System Code Matrix

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PAC Program© Condition Grading System

The Pipeline Assessment and Certification Program (PACP) developed by NASSCO provides a mechanism for creating reliable descriptions of pipe conditions. NASSCO has also developed a system based on the PACP codes to assign a condition rating to pipelines. Requirements of the grading system were as follows:

1. Like the PACP, the grading system should be direct and objective.
2. Provide the ability to quantitatively measure the difference in pipe condition between one inspection and subsequent inspections, and to prioritize among different pipe segments.

Many other approaches to sewer pipe grading have been used in the United States as well as in other parts of the World. These approaches generally use some type of defect grading that is then used to calculate an overall pipe rating.
It is problematic to develop a single pipe segment rating that fully describes all of the important aspects of a pipe. Therefore the PACP Condition Grading System uses more than one method of rating pipe segment condition including a rating that considers the number of total defects within the pipe segment and a rating that considers the most severe defects within the pipe segment.

The PACP Condition Grading System only considers internal pipe conditions obtained from TV inspection. While other factors such as pipe material, depth, soils, and surface conditions also affect pipe survivability, those factors have not been included in this version of the PACP Condition Grading System. The PACP Condition Grading System should be used as a tool for screening pipe segments, allowing the User to quickly determine which pipe segments have significant defects. It is expected that as the PACP further develops the PACP Condition Grading System will expand to include other factors.

The PACP Condition Grading System provides condition ratings for Structural Defects and Operation and Maintenance Defects.

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APPROACH

Using the PACP Code Matrix, Each PACP defect code is assigned a condition grade of from 1 to 5. Grades are assigned based on potential for further deterioration or pipe failure. Pipe failure is defined as when the pipe can no longer convey the pipe design capacity.
Grades are assigned for two categories, Structural, and O&M defects.
Grades are as follows;

5 - Immediate Attention	Defects requiring immediate attention
4 – Poor	Severe defects that will become Grade 5 defects within the foreseeable future
3 – Fair	Moderate defects that will continue to deteriorate
2 – Good	Defects that have not begun to deteriorate
1 – Excellent	Minor defects

The mechanisms and rates of pipeline deterioration are highly dependent on local conditions. However the following general guidelines are provided to estimate the amount of time before the defect causes complete line failure. These guidelines should be verified by actual research under prevailing local conditions.

5 – Pipe has failed or will likely fail within the next five years
4 – Pipe will probably fail in 5 to 10 years
3 – Pipe may fail in 10 to 20 years
2 – Pipe unlikely to fail for at least 20 years
1 – Failure unlikely in the foreseeable future

Grading of Continuous Defects

The PACP continuous defect feature is used to denote where long portions of a sewer pipe are affected by the same defect, without the User having to repetitively enter point

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defects. However to develop a grade for the pipe segment, a mechanism is needed to translate a continuous defect into an equivalent number of point defects. The original version of the PACP Condition Grading System calculated the number of"repeated continuous" (joint) defect grades by dividing the length of the continuous defect by the joint length. However, the PACP defect coding and the PACP database do not distinguish between whether a continuous defect is "repeating" or "truly". Therefore the grading methodology for determining the equivalent number of defects from continuous defects is changed and now no differentiation is made between the two types of continuous defects.

The equivalent number (quantity) of "truly" and "repeating" continuous defects is calculated by dividing the length of the continuous defect by 5. Example, a 6-meter long continuous defect, grade 3, should equate to four Grade 3 defects. Fractions are rounded to the nearest whole number.

Pipe Ratings

The pipe rating is based on the number of occurrences for each condition grade. Ratings are calculated separately for **Structural Defects** and **O&M Defects**. Several ways of expressing pipe segment condition are used by the PACP Condition Grading System as follows.

Segment Grade Scores - Each pipe segment will have a Segment Grade Score for each of the five grades. The number of occurrences of each pipe grade is multiplied by the pipe grade to calculate the segment grade score. Example, six Grade 5 defects would be 6 times 5 and equates to a Segment Grade 5 Score of 30. If a pipe segment had no defects of a particular grade, then the Segment Grade Score for that grade would be 0.

Overall Pipe Rating –The five Segment Grade Scores are added together to calculate the **Overall Pipe Rating. Structural Pipe Ratings** are calculated using only Structural Defect grades, while **O&M Pipe Ratings** are calculated using only O&M Defect grades.

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PACP Quick Rating – The PACP Quick Rating is a shorthand way of expressing the number of occurrences for the two highest severity grades. The PACP Quick Rating is a four character score as follows:

1. The first character is the highest severity grade occurring along the pipe length.
2. The second character is the total number of occurrences of the highest severity grade. If the total number exceeds 9, then alphabetic characters are used as follows- 10 to 14 – A; 15 to 19 – B; 20 to 24 – C; etc.
3. The third character is the next highest severity grade occurring along the pipe length.
4. The fourth character is the total number of the second highest severity grade occurrences, derived as in item 2 above.

For Example

4B27

This immediately shows that no grade 5 defects or grade 3 defects, however 15 to 19 grade 4 defects and seven grade 2 defects were found.

Another Example

3224

Two grade 3 defects and four grade 2 defects, however no grade 5 or grade 4 defects were found.

If a pipe segment only has defects of one grade, the first two characters are the grade and the quantity of defects, and the last two characters are 00 (denoting no other defect grades). A pipe segment with no defects would have a Quick Score of 0000 (all zeros).

The PACP Quick Rating provides the ability to summarize the number and severity of defects found within a pipe segment. As with the Pipe Rating, Quick Structural Ratings are calculated using only Structural Defect Grades, and Quick O&M Ratings are calculated using only O&M Defect Grades.

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Pipe Ratings Index – This is an indicator of the distribution of defect severity. The Pipe Ratings Index is calculated by dividing the Pipe Rating by the number of defects. For example, the Structural Pipe Ratings Index would be the Structural Pipe Rating divided by the number of structural defects. Pipe Ratings Indexes are calculated for Structural, O&M, and Overall. A pipe segment with a Pipe Rating of zero (0) would have a Pipe Rating Index of zero (0).

Summary

The following procedures are used to calculate pipe segment ratings using the PACP Condition Grading System:

1. Determine the number of occurrences for each condition grade within the pipe segment. Calculate separately for Structural Defect Grades and O&M Defect Grades.
2. Calculate the Segment Grade Score by multiplying the number of occurrences by the respective grade 1 through 5. Calculate the Structural Segment Grade Score and the O&M Segment Grade Score separately, then add together for the Overall Segment Grade Score.
3. Calculate the Pipe Rating for the pipe segment by adding the Segment Grade Scores. Add all five Structural Segment Grade Scores for the Structural Pipe Rating, and add all five O&M Segment Grade Scores for the O&M Pipe Rating. Add all five Overall Segment Grade Scores for the Overall Pipe Rating.
4. Determine the PACP Quick Rating by calculating the number of occurrences of the two highest severity grades.
5. Calculate the Pipe Ratings Index by dividing the Pipe Rating by the number of defects. If the pipe has no defects, the Pipe Ratings Index is zero.

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APPENDIX B
SANITATION DISTRICT NO. 2 OF MARIN COUNTY
EXAMPLE CONDITION GRADING CALCULATIONS

	Number of Occurrences for Defect			Segment Grade Scores		
Grade	**Structural**	**O&M**	**Overall**	**Structural**	**O&M**	**Overall**
1	1	3	4	1	3	4
2	3	5	8	6	10	16
3	2	4	6	6	12	18
4	5	0	5	20	0	20
5	3	2	5	15	10	25
Total	**14**	**14**	**28**	**48**	**35**	**83**

Overall Pipe Rating = sum of structural and O&M segment scores

Segment Grade Score = Grade x Number of structural defect occurrences

PACP Quick Structural Rating	**5345**
PACP Quick O&M Rating	**5234**
PACP Quick Overall Rating	**5545**

Quick Structural Rating =
[Highest grade][Number of occurrences] [2nd highest grade][Number of occurrences]

Structural Index	**3.4**
O&M Index	**2.5**
Overall Index	**3.0**

$$\text{Overall Index} = \frac{\text{Overall Pipe Rating}}{\text{Overall number of occurrences}}$$

APPENDIX C
NASSCO PACP Structural and O&M Defects

APPENDIX C
SANITARY DISTRICT NO. 2 OF MARIN COUNTY
INSPECTION CODES AND NASSCO PACP CONDITION GRADING SYSTEM

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
Structural	Crack (C)	Circumferential (C)		CC	1	
		Longitudinal (L)		CL	2	
		Multiple (M)		CM	3	
		Spiral (S)		CS	2	
Structural	Fracture (F)	Circumferential (C)		FC	2	
		Longitudinal (L)		FL	3	
		Multiple (M)		FM	4	
		Spiral (S)		FS	3	
Structural	Pipe Failures (Silent)	Broken (B)		B	1 clock pos - 3, 2 clock pos - 4, >=3 clock pos - 5	
		Broken (B)	Soil Visible (SV)	BSV	5	
		Broken (B)	Void Visible (V V)	BVV	5	
		Hole (H)		H	1 clock pos - 3, 2 clock pos - 4, >= 3 clock pos - 5	
		Hole (H)	Soil Visible (SV)	HSV	5	
		Hole (H)	Void Visible (V V)	HVV	5	
Structural	Collapse (X)	Pipe (P)		XP	5	
		Brick (B)		XB	5	
Structural	Deformed (D)	(Pipe) (P)		D	<=10% - 4,>10% - 5	
		Brick (B)	Horizontally (H)	DH	5	
		Brick (B)	Vertically (V)	DV	5	
Structural	Joint (J)	Offset (displaced) (O)	Med (M)	JOM	1	
			Large (L)	JOL	2	
		Separated (open) (S)	Med (M)	JSM	1	
			Large (L)	JSL	2	
		Angular (A)	Med (M)	JAM	1	
			Large (L)	JAL	2	
	Surface Damage Chemical (S)	Roughness Increased (RI)	C	SRIC	1	
		Surface Spalling (SS)	C	SSSC	2	
		Aggregate Visible (AV)	C	SAVC	3	
		Aggregate Projecting (AP)	C	SAPC	3	
		Aggregate Missing (AM)	C	SAMC	4	
		Reinforcement Visible (RV)	C	SRVC	5	
		Reinforcement Corroded (RC)	C	SRCC	5	
		Missing Wall (MW)	C	SMWC	5	
		Other (Z)	C	SZC		
	Surface Damage Mechanical (M)	Roughness Increased (RI)	M	SRIM	1	
		Surface Spalling (SS)	M	SSSM	2	
		Aggregate Visible (AV)	M	SAVM	3	

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APPENDIX C
SANITARY DISTRICT NO. 2 OF MARIN COUNTY
INSPECTION CODES AND NASSCO PACP CONDITION GRADING SYSTEM

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Aggregate Projecting (AP)	M	SAPM	3	
		Aggregate Missing (AM)	M	SAMM	4	
		Reinforcement Visible (RV)	M	SRVM	5	
		Reinforcement Corroded (RC)	M	SRCM	5	
		Missing Wall (MW)	M	SMWM	5	
		Other (Z)	M	SZM	N/A	
	Surface Damage Not Evident (Z)	Roughness Increased (RI)	Z	SRIZ	1	
		Surface Spalling (SS)	Z	SSSZ	2	
		Aggregate Visible (AV)	Z	SAVZ	3	
		Aggregate Projecting (AP)	Z	SAPZ	3	
		Aggregate Missing (AM)	Z	SAMZ	4	
		Reinforcement Visible (RV)	Z	SRVZ	5	
		Reinforcement Corroded (RC)	Z	SRCZ	5	
		Missing Wall (MW)	Z	SMWZ	5	
		Other (Z)	Z	SZZ	N/A	
	Surface Damage (Metal Pipes)	Corrosion (CP)		SCP	3	
Structural	Lining Failure (LF)	Detached (D)		LFD	3	
		Defective End (DE)		LFDE	3	
		Blistered (B)		LFB	3	
		Service Cut Shifted (CS)		LFCS	3	
		Abandoned Connection (AC)		LFAC		
		Overcut Service (OC)		LFOC	3	
		Undercut Service (UC)		LFUC	3	
		Buckled (BK)		LFBK	3	
		Wrinkled (W)		LFW	3	
		Other (Z)		LFZ		
Structural	Weld Failure (WF)	Circumfrential (C)		WFC	2	
		Longitudinal (L)		WFL	2	
		Multiple (M)		WFM	3	
		Spiral (S)		WFS	2	
Structural	Point Repair (RP)	Localized Lining (L)		RPL		
		Localized Lining (L)	Defective (D)	RPLD	4	
		Patch Repair (P)		RPP		
		Patch Repair (P)	Defective (D)	RPPD	4	
		Pipe Replaced (R)		RPR		

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APPENDIX C
SANITARY DISTRICT NO. 2 OF MARIN COUNTY
INSPECTION CODES AND NASSCO PACP CONDITION GRADING SYSTEM

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Pipe Replaced (R)	Defective (D)	RPRD	4	
		Other (Z)		RPRZ		
		Other (Z)		RPRZD		
Structural	Brickwork (Silent)	Displaced (DB)		DB	3	
		Missing (MB)		MB	4	
		Dropped Invert (DI)		DI	5	
		Missing Mortar	Slight	MMS	2	
			Medium	MMM	3	
			Large	MML	3	
O&M	Deposits Attached (DA)	Encrustation (E)		DAE		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Grease (G)		DAGS		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Ragging (R)		DAR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		DAZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
	Deposits Settled (DS)	Hard/Compacted (C)		DSC		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Fine (F)		DSF		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Gravel (G)		DSGV		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		DSZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
	Deposits Ingress (DN)	Fines silt/sand (F)		DNF		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Gravel (GV)		DNGV		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		DNZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
O&M	Roots (R)	Fine (F)	Barrel (B)	RFB		2
			Lateral (L)	RFL		1
			Connecfion (C)	RFC		1
	Roots (R) at a Joint		N/A	RF		1
		Tap (T)	Barrel (B)	RTB		3
			Lateral (L)	RTL		2
			Connecfion (C)	RTC		2

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APPENDIX C
SANITARY DISTRICT NO. 2 OF MARIN COUNTY
INSPECTION CODES AND NASSCO PACP CONDITION GRADING SYSTEM

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
	Roots (R) at a Joint		N/A	RT		2
		Medium (M)	Barrel (B)	RMB		4
			Lateral (L)	RML		3
			Connecfion (C)	RMC		3
	Roots (R) at a Joint		N/A	RM		3
		Ball (B)	Barrel (B)	RBB		5
			Lateral (L)	RBL		4
			Connecfion (C)	RBC		4
	Roots (R) at a Joint		N/A	RB		4
O&M	Infiltration (I)	Weeper (W)		IW		2
		Dripper (D)		ID		3
		Runner (R)		IR		4
		Gusher (G)		IG		5
O&M	Obstacles/Obstructions (OB)	Brick or Masonry (B)		OBB		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Pipe Material in Invert (M)		OBM		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Protruding Thru Wall (I)		OBI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Wedged in Joint (J)		OBJ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Object Thru Connection (C)		OBC		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		External Pipe or Cable In Sewer (P)		OBP		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Built Into Structure (S)		OBS		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Construction Debris (N)		OBN		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Rocks (R)		OBR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other Objects (Z)		OBZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
O&M	Vermin (V)	Rat (R)		VR		2
		Cockroach (C)		VC		1
		Other (Z)		VZ		1
Construction Features	Tap (T)	Factory Made (F)		TF		
			Capped (C)	TFC		
			Defective (D)	TFD		2

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APPENDIX C
SANITARY DISTRICT NO. 2 OF MARIN COUNTY
INSPECTION CODES AND NASSCO PACP CONDITION GRADING SYSTEM

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
			Intruding (I)	TFI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Active (A)	TFA		
		Break-In/Hammer (B)		TB		
			Capped (C)	TBC		2
			Defective (D)	TBD		3
			Intruding (I)	TBI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Active (A)	TBA		
		Saddle (S)		TS		
			Capped (C)	TSC		
			Defective (D)	TSD		2
			Intruding (I)	TSI		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Active (A)	TSA		
Construction Features	Intruding Seal Material (IS)			IS		
		Sealing Ring (SR)		ISSR		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Hanging	ISSRH		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
			Broken	ISSRB		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Grout (GT)		ISGT		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
		Other (Z)		ISZ		<=10% - 2, <=20% - 3, <=30% - 4, >30% - 5
Construction Features	Line (L)	Left (L)		LL		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Left/UP (LU)		LLU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Left/Down (LD)		LLD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Right (R)		LR		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Right/Up (RU)		LRU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Right/Down (RD)		LRD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
		Up (U)		LU		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4

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APPENDIX C
SANITARY DISTRICT NO. 2 OF MARIN COUNTY
INSPECTION CODES AND NASSCO PACP CONDITION GRADING SYSTEM

Family	Group	Descriptor	Modifier	Code	Structural Grade	O&M Grade
		Down (D)		LD		<=10 Deg - 1, <=20 Deg 2, >20 Deg - 4
Construction Features	Access Points (A)					
		Cleanout (CO)		ACO		
			Mainline (M)	ACOM		
			Property (P)	ACOP		
			House (H)	ACOH		
		Discharge Point (DP)		ADP		
		Junction Box (JB)		AJB		
		Meter (M)		AM		
		Manhole (MH)		AMH		
		Other Special Chamber (OC)		AOC		
		Tee Connection (TC)		ATC		
		WW Access Device (WA)		AWA		
		Wet Well (WW)		AWW		
Other Observations	Miscellaneous (M)	Camera Underwater (CU)		MCU		4
		Dimension/Diam/Shape Change (SC)		MSC		
		General Observation (GO)		MGO		
		General Photograph (GP)		MGP		
		Material Change (MC)		MMC		
		Lining Change (LC)		MLC		
		Joint Length Change (JL)		MJL		
		Survey Abandoned (SA)		MSA		
		Water Level (WL)		MWL		
		Water Level (WL)	(S)	MWLS		<=30% - 2, <=50% - 3, >50% - 4
		Water Mark (WM)		MWM		>=50% 4, >=75% 5
		Dye Test (Y)		MY		
			Visible (V)	MYV		5
			Not Visible (N)	MYN		3

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BLACKWATER
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Appendix B

Sherwood Forest Evaluation

Technical Memorandum

BLACKWATER CONSULTING ENGINEERS, INC.

To: Cheng Vue, State Water Resources Control Board (SENT VIA: EMAIL)

From: Jeff Black, P.E., Black Water Consulting Engineers, Inc.
Tyler Lee, E.I.T., Black Water Consulting Engineers, Inc.

Subject: **FINAL Twain Harte Community Services District**
(Planning Project No. C-06-8408-110)
Sherwood Forest Evaluation

Date: February 24, 2021



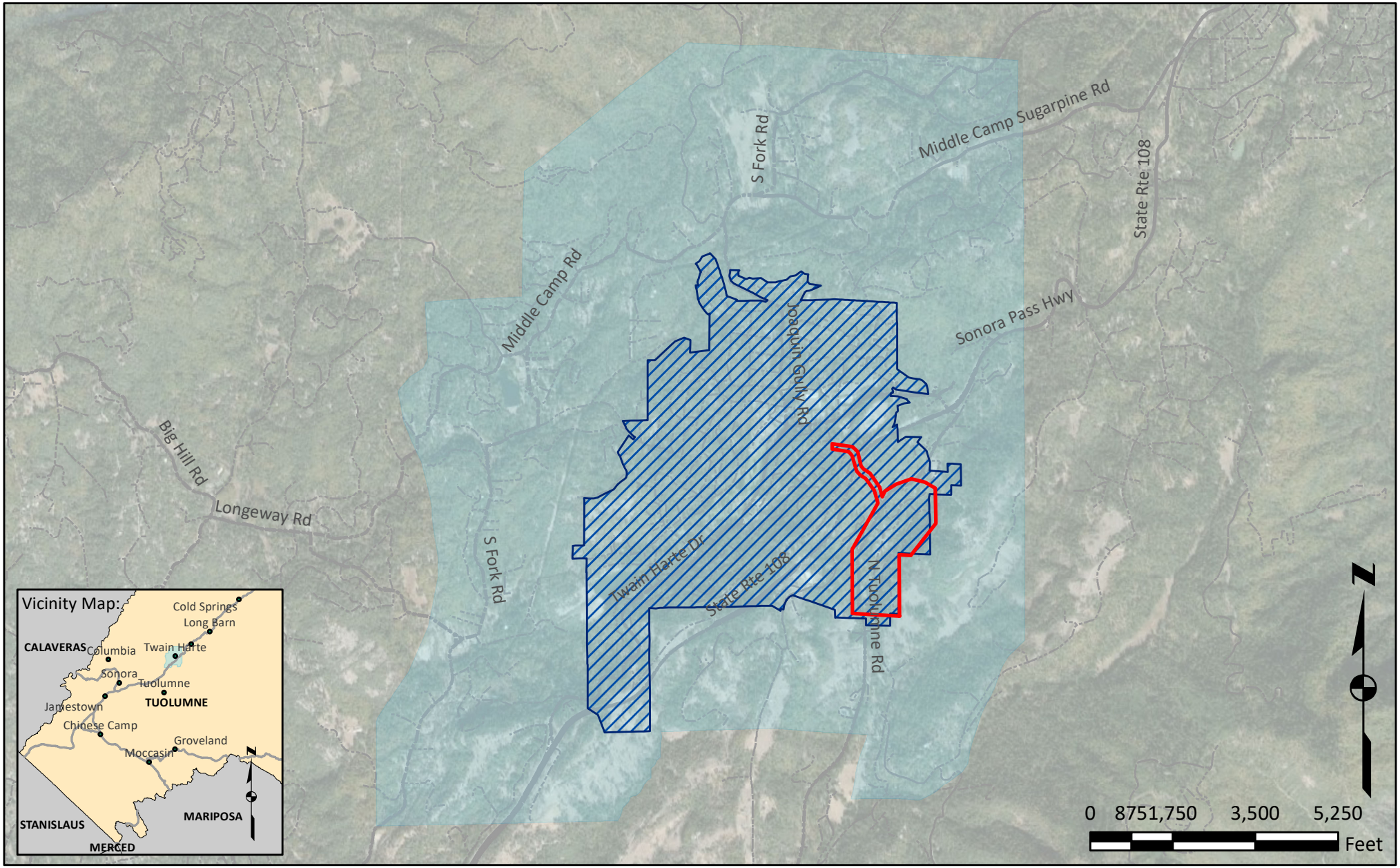
INTRODUCTION

This technical memorandum (memo) has been prepared as part of the Sherwood Forest Evaluation (Task 5) of the Twain Harte Community Services District (THCSD) Inflow/Infiltration Identification and Reduction Planning Project No. C-06-8408-110. This memo will describe the history and the limitations of the current on-site wastewater treatment systems (OWTS) at the Sherwood Forest community. Following the historical background is an evaluation of the potential for a gravity collection system connecting to the THCSD sewer. The evaluation will be based on maintenance requirements, design constraints, potential environmental impacts, and estimated construction costs. This memo will also present the project constraints and a recommended alternative.

BACKGROUND

Sherwood Forest is located southwest of Twain Harte in the county of Tuolumne, CA as shown in **Figure 1**. The Sherwood Forest development was constructed in 1964 and included Cedar Springs Road, King Arthurs Court, Little John Road, Broken Bough Lane, Robin Hood Drive, and Fallen Leaf Lane. After the initial development was constructed, additional houses were built along N. Tuolumne Rd. In this memo, the entire area will be referred to as Sherwood Forest or the Development. At the center of the Development, between Robin Hood Drive and Little John Road, is Turnback Creek with a perennial reservoir. The Development area is shown in **Figure 2**.

As a condition of the Development, each lot line has a 5-ft public utility easement (PUE). Each of the lots was constructed with independent OWTS. Since its approval and initial construction phase, the Development has continued to build-out as planned with each property owner independently maintaining an OWTS. As shown in **Figure 1**, Sherwood Forest is within the THCSD service area and has the potential to connect to the public sewer system. This technical memorandum will evaluate the potential of abandoning the individual OWTS in Sherwood Forest and connecting to the public sewer system.



TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

Figure1: Sherwood Forest Conceptual Collection System - Location Map

Author: Tyler Lee

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- Project Area
- THCSD Boundary
- THCSD Sphere of Influence
- Roads
- Major Roadways

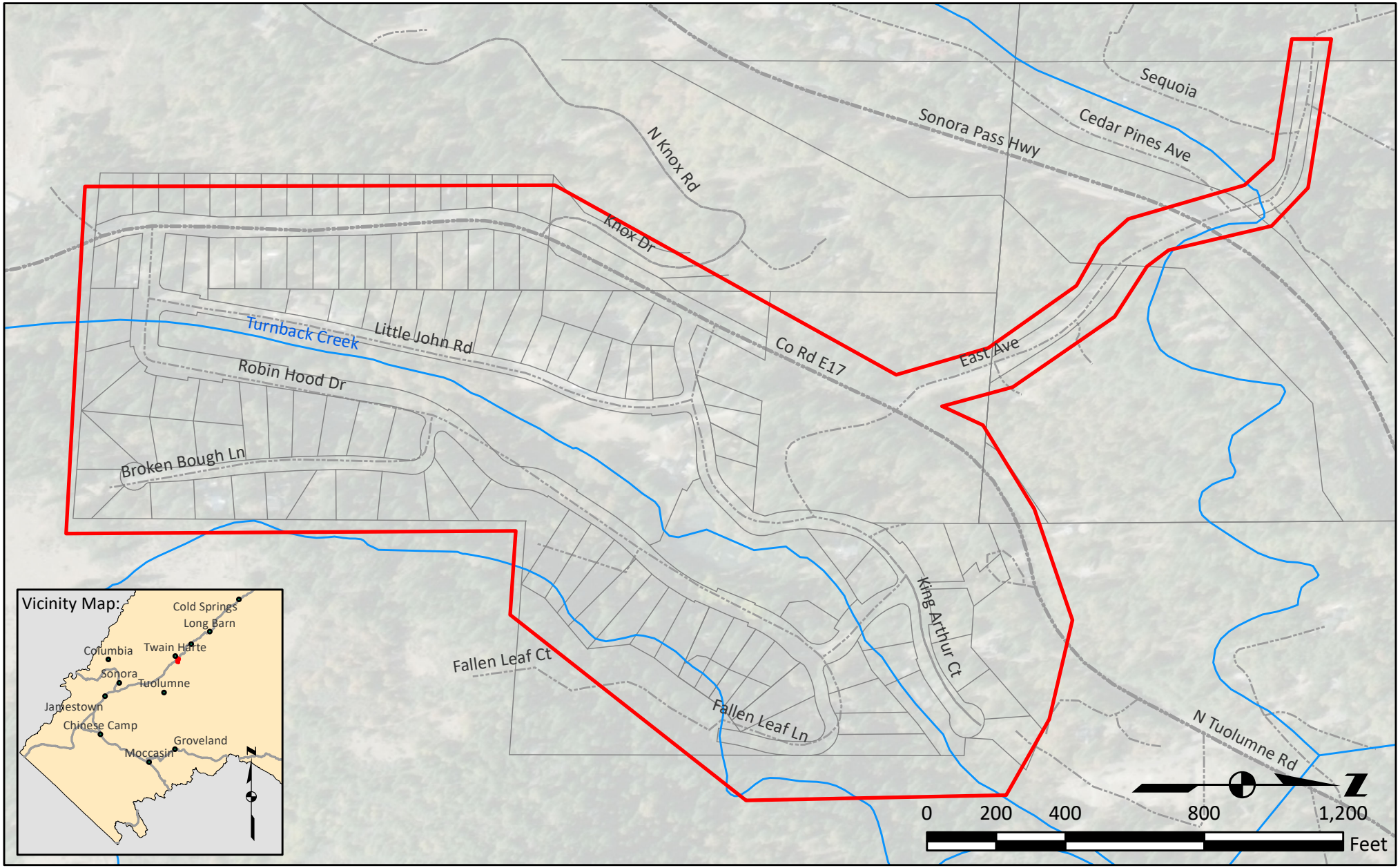


Figure 2: Sherwood Forest Conceptual Collection System - Project Area

Author: Tyler Lee

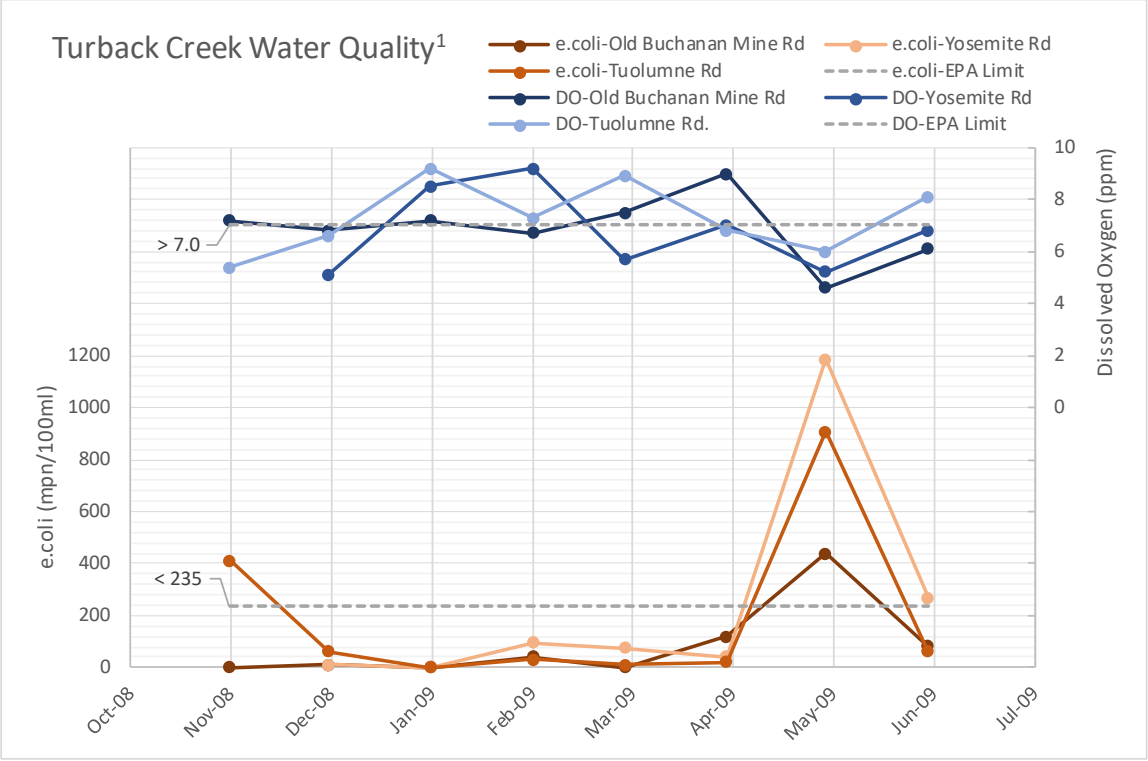
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Project Area
Waterways
Roads
Major Roadways

Sherwood Forest originally received water from the Waterfall Lodge Improvement Company. The water system operated from groundwater well(s). When the water system failed drinking water standards the well was abandoned and the distribution piping was consolidated with the Twain Harte Community Services District water system.

In 2016, the Central Valley Regional Board recommended that Turnback Creek be added to the 303(d) list for impaired surface water. This recommendation was based on water quality samples taken from the creek from 2007 to 2009. The samples collected evaluated pH, turbidity, dissolved oxygen (DO), and the indicator bacteria, E. coli. Of the 19 samples tested for E. coli from 2007 to 2009, five samples exceeded the Environmental Protection Agency (EPA) recreational limits. Of the 46 samples tested for dissolved oxygen, 20 were below the EPA recreational minimums. As a result, the Central Valley Regional Board recommended that Turnback Creek be added to the State's list of impaired surface water. The recommendation was received by the State as part of a multi-county submission in 2016. The State has not ruled on the various recommendations from 2016 and its decision is pending. The values for DO and E. coli reported to the Central Valley Regional Board from November 2008 to June 2009 are shown in **Figure 3.**

Figure 3 - Turnback Creek Impacted Surface Water Recordings for Dissolved Oxygen and E. coli



[1]Tuolumne County Stream Team water Quality Monitoring Report 2008-09, Tuolumne County Resource Conservation District

With the construction of a sewer collection system, all existing OWTS could be removed from service. This would alleviate the possibility of the OWTS impacting the water quality in Turnback Creek.

If the State designates Turnback Creek as an impaired water body as a result of the recorded decline in water quality, then the setbacks for OWTS will increase. The current setbacks are 50 ft for sewer lines, 50 ft for septic tanks, and 100 ft for leach fields. Should the State move forward and designate Turnback Creek as an impaired creek, the new setback requirements for future development at Sherwood Forest would be 50 ft for sewer lines, 600 ft for septic tanks, and 600 ft for leach fields. Since many areas are incapable of meeting these setbacks, future growth in the area would be curbed by the setback requirements of an impaired water source. With the installation of a collection system for the area, development could continue in the area regardless of updated OWTS setbacks.

PURPOSE

The purpose of this memo is to provide preliminary analysis, justification, and design information to the State Water Resources Control Board (SWRCB) for approving the development of design documents for a proposed collection system and sewer lift station in Sherwood Forest and connection to the existing THCSD sewer system. The following sections will provide a detailed evaluation of the Sherwood Forest Development regarding sanitary sewer collection.

DESIGN CONSTRAINTS

The design of the collection system will be based on a design flow derived using the THCSD standards. This design flow accounts for base sanitary flow, inflow, infiltration, and peaking flow. The pump station will also be designed to meet the design flow.

Since the area surrounding Twain Harte is heavily wooded, the collection system has frequent issues with root intrusion. While it is not economical to construct a collection system that prevents all root intrusion, it can be minimized by locating the collection system in the public right-of-way with limited use of utility easements. Where the collection system cannot be installed in the public right-of-way, root intrusion can be minimized with the use of seamless pipe such as high-density polyethylene (HDPE).

The elevations across the Sherwood Forest Development vary from 3557.6 ft to 3752.0 ft above mean sea level (AMSL). The variability in elevation has the potential to result in sewer lines with uncharacteristically steep slopes. If this is the case, then the layout of the collection system will match the topography where possible.

There are two locations where topography will preclude using public rights-of-way. The first location is along the east side of N. Tuolumne Road where the houses are 15-20 ft below the road. The options for this location are presented in Options 1 and 2 described later in this memo. The second location is along Broken Bough Lane. Broken Bough Lane is a dead-end road that starts at Robin Hood Drive. The lane rises from its origin to a high point of ±3,695 AMSL then dips back down to ±3,680 AMSL. Several homes on the end of this road are lower than the high point and would not be able to gravity flow to a public sewer main in the roadway. The options for sewering homes on Broken Bough Lane are presented in Options 1 and 3 of this memo.

SHERWOOD FOREST WASTEWATER FLOWS

In calculating the design flow of the collection system, it is assumed that every parcel is one household equivalent (HE). There are 124 parcels in the Development. Despite a few of the parcels being undeveloped, all vacant lots will also be assigned one HE. This assumption has minimal effect on flow rates and creates a margin of safety in the design. THCSD standards specify a waste generation rate of 437 gpd/HE. Multiplying the generation rate by 124 HE's in the Development, the average flow for the Development is estimated at 54,188 gpd. THCSD standards also specify a peaking factor of 3.0 and 500 gpd/(in·mile) for inflow and infiltration. Assuming 2.19 miles of 8-in pipe, the inflow and infiltration is estimated to be 8,750 gpd. This equates to an estimated design flow of 171,316 gpd. A detailed analysis of the proposed collection system pipeline alignments is provided in **Attachment A**.

Tuolumne Utilities District (TUD) has confirmed capacity at their Sonora Regional WWTP to accept and treat the anticipated flow from 124 HEs at Sherwood Forest.

For a detailed discussion on additional flows from Sherwood Forest using the District's collection system, a system hydraulic model has been developed under Task 6 of the Planning Project No. C-06-8408-110. District standards limit the depth-to-diameter ratio (d/D) to 0.70. The maximum flow recorded annually is referred to as the Peak Wet Weather Flow (PWWF). The PWWF accounts for groundwater infiltration and inflow from surface runoff and peak generation rates from the service connections. It is estimated that under the PWWF flow for the year of 2018, the current number of undersized lines from Sherwood Forest to the TUD collection point is three (3). If the District received additional wastewater flows from Sherwood Forest, the number of undersized lines along this path increases to seven (7). Assuming the three lines will be updated regardless of this project, four additional pipelines would need to be upgraded in the existing collection system to effectively convey flows from Sherwood Forest. The pipelines to be replaced are located between these manholes:

- SP35 to MH19
- SP38 to DMH3
- MH25 to SP71
- DMH16 to MH25

THCSD sewer design standards call for:

- A minimum pipe slope of 0.0033 ft/ft for an 8-inch diameter pipe
- A minimum pipe slope of 0.0049 ft/ft for a 6-inch diameter pipe for top of line sewers less than 400 ft in length

The minimum slope ensures that flows in gravity collection achieve a scouring velocity of 2.0 ft/s at full or half-full pipe. While THCSD does not provide a maximum slope, it is generally recommended that the velocity of gravity sewers not exceed 10.0 ft/s. Using the minimum pipe size permitted by THCSD design standards (8-in), the maximum depth of flow in a pipe at the minimum slope would be approximately 3.4 inches or 0.43 d/D.

THCSD does not have design standards for sewer lift stations but it is recommended that the District utilize the design criteria in **Tables 1** and **2**. Applying these criteria, the wet well requires an active volume of at least 300 gallons (**Attachment B**) and pumps capable of operating with a total dynamic head of 270 ft. The pump station will operate with three (3) submersible pumps (two duty and one standby). THCSD will require an on-site emergency generator with 3,000 gallons of overflow storage. The overflow storage can be provided with either off- or on-line storage as necessary.

Table 1 – Pump System Design

Description	Criteria
System Design	
Flow Rate	120 gpm
Static Head	219 ft
Pump Design	
Number of Active	2
Number of Stand-By	1
Power	10 hp
Pump Type	Submersible
Minimum TDH	270 ft
Maximum Cycles per Hour	
Submersible Pump	6 cycles/hr
Wet Well Design	
Wet Well Depth	72 in
Wet Well Active Volume	300 gal
Design Velocity	
Minimum design velocity	3 ft/s
Maximum design velocity	10 ft/s
Force Main	
Force Main Diameter	4 in
Force Main Length	4140 ft
Material	Ductile Iron
Generator	
Power	14.92 kW
Overflow Storage	
Inline storage	3,000 gal

Table 2 – Design Standards

Element	Design Standard
Pumps	Enclosures must be explosion-proof
	Pump NPSH'r must be met with safety allowances
	Minimum submergence per pump mfr or Froude submergence values, whichever is greater
Redundancy	Emergency Generator capable of meeting peak operating limits
	Pump station shall meet PWWF w/ largest pump out of service
	Bypass pumping locations (suction and discharge)
	2-hour in-line emergency storge
Security and Access	The site shall be designed above the 10-year flood line
	The site shall divert all stormwater away from the wet well
	The site shall be accessible with a 12 ft access gate
	The site shall have 1 hr freeboard with alarm at average flow
	The collection system shall have 2 hours of inline storage at design flow
	The site shall have odor control measures
Control Design	Force main shall have a flow meter rated for the design velocities
	Wet well liquid level shall be reported locally and remotely to the District

OPTION 1

This option uses public rights-of-way and existing PUEs along the common lot lines running parallel to N. Tuolumne Road and Little John Road. The topography along these shared lot lines naturally slopes down from the north to south. THCSD currently has a water main in the PUEs. The water main is difficult for THCSD staff to access and maintain and has been damaged by property owners. As a result of the maintenance issues and to provide separation from the proposed sewer, the water line should be relocated to N. Tuolumne Road and a gravity sewer line installed in its place. The gravity sewer line will be HDPE and backfilled with controlled low strength material (CLSM). The fused joints of the HDPE will minimize root intrusion, and the slurry backfill will protect the sewer main from damage by property owners. The total length of the PUE segment is approximately 1,100 ft. In addition to the 1,100 ft gravity sewer in the PUE, another PUE would be utilized for the sewer pipe segment from Little John Road to two lots on the east side of N. Tuolumne Road.

The residences at the end of Broken Bough Lane would be served by a gravity line within the roadway. This would require either a bore through the hill between two proposed manholes on Broken Bough Lane or a trench having a depth of approximately 15-ft (**Figure 4**). These sub-options have high costs but would allow for a gravity line to reach the end of the street.

The advantage of this option is the limited use of PUEs. When PUEs are required, the sewer pipe will be encased and jointless. The disadvantage of this option is additional coordination during construction. The associated cost estimate for this project is shown in **Table 3**.

Table 3 – Cost Estimate of Option 1

Item	Unit	Quantity	Unit Cost, $	Total Unit Cost, $
Collection System (Option 1)				
Mobilization	ls	1	$ 8,000	$ 8,000
Connections to existing piping	ls	1	$ 1,600	$ 1,600
Collection System Piping	lf	11550	$ 173	$ 1,998,000
6" Lateral Connections	ea	124	$ 1,200	$ 148,800
SS Manhole	ea	46	$ 4,359	$ 200,500
Pump Station/Force Main				
Civil Site Improvements	ls	1	$ 50,000	$ 50,000
Wet Well	ls	1	$ 40,000	$ 40,000
Submersible Pumps	ea	3	$ 16,000	$ 48,000
Force Main Pipe	lf	4200	$ 161	$ 676,650
Electrical and Instrumentation	ls	1	$ 120,000	$ 120,000
Site Piping and Appurtenances	ls	1	$ 150,000	$ 150,000
20 kW Generator	ls	1	$ 60,000	$ 60,000
			Estimated Construction Cost	$ 3,501,550
			40% construction contingency	$ 1,400,620
Engineering, Construction Services, and Administration			Preparation of bid documents	$ 250,000
			Consultant assistance during bidding	$ 9,000
			Engineering services during construction	$ 25,000
			Construction management	$ 150,000
			Estimated Project Cost	$ 5,336,170

[1] Engineering News Record, Construction Cost Index for 2/8/2021=$ 11,698.80

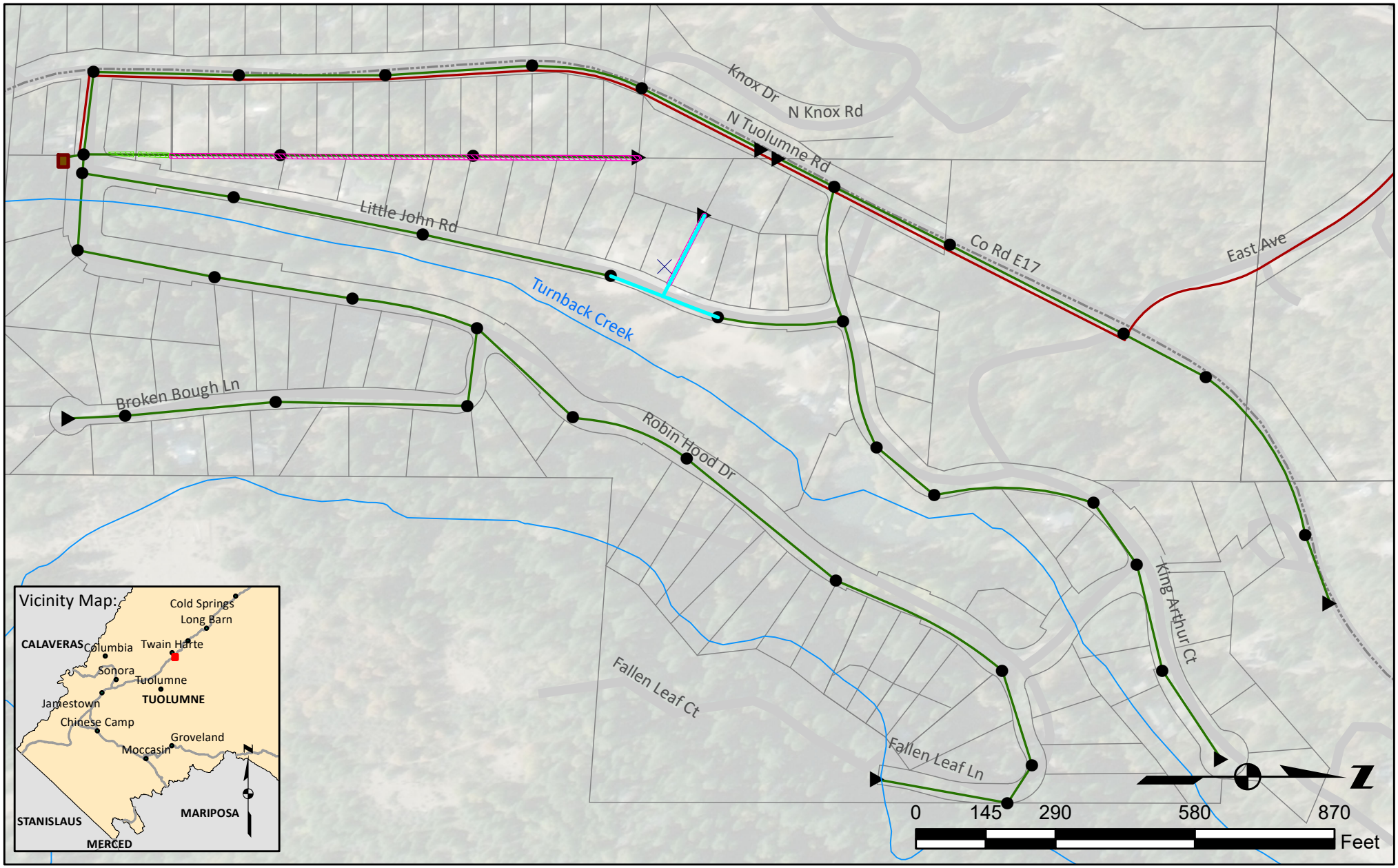


Figure 4: Sherwood Forest Conceptual Collection System - Option 1

Author: Tyler Lee

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- Existing Manhole
- Cleanout
- Manhole
- Force Main
- Gravity Colleciton
- Lot Line
- Major Roadways
- Roads
- Waterways
- Sewer Easement
- PUE
- Pump Station

OPTION 2

This option provides an alternative to the continuous easement between N. Tuolumne Road and Little John Road presented in Option 1. This option uses easements from east to west perpendicular to Little John Road. Each easement would service both the lot west of Little John Road and the lots along the east side of N. Tuolumne Road. Gravity sewers would be encased with CLSM to protect them from accidental damage by property owners. This option would require end of line cleanouts along each of the mains. (**Figure 5**). The additional cleanouts required make this option impractical. This option creates multiple unnecessary crossings of existing utilities. Additionally, this option increases the amount of infrastructure in PUE's which are difficult to access and maintain. Lastly, this option requires additional construction through the front and side yards of the properties along Little John Rd. A preliminary cost estimate is shown in **Table 4**.

Table 4: Cost Estimate for Option 2.

Item	Unit	Quantity	Unit Cost, $	Total Unit Cost, $
Collection System (Option 2)				
Mobilization	ls	1	$ 8,000	$ 8,000
Connections to existing piping	ls	1	$ 1,600	$ 1,600
Collection System Piping	lf	12300	$ 173	$ 2,127,740
6" Lateral Connections	ea	124	$ 1,200	$ 148,800
SS Manhole	ea	52	$ 4,359	$ 226,652
Pump Station/Force Main				
Civil Site Improvements	ls	1	$ 50,000	$ 50,000
Wet Well	ls	1	$ 40,000	$ 40,000
Submersible Pumps	ea	3	$ 16,000	$ 48,000
Force Main Pipe and Spool	lf	4200	$ 161	$ 676,650
Electrical and Instrumentation	ls	1	$ 120,000	$ 120,000
Site Piping and Appurtenances	ls	1	$ 150,000	$ 150,000
20 kW Generator	ls	1	$ 60,000	$ 60,000
			Estimated Construction Cost	$ 3,657,442
			40% construction contingency	$ 1,462,977
Engineering, Construction Services, and Administration			Preparation of bid documents	$ 250,000
			Consultant assistance during bidding	$ 9,000
			Engineering services during construction	$ 25,000
			Construction management	$ 150,000
			Estimated Project Cost	$ 5,554,419

[1] Engineering News Record, Construction Cost Index for 2/8/2021=$ 11,698.80

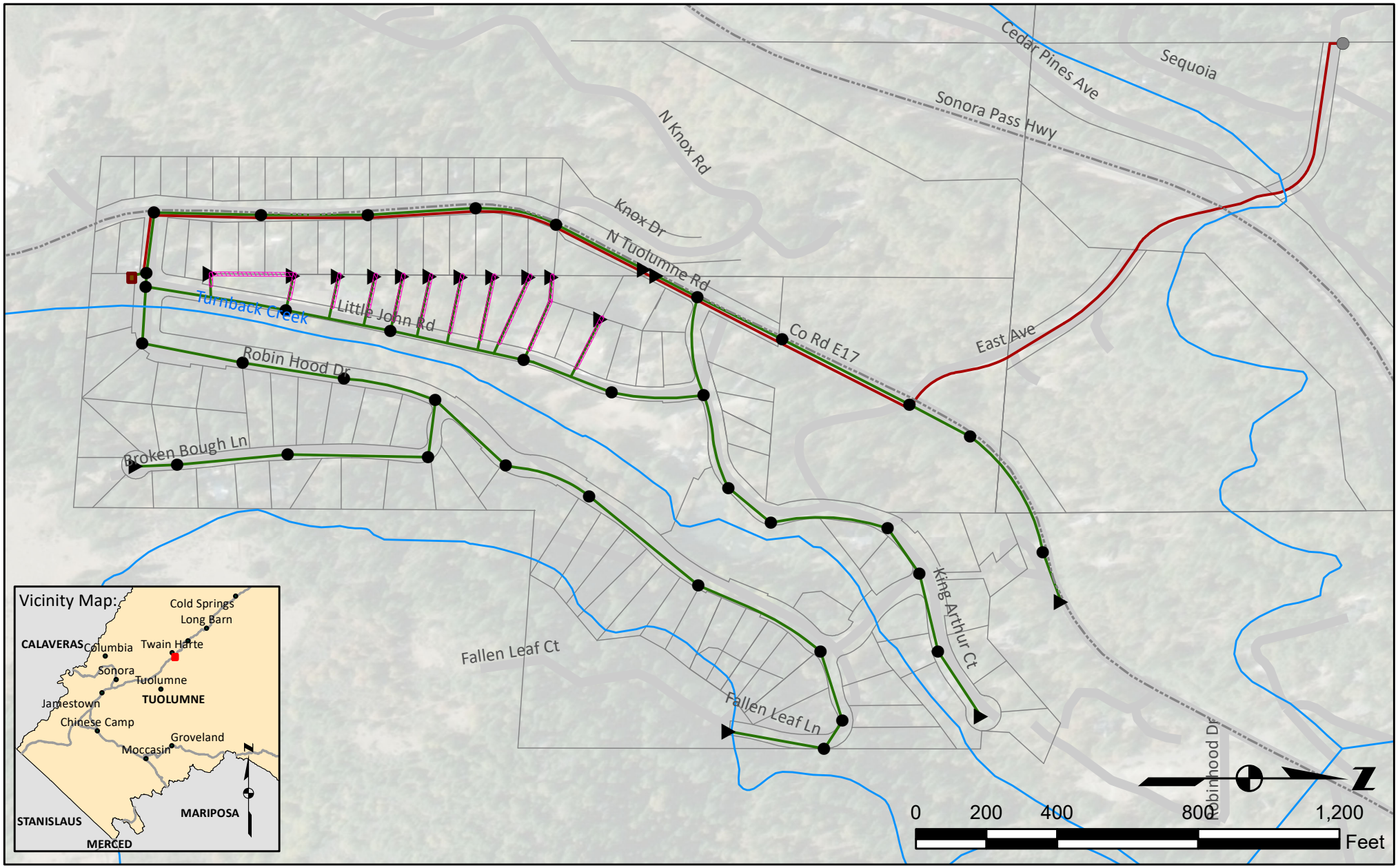


Figure 5: Sherwood Forest Conceptual Collection System - Option 2

Author: Tyler Lee

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

- Existing Manhole
- Proposed Cleanout
- Proposed Manhole
- Force Main
- Gravity Collection
- Lot Line
- Major Roadways
- Roads
- Waterways
- PUE
- Pump Station

OPTION 3

This option provides an alternative to trenching or tunneling through the high point in Broken Bough Lane. This option would use an existing PUE between Robin Hood Drive and Broken Bough Lane. Wastewater from the properties at the end of Broken Bough Lane would flow through this PUE to Robin Hood Drive. This option would require two additional manholes and construction along the steep slope between Broken Bough Lane and Robin Hood Drive (**Figure 6**). In addition to the previous issues, there would be increased construction costs associated with clearing the land and working on the steep slope. Assuming that the contractors were able to work on the slope, this line would require cutoff walls to avoid gradual creep down the hill. This option will have similar costs to Option 1 and would create additional access and maintenance issues associated with steep slopes. The associated cost estimate for Option 3 is shown in **Table 5**.

Table 5: Cost estimate for Option 3.

Item	Unit	Quantity	Unit Cost, $	Total Unit Cost, $
Collection System (Option 3)				
Mobilization	ls	1	$ 8,000	$ 8,000
Connections to existing piping	ls	1	$ 1,600	$ 1,600
Collection System Piping	lf	11825	$ 173	$ 2,045,571
6" Lateral Connections	ea	124	$ 1,200	$ 148,800
SS Manhole	ea	48	$ 4,359	$ 209,217
Pump Station/Force Main				
Civil Site Improvements	ls	1	$ 50,000	$ 50,000
Wet Well	ls	1	$ 40,000	$ 40,000
Submersible Pumps	ea	3	$ 16,000	$ 48,000
Force Main Pipe and Spool	lf	4200	$ 161	$ 676,650
Electrical and Instrumentation	ls	1	$ 120,000	$ 120,000
Site Piping and Appurtenances	ls	1	$ 150,000	$ 150,000
20 kW Generator	ls	1	$ 60,000	$ 60,000
			Estimated Construction Cost	$ 3,557,838
			40% construction contingency	$ 1,423,135
Engineering, Construction Services, and Administration			Preparation of bid documents	$ 250,000
			Consultant assistance during bidding	$ 9,000
			Engineering services during construction	$ 25,000
			Construction management	$ 150,000
			Estimated Project Cost	$ 5,414,973

[1] Engineering News Record, Construction Cost Index for 2/8/2021=$ 11,698.80

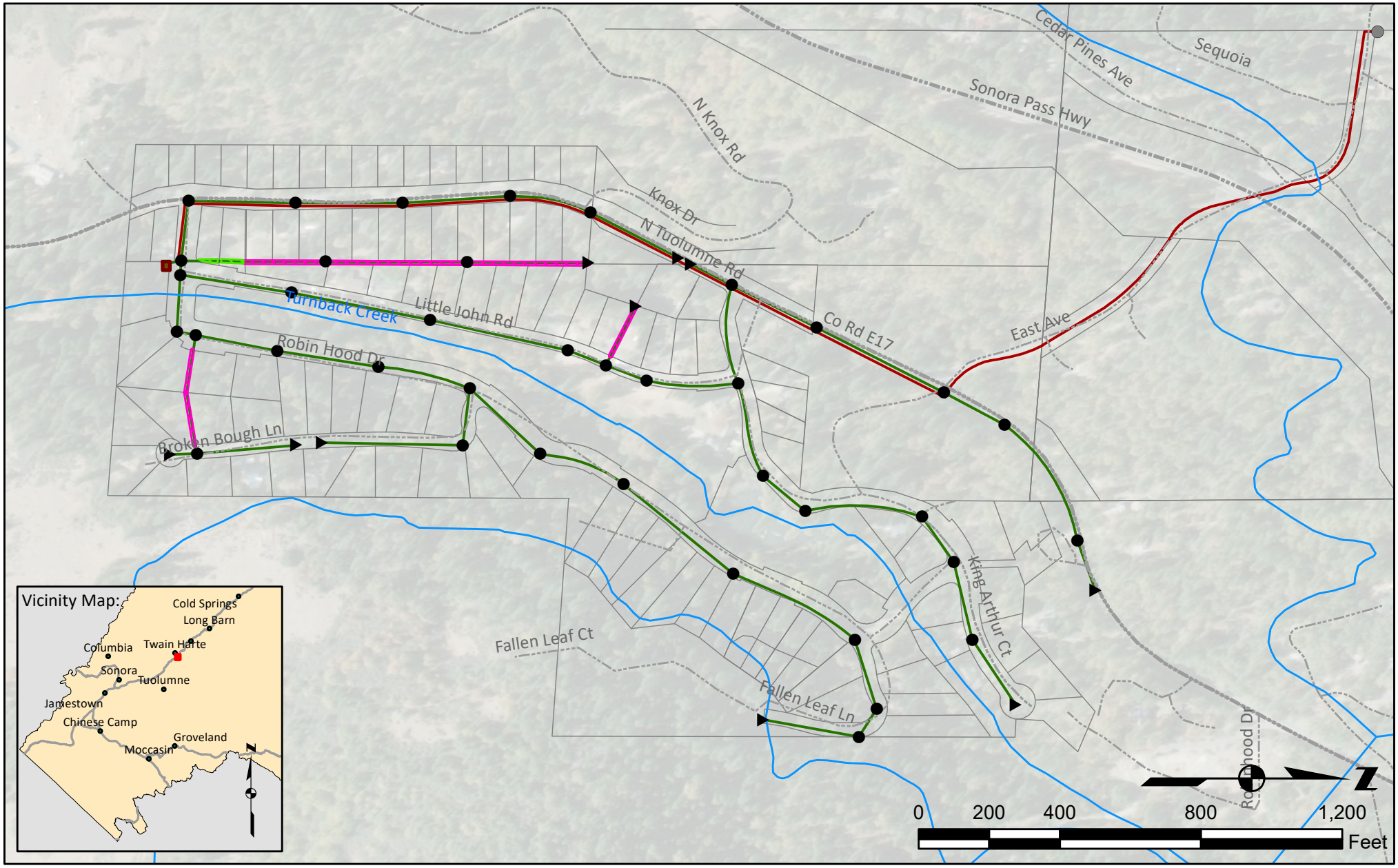


Figure 6: Sherwood Forest Conceptual Collection System-Option 3

Author: Tyler Lee

BLACKWATER CONSULTING ENGINEERS, INC.

- Existing Manhole
- Proposed Cleanout
- Proposed Manhole
- Waterways
- Roads
- Major Roadways
- Sewer Easement
- PUE
- Gravity Collection
- Force Main
- Lot Line

COMPARISON OF OPTIONS

Table 6 compares the three options using the following factors:

- Permitting
- Community and Traffic
- Constructability, Elements, and Schedule
- Environmental Impact
- Utilities
- Operations and Maintenance

Based on this analysis, Option 1 is most desirable for the project. Option 1 is estimated to cost between $5.07 million and $6.14 million. Costs have been estimated using previous construction information from projects in the county of Tuolumne and adjacent counties.

Table 6 – Comparison of Project Options

Item	Weight	Option 1 Recommended Alternative	Rank	Weighted Rank	Option 2 PUE Alternative	Rank	Weighted Rank	Option 3 Broken Bough Ln Alternative	Rank	Weighted Rank
Permitting	5%	**Advantages:** **Disadvantages:**	3	0.15	**Advantages:** **Disadvantages:**	3	0.15	**Advantages:** **Disadvantages:**	3	0.15
Community and Traffic	5%	**Advantages:** • Back yard disruption is less visual than side yard construction. • Does not result in a shared lateral situation. **Disadvantages:**	3	0.15	**Advantages:** **Disadvantages:** • Const. in side yards will be disruptive to property owners. • Additional traffic in Little John Road due to lateral connections.	1	0.05	**Advantages:** • Back yard disruption is less visual than side yard construction. • Does not result in a shared lateral situation. **Disadvantages:** • Extended traffic disruption on Broken Bough associated with boring.	2	0.10
Constructability	50%	**Advantages:** • Least pipe length • Less likely to intersect utilities **Disadvantages:** • Requires bore or deep open cut along Broken Bough • Const. in back yard • Need to relocate existing water main to N Tuolumne Rd	3	1.50	**Advantages:** • Fewest sewer structures **Disadvantages:** •Repeated Utility crossings on Little John Rd. • Const. in side yard • Most potential utility conflicts. • Utility crossings with Water main between N. Tuolumne and Little John	2	1.00	**Advantages:** • Less likely to conflict with existing utilities. **Disadvantages:** •Const. on steep slope between Robin Hood and Broken Bough • Slope requires Cut-off walls. • Const. in back yard • Relocate ex water main to N Tuolumne Rd	1	0.50
Environmental Impact	10%	**Advantages:** • Use of previously impacted area from water relocation project **Disadvantages:** • 1,100 linear ft of impacted property outside of roadway.	3	0.30	**Advantages:** **Disadvantages:** • 1,700 linear ft of impacted property outside of the roadway.	2	0.20	**Advantages:** • Use of previously impacted area from water relocation project **Disadvantages:** • 1,400 linear ft of impacted property outside of roadway. • Potential Environmental impacts between Robin Hood and Broken Bough.	1	0.10
Operations and Maintenance	30%	**Advantages:** **Disadvantages:** • Service lines and main only accessible from back yards.	2	0.60	**Advantages:** • Service lines are accessible from Little John **Disadvantages:**	3	0.90	**Advantages:** **Disadvantages:** • Difficult maintenance between Robin Hood and Broken Bough. • Service lines and main only accessible from back yards.	1	0.30
Total Σ:	100%			**2.70**			**2.30**			**1.15**

*Note :

1. Unweighted Score: Least Desireable = 1, Most Desireable = 3.

RECOMMENDATION

Given THCSD's experience with maintenance and root intrusion, it is recommended that the collection system minimize the number of sewer lines, manholes, cleanouts, and use of PUEs/sewer easements by selecting Option 1. Option 1 provides an effective collection system that limits the need for PUEs. It is recommended upon approval from the SWRCB that THCSD begin developing design documents for this option. It is further recommended that the design follow THCSD standards where applicable. The design documents will provide the locations of manholes and cleanouts that maintain separation from existing water mains and surface water bodies. The collection system should be further evaluated to limit steep slopes that would result in pipe flow velocities above 10.0 ft/s.

In addition to a properly designed collection system, the design documents will include a sewer pump station. The preliminary design documents will outline the design standards required by THCSD. Finally, the force main will be designed to achieve scouring velocities greater than 3.0 ft/s. In addition to velocities above 3.0 ft/s, the force main will be designed with appropriate check valves, control valves, bypass facilities, and air release valves.

CONCLUSION

It is recommended that THCSD proceed with Option 1 by finalizing the planning project, preparing 30% preliminary design documents, initiating CEQA work, and applying for construction funds.

DISCLOSURE STATEMENT

Funding for this project has been provided in full or in part through an agreement with the SWRCB. California's Clean Water State Revolving Fund is capitalized through a variety of funding sources, including grants from the United States Environmental Protection Agency and state bond proceeds. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendations for use.

REFERENCES

[1] Tuolumne County Setbacks
https://www.tuolumnecounty.ca.gov/DocumentCenter/View/376/Chapter-1308---On-Site-Sewage-Treatment-and-Disposal-Code?bidId=

[2] Tuolumne County Surface Water Quality
https://www.waterboards.ca.gov/water_issues/programs/tmdl/2014_16state_ir_reports/02982.shtml#52461

Attachment A

Table 1 - Valley Vista Sewer Capacity Analysis

Project Name: THCSD Sewer Collection

Legend

Gold Update to Match Project Geometry

Cyan Input

Purple Output

Orange Look up

Preapred By: TCL

Checked By:

Date: 3/19/2020

Black Water Consulting Eng.

Inputs

=IF($J$12="max",VLOOKUP(K16,Sheet1!$D$13:$E$21,2),IF($J$12="min",VLOOKUP(K16,Sheet1!$D$13:$F$21,2),""))

Peaking Factor:	3		P_F	rec max	0.08345		
Pipe Size:	8	in	Ø	min permited	0.00334		
Mannings n:	0.013		n	min designed	0.00334		
Average Flow:	437	gpd/ESFR	E_F				
Infiltration Rate:	500.00	gpd/(in*mile)	I_F	Drop Across MH:	0.2	ft	
Gravity:	32.17	ft/s²	g	Max Recommended Slope	min	r = Ø/2	

Warning Above: 0.7

Pressure Pipe: 1

θ = ∡ CL and Inv to WS

Itterate for Values

R_h = A/P

								Isolated Sewer Segment Flow						Cumulative Basin Flow					Goal Seek Values									Flow Regime Check	
				Inv_1	Inv_2	L	S = (Inv_1 - Inv_2)/L		E	$\alpha = E\ E_F$	P	$I = I_F$ L/5280	$Q_A = \alpha\ P + I$	$Q_B = Q_A$ Convert	$E_S = E$ + (upstream ESFR)	$\alpha_S = E_S\ E_F$	$I_S = I$ + (upstream basin I)	$Q_C = \alpha_S\ P + I_S$	$Q_D = Q_C$ Convert	d/Ø	d	θ = π - cos⁻¹(d/Ø - 1)	A = (2Ø - sin[2Ø])Ø² 0.125	W = θ Ø	V = Q/A	Δ = (Q - Q_D)100	Q = 1.49 S^0.5 $R_h^{0.667}$ A /n	T = sin(q) Ø	= [V /√(g A/T)]²
Upstream Rim Elev.	Downstream Rim Elev.	Upstream MH	Downstream MH	(ft) Upstream Invert	(ft) Downstream Invert	(ft) Pipe Length	(#/#) Slope	(in) Pipe Size	No. of ESFR	(gpd) Avg Daily Flow	Peaking Factor	(gpd) Infiltration	(gpd) Design Flow	(ft³/s) Design Flow	∑ No. of ESFR	(gpd) ∑ Avg Daily Flow	(gpd) ∑ Infiltration	(gpd) ∑ Design Flow	(ft³/s) ∑ Design Flow	% Percent Full	(ft) Depth	(radians) Theta	(ft²) Area	(ft) Wet Perimeter	(ft/s) Velocity	Δ Used for Goal Seek	(ft³/s) Goal Seek Flow	(ft) Top Width	(#/#) Froude Squared
3715.8	3701.0	FL-01	FL-02	3710.57	3696.00	275.00	0.05296	8.00	5	2,185	3.0	208	6,763	0.010	5	2,185	208	6,763	0.0105	4.46%	0.030	0.43	0.0055	0.284	1.900	8.2E-06	0.0105	0.28	5.61
3701.0	3682.5	FL-02	FL-03	3695.80	3677.50	93.47	0.19578	8.00	1	437	3.0	71	1,382	0.002	6	2,622	279	8,145	0.0126	3.59%	0.024	0.38	0.0040	0.254	3.167	7.1E-06	0.0126	0.248	19.41
3682.5	3640.0	FL-03	FL-04	3677.30	3634.99	205.86	0.20551	8.00	4	1,748	3.0	156	5,400	0.008	10	4,370	435	13,545	0.0210	4.50%	0.030	0.43	0.0056	0.285	3.761	1.4E-05	0.0210	0.276	21.81
3640.0	3617.6	FL-04	RH-09	3634.79	3612.65	399.32	0.05546	8.00	6	2,622	3.0	303	8,169	0.013	16	6,992	738	21,714	0.0336	7.63%	0.051	0.56	0.0122	0.373	2.753	3.3E-05	0.0336	0.354	6.83
3617.6	3607.8	RH-09	RH-08	3612.45	3602.83	400.00	0.02404	8.00	6	2,622	3.0	303	8,169	0.013	22	9,614	1,041	29,883	0.0462	10.83%	0.072	0.67	0.0204	0.447	2.264	1.1E-04	0.0462	0.414	3.23
3607.8	3607.0	RH-08	RH-07	3602.63	3601.70	255.36	0.00365	8.00	1	437	3.0	193	1,504	0.002	23	10,051	1,234	31,387	0.0486	19.29%	0.129	0.91	0.0472	0.606	1.259	1.1E+00	0.0594	0.526	0.55
3607.0	3595.0	RH-07	RH-06	3601.50	3590.00	272.27	0.04224	8.00	1	437	3.0	206	1,517	0.002	24	10,488	1,440	32,904	0.0509	9.85%	0.066	0.64	0.0178	0.426	2.827	-6.7E-02	0.0502	0.397	5.55
3680.0	3691.4	BB-01	BB-02	3676.30	3675.91	117.85	0.00334	8.00	6	2,622	3.0	89	7,955	0.012	6	2,622	89	7,955	0.0123	7.10%	0.047	0.54	0.0110	0.360	0.645	-5.2E-01	0.0071	0.342	0.40
3691.4	3675.0	BB-02	BB-03	3675.71	3670.00	314.34	0.01816	8.00	4	1,748	3.0	238	5,482	0.008	10	4,370	327	13,437	0.0208	9%	0.060	0.61	0.0154	0.405	1.744	6.1E-01	0.0269	0.381	2.33
3675.0	3623.1	BB-03	BB-04	3669.80	3618.12	397.80	0.12991	8.00	3	1,311	3.0	301	4,234	0.007	13	5,681	629	17,672	0.0273	5.67%	0.038	0.48	0.0079	0.321	3.478	7.9E-04	0.0274	0.308	14.74
3623.1	3595.0	BB-04	RH-06	3617.92	3590.00	162.65	0.17166	8.00	1	437	3.0	123	1,434	0.002	14	6,118	752	19,106	0.0296	5.51%	0.037	0.47	0.0075	0.316	3.924	8.8E-06	0.0296	0.304	19.32
3595.0	3579.5	RH-06	RH-05	3589.80	3574.50	267.39	0.05722	8.00	3	1,311	3.0	203	4,136	0.006	41	17,917	2,395	56,146	0.0869	11.90%	0.079	0.70	0.0234	0.470	3.706	9.4E-05	0.0869	0.432	7.86
3579.5	3569.6	RH-05	RH-04	3574.30	3564.61	290.00	0.03341	8.00	3	1,311	3.0	220	4,153	0.006	44	19,228	2,615	60,299	0.0933	14.02%	0.093	0.77	0.0298	0.512	3.136	3.6E-06	0.0933	0.463	4.76
3569.6	3560.6	RH-04	RH-03	3564.41	3555.62	290.00	0.03033	8.00	3	1,311	3.0	220	4,153	0.006	47	20,539	2,834	64,451	0.0997	14.82%	0.099	0.79	0.0323	0.527	3.092	1.7E-06	0.0997	0.474	4.36
3560.6	3559.3	RH-03	RH-02	3555.42	3554.27	154.00	0.00745	8.00	2	874	3.0	117	2,739	0.004	49	21,413	2,951	67,190	0.1040	21.32%	0.142	0.96	0.0545	0.640	1.909	2.0E-05	0.1040	0.546	1.14
3667.6	3651.5	KA-03	KA-02	3662.43	3646.46	223.75	0.07137	8.00	4	1,748	3.0	170	5,414	0.008	4	1,748	170	5,414	0.0084	3.75%	0.025	0.39	0.0043	0.260	1.969	2.8E-05	0.0084	0.253	7.17
3651.5	3649.3	KA-02	KA-01	3646.26	3644.27	223.75	0.00889	8.00	4	1,748	3.0	170	5,414	0.008	8	3,496	339	10,827	0.0168	8.47%	0.056	0.59	0.0142	0.394	1.178	2.3E-05	0.0168	0.371	1.13
3649.3	3645.0	KA-01	RH-10	3644.07	3640.00	157.19	0.02589	8.00	2	874	3.0	119	2,741	0.004	10	4,370	458	13,568	0.0210	7.32%	0.049	0.55	0.0115	0.365	1.830	7.9E-05	0.0210	0.347	3.15
3645.0	3622.2	RH-10	RH-11	3639.80	3617.16	335.63	0.06744	8.00	1	437	3.0	254	1,565	0.002	11	4,807	712	15,133	0.0234	6.15%	0.041	0.50	0.0089	0.334	2.641	5.9E-05	0.0234	0.320	7.83
3622.2	3617.9	RH-11	RH-12	3616.96	3613.93	155.83	0.01948	8.00	1	437	3.0	118	1,429	0.002	12	5,244	830	16,562	0.0256	8.04%	0.054	0.57	0.0132	0.383	1.686	-3.4E-01	0.0222	0.363	2.43
3617.9	3625.0	RH-12	LJ-05	3613.73	3611.97	273.18	0.00644	8.00	2	874	3.0	207	2,829	0.004	14	6,118	1,037	19,391	0.0300	14.77%	0.098	0.79	0.0321	0.526	1.422	1.6E+00	0.0457	0.473	0.93
3752.0	3739.6	T-13	T-12	3746.78	3734.63	150.00	0.08102	8.00	2	874	3.0	114	2,736	0.004	2	874	114	2,736	0.0042	2.65%	0.018	0.33	0.0025	0.218	1.670	2.4E-05	0.0042	0.214	7.32
3739.6	3706.6	T-12	T-11	3734.43	3701.60	396.23	0.08286	8.00	1	437	3.0	300	1,611	0.002	3	1,311	414	4,347	0.0067	3.27%	0.022	0.36	0.0035	0.242	1.939	4.2E-05	0.0067	0.237	7.99
3706.6	3690.2	T-11	T-10	3701.40	3685.17	200.00	0.08111	8.00	1	437	3.0	152	1,463	0.002	4	1,748	565	5,809	0.0090	3.76%	0.025	0.39	0.0043	0.260	2.103	5.1E-05	0.0090	0.254	8.16
3690.2	3659.3	T-10	T-09	3684.97	3654.27	400.00	0.07676	8.00		0	3.0	303	303	0.000	4	1,748	868	6,112	0.0095	3.90%	0.026	0.40	0.0045	0.265	2.096	4.3E-05	0.0095	0.258	7.81
3659.3	3652.0	T-09	T-08	3654.07	3647.00	267.92	0.02639	8.00	1	437	3.0	203	1,514	0.002	5	2,185	1,071	7,626	0.0118	5.56%	0.037	0.48	0.0076	0.317	1.547	4.9E-05	0.0118	0.305	2.98
3655.2	3652.0	T-07	T-08	3650.02	3647.00	130.01	0.02323	8.00	2	874	3.0	98	2,720	0.004	2	874	98	2,720	0.0042	3.53%	0.024	0.38	0.0039	0.252	1.081	1.1E-05	0.0042	0.246	2.29
3652.0	3625.0	T-08	LJ-05	3646.80	3611.97	284.51	0.12242	8.00	1	437	3.0	216	1,527	0.002	8	3,496	1,385	11,873	0.0184	4.77%	0.032	0.44	0.0061	0.294	3.018	5.4E-05	0.0184	0.284	13.22
3625.0	3608.2	LJ-05	LJ-04	3611.77	3603.19	261.40	0.03282	8.00	3	1,311	3.0	198	4,131	0.006	25	10,925	2,621	35,396	0.0548	10.90%	0.073	0.67	0.0206	0.449	2.656	2.1E-05	0.0548	0.416	4.42
3608.2	3596.8	LJ-04	LJ-03	3602.99	3591.84	238.71	0.04673	8.00	3	1,311	3.0	181	4,114	0.006	28	12,236	2,802	39,510	0.0611	10.56%	0.070	0.66	0.0197	0.441	3.107	1.2E-04	0.0611	0.410	6.25
3596.8	3584.0	LJ-03	LJ-02	3591.64	3579.00	400.00	0.03159	8.00	5	2,185	3.0	303	6,858	0.011	33	14,421	3,105	46,368	0.0717	12.52%	0.083	0.72	0.0252	0.482	2.843	1.3E-05	0.0717	0.441	4.39
3584.0	3567.0	LJ-02	LJ-01	3578.80	3561.99	400.00	0.04203	8.00	4	1,748	3.0	303	5,547	0.009	37	16,169	3,408	51,915	0.0803	12.34%	0.082	0.72	0.0247	0.479	3.250	6.5E-05	0.0803	0.439	5.82
3567.0	3559.3	LJ-01	RH-02	3561.79	3554.27	319.10	0.02357	8.00	1	437	3.0	242	1,553	0.002	38	16,606	3,649	53,467	0.0827	14.39%	0.096	0.78	0.0309	0.519	2.677	8.8E-04	0.0827	0.468	3.37
3654.0	3646.4	T-06	T-05	3648.80	3641.38	280.14	0.02650	8.00	3	1,311	3.0	212	4,145	0.006	3	1,311	212	4,145	0.0064	4.17%	0.028	0.41	0.0050	0.274	1.287	3.1E-04	0.0064	0.267	2.75
3646.4	3628.7	T-05	T-04	3641.18	3623.68	234.68	0.07456	8.00	2	874	3.0	178	2,800	0.004	5	2,185	390	6,945	0.0107	4.17%	0.028	0.41	0.0050	0.274	2.157	5.2E-04	0.0108	0.267	7.74
3628.7	3613.5	T-04	T-03	3623.48	3608.54	306.07	0.04880	8.00	5	2,185	3.0	232	6,787	0.011	10	4,370	622	13,732	0.0212	6.34%	0.042	0.51	0.0093	0.339	2.291	2.1E-04	0.0212	0.325	5.71
3613.5	3596.3	T-03	T-02	3608.34	3591.27	303.00	0.05636	8.00	4	1,748	3.0	230	5,474	0.008	14	6,118	851	19,205	0.0297	7.18%	0.048	0.54	0.0111	0.362	2.667	4.1E-05	0.0297	0.344	6.83
3596.3	3580.0	T-02	T-01	3591.07	3574.97	303.00	0.05311	8.00	4	1,748	3.0	230	5,474	0.008	18	7,866	1,081	24,679	0.0382	8.19%	0.055	0.58	0.0135	0.387	2.819	2.2E-04	0.0382	0.366	6.67
3580.0	3562.5	T-01	RH-01	3574.77	3553.91	171.95	0.12133	8.00	4	1,748	3.0	130	5,374	0.008	22	9,614	1,211	30,053	0.0465	7.40%	0.049	0.55	0.0117	0.367	3.990	1.5E-04	0.0465	0.349	14.82
3625.0	3604.0	E-03	E-02	3619.80	3599.00	344.05	0.06046	8.00	5	2,185	3.0	261	6,816	0.011	5	2,185	261	6,816	0.0105	4.34%	0.029	0.42	0.0053	0.280	1.994	1.6E-05	0.0105	0.272	6.35
3604.0	3584.0	E-02	E-01	3598.80	3579.00	400.00	0.04950	8.00	5	2,185	3.0	303	6,858	0.011	10	4,370	564	13,674	0.0212	6.30%	0.042	0.51	0.0092	0.338	2.299	1.1E-05	0.0212	0.324	5.79
3584.0	3562.5	E-01	RH-01	3578.80	3553.91	409.65	0.06076	8.00	5	2,185	3.0	310	6,865	0.011	15	6,555	874	20,539	0.0318	7.28%	0.049	0.55	0.0114	0.364	2.794	4.9E-05	0.0318	0.346	7.39
3559.3	3562.5	RH-02	RH-01	3554.07	3553.91	46.00	0.00343	8.00	0	0	3.0	35	35	0.000	87	38,019	6,635	120,692	0.1867	35.05%	0.234	1.27	0.1091	0.845	1.712	1.1E-04	0.1867	0.636	0.53
3562.5	3557.6	RH-01	LS	3553.71	3552.60	41.00	0.02707	8.00	0	0	3.0	31	31	0.000	124	54,188	8,752	171,316	0.2651	24.66%	0.164	1.04	0.0669	0.693	3.960	1.6E-06	0.2651	0.575	4.18
			Maximum Req'd Elevation:	**3746.78**				**Σ Total:**	**124**																				

Total Gravity Collection Length:	11552.07 ft
Total Trench Length:	13294.47 ft
ForceMain Length from Lift Station by Gravity:	2396.77 ft
ForceMain Length not adjacent to Gravity:	1742.4 ft
Total Est. ForceMain Length:	4139.17 ft
Easement Line:	1153.70 ft
SDR 35 Pipe:	10398.37 ft

Attachment B

SHERWOOD FOREST
Twain Harte, CA
Wastewater Pumping Station
Calculation Work Sheet

Date: 3/19/2020
Calculated By: TCL
Job: 17196_05 Sherwood

Legend

Cyan =	Input
Purple =	Ouptut
Orange =	Dropmenu
Red =	Look up Value
CHECK	Check Cell

Abreviations

NO =	Normal Operation
OF =	Overflow
NA =	Not Applicable
∞ =	Infinate

			Variable
Peak Flow to Pump Station:	118.95	gpm	PF
Number of Pumps:	2	Active	N_{act}
	1	Stand-By	N_{std}
Total Pumps	3		N_{all}

Step 1: Compute Wet Well Active Volume

Max Starts per Hour:	6	cyc/hr	C_{hr}
Wet Well Shape:	Cylinder		
~~Wet well length:~~	~~5~~	~~ft~~	~~L_{wet}~~
~~Wet well width:~~	~~3~~	~~ft~~	~~W_{wet}~~
Wet Well Diameter:	72	in	Ø
Wet Well Area:	28.27	ft^2	A_{wet}

Pump Capacity:	59.47535	gpm	Q_{pump}	
Inlet Flow:	59.48	gpm	$Q_{in} = Q_{out}/2$	*Max number of starts occurs when $Q_{in} = Q_{out}/2$*
Outlet Flow (Pump):	118.95	gpm	$Q_{out} = N_{act}\ Q_{pump}$	
Cycle total time:	10	min	$T_{tot} = 60\ min/C_{hr}$	
Cycle fill time:	5	min	$T_{fill} = V_{0\ act}/Q_{in}$	
Cycle empty time:	5	min	$T_{empty} = V_{0\ act}/(Q_{out} - Q_{in})$	
Active Volume of Wet Well:	297.3767	gal	$V_{0\ act} = Q_{in}\ T_{tot}/2$	
Active Volume of Wet Well:	40	ft^3	$V_{act} = V_{0\ act}$ Conversion	
Active Depth of Wet Well:	1.41	ft	$d_{act} = V_{act}/A_{wet}$	OK

Step 2: Design Tank Controls (Approximate)

Wet Well Inlet:			E_{inlet}
	Calc'd	Use	
Alarm:	-	3549.00	E_{alarm}
Lag Pump On:	-	3549.00	E_{lag}
Lead Pump On:	-	3548.00	E_{lead}
Pump(s) off:	-	3546.50	E_{off}
Bottom of Wet Well:	-	3546.00	E_{min}

Recommend 1ft below overflow
Recommend 1ft below alarm

V_{act} =	*1.5*	317.3
		19.88

Step 3: Variable Operations Check

	Normal Operation				Hypothetical Control				
PF x	0.20	0.50	0.75	1.00	1.25	1.38	1.5	1.68	1.75
time from E_{lag} to E_{alarm}	NA	NA	NA	NA	NA	NA	∞	0.00	0.00
time from E_{lead} to E_{lag}	NO	NO	NO	∞	7.11	4.74	3.56	2.63	2.37
(Stand-By) T_{empty}	NA	NA	NA	NA	10.67	21.34	∞	OF	OF
(NO) T_{empty}	3.33	5.33	10.67	∞	NA	NA	NA	NA	NA
T_{fill}	13.34	5.33	3.56	2.67	2.13	1.94	∞	OF	OF
T_{cycle}	16.67	10.67	14.22	∞	12.80	23.28	∞	∞	∞
C_{hr}	3.60	5.62	4.22	< 1	4.69	2.58	< 1	< 1	< 1

Date: 3/19/2020
Calculated By: TCL
Job: 17196_05 Sherwood

Step 4: Friction Head Approximation

Discharge Elevation:	3766.26		E_{final}	*Assumes Tank has a velocity of 0.00*
Static Lift:	219.76	ft	$\Delta_z = E_{final} - E_{off}$	*Assumes Discharge to Atmosphere*
FM Diameter:	4	in	$Ø_{FM}$	
FM Length:	4139.17	ft	L_{FM}	
FM Vel.:	3.04	ft/s	$V_{FM} = Q_{out}$ (Convert)/($Ø_{FM}^2 \pi$ 0.25)	

	K Value	Quantity
Gate Valve	0.1	1
Check Valve	0.65	1
Tee Branch Flow	0.78	1
90° Bend	0.39	3

Σ K Values:	2.70		K	*Value not specific but general*
Minor Losses:	0.39	ft	$h_{minor} = K V^2/2g$	

Using Hazen-Williams

C-Value:	120		C
Major Losses:	50.03	ft	h_{hz} = Hazen-Williams Equation
Est. TDH	**270.31**	ft	$TDH_{hz} = \Delta_z + h_{minor} + h_{hz} + V_{FM}^2/(2g)$

Using Swamee-Jain Equation w/ Darcy Wiesbach

Gravity:	32.17	ft/s²	g	*input swamee*
Kinematic Viscosity:	1.06E-05		ν	*input swamee*
Reynols Number:	9.55E+04		$Re = V Ø_{FM}/\nu$	
Material Roughness:	9.84E-04	ft	*e*	*input swamee*
friction factor:	0.028		f = Swamee-Jain Equation	
Major Losses:	49.24	ft	$h_{sw} = f L V_{FM}^2/(2 g Ø_{FM})$	
Est. TDH:	**269.53**	ft	$TDH_{sw} = \Delta_z + h_{minor} + h_{sw} + V_{FM}^2/(2g)$	

Swamee-Jain

TDH	116.79	psi
α:	706.58	for ft³/s

BLACKWATER
CONSULTING ENGINEERS, INC.
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Appendix C

Sewer System Hydraulic Model

Technical Memorandum

BLACKWATER CONSULTING ENGINEERS, INC.

To: Tom Trott, P.E. General Manager
Twain Harte Community Services District



From: Jeff Black, P.E.
Tyler Lee, E.I.T.
Christiana Giedd, E.I.T.

Subject: Twain Harte Community Services District
Sewer System Hydraulic Model
Date: April 19, 2021

INTRODUCTION

As part of the Scope of Work for the Inflow/Infiltration Identification and Reduction Project (CWSRF Project No. C-06-8408-110), Black Water Consulting Engineers, Inc. (Black Water) was tasked to develop a hydraulic model of the Twain Harte Community Services District (THCSD/District) sewer collection system. The purpose of this Technical Memorandum (TM) is to present the findings of the sewer collection system hydraulic capacity analysis and identify system deficiencies and recommend capital improvement projects.

Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board (State Board/SWRCB). California's Clean Water State Revolving Fund is capitalized through a variety of funding sources, including grants from the United States Environmental Protection Agency and state bond proceeds. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendations for use.

REFERENCES

Engineering reports and documents reviewed and referenced in this TM include the following:

[1] Twain Harte Community Services District Sewer Standard Specifications and Details, November 2006. (THCSD standards)
[2] Planning Project No. C-06-8408-110 Attachment 1 Plan of Study, October 2018.
[3] DRAFT Twain Harte Community Services District, (Planning Project No. C-06-8408-110) Sherwood Forest Evaluation, September 2020.
[4] Ten State Standards, 1978.

EXISTING SYSTEM

The THCSD owns, operates, and maintains the sewer collection system serving the community of Twain Harte. This encompasses an estimated population of 2,500 which includes a total of 1,607 housing equivalents and 1,436 physical connections (1,347 residential, 84 commercial, and 5 public facilities).

Wastewater generated by the THCSD service area is collected and conveyed through the sewer mains to the Twain Harte Wastewater Treatment Plant (WWTP) which is owned and operated by the Tuolumne Utilities District (TUD). The sewage receives primary treatment before being conveyed via TUD's sewer interceptor lines to the Sonora Regional Wastewater Treatment Plant (SRWTP).

This TM is part of a larger project under the State Board Clean Water State Revolving Fund (CWSRF) Planning Project No. C-06-8408-110 (Project). Task 05 of the Project includes inflow/infiltration identification and reduction and development of a sewer hydraulic model. The hydraulic model must assess system capacity, identify deficiencies, and evaluate scenarios for capital projects needed to upgrade and improve the collection system.

MODEL SETUP

Asset Inventory

The hydraulic model was created using Innovyze InfoSewer software. Collection system data used to develop the model includes manhole locations, pipe diameters, invert elevations, and rim elevations. Two primary sources provided the information necessary to create a model of the THCSD sewer collection system. System data was obtained from a 2007 topographic survey. Where survey data was unavailable, the District developed and has since maintained an online database (Nobel). The Nobel database was used to confirm additional construction and expansion since the topographic survey.

Pipes with design flows exceeding 35,000 gpd were included in the model. In some instances, it was necessary to estimate invert and rim elevations where structures were inaccessible or could not be located. Invert elevations can be approximated by linear interpolation of adjacent inverts if the adjacent inverts have upstream and downstream connections with invert data. The hydraulic model was created for only part of the collection system based on the estimated flow, the number of connections, and the quality of available data to limit the number of approximated inverts. The model includes six manholes with missing inverts that were approximated using linear interpolation of adjacent invert elevations. Sewer pipelines included in the hydraulic model are shown in **Attachment A**.

Collection pipes outside of the model were evaluated for slope, velocity, and cover with available data from the topographic survey. Pipes were analyzed using spreadsheets and areas of concern are included in the Model Results sections below.

Design Flow

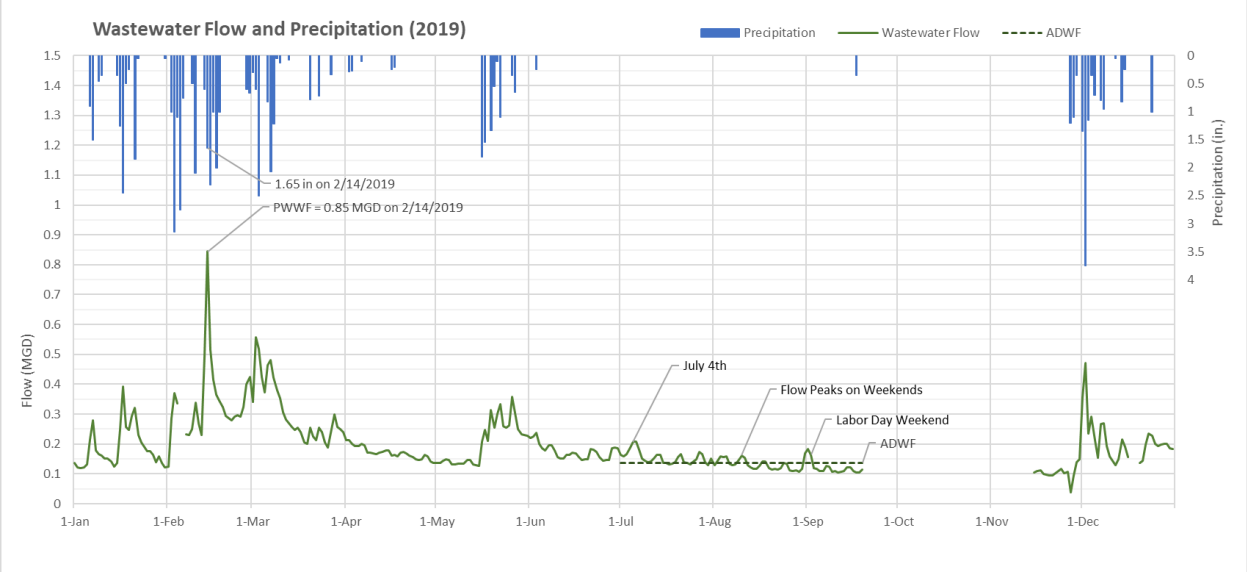
In the absence of a master plan, the collection system can be evaluated using District standards or with recent flow monitoring data. The design flow in the system was estimated based on the number of parcels assigned to each pipe segment. Each parcel is equal to one housing equivalent (HE). The design flow was determined using peak flow rates plus inflow and infiltration (I/I) [THCSD Standard 2.4]. THCSD Standards state that design flows and I/I can be calculated using the following assumptions [1]:

- Average Flow = 437 gpd/HE
- Peaking Factor = 3.0
- Inflow and Infiltration = 500 gpd/ (in-mile)

Using the THCSD Standards as design criteria, the design flow was calculated as 1.78 MGD with an average flow of 0.57 MGD. Comparing 1.78 MGD with recent flow monitoring at the TUD Twain Harte treatment plant shows a discrepancy between design flow and recorded values. As a result, the model was calibrated by adjusting wastewater generation rates to result in ADWFs consistent with the flow monitoring data. Measured flow data was available from 2018-2020 (2019 shown in **Figure 1**). 2019 was the year with the highest rainfall and data from this year is used to determine the average dry weather flow (ADWF), peak hour dry weather flow (PHDWF), and peak hourly wet weather flow (PHWWF).

Peak wet weather flow is normally determined based on the recorded wastewater flow following a storm of a 1 in 5 years return interval. Since this analysis is limited to three years of flow monitoring data the PHWWF is assumed as the maximum flow observed.

Figure 1: TUD/Twain Harte Treatment Plant Sewer Flow Data



1. Flow data was not available for September 20 – November 12, 2019.

The ADWF was calculated to be 0.14 MGD. ADWF was calculated from the average daily flow between July 2019 to September 2019. The PHDWF was calculated using EQ 1 from the Ten-States Standards [4] (PHF), where p is the District population in thousands.

$$PF = \frac{Q_{peak}}{Q_{ave}} = \frac{18+\sqrt{p}}{4+\sqrt{p}} = 3.5$$ EQ-1

Using the peaking factor (PF) from EQ-1, the PHDWF was calculated as 0.48 MGD. The PHWWF was determined to be 0.85 MGD, which was observed on February 14, 2019. The PHWWF is significantly lower than the design flow calculated using THCSD Standards and is more representative of the actual flow data.

The District currently has a design standard of 437 gal/day·HE with an hourly peaking factor of 3.0 (see the THCSD Standards). Since the design flow does not reflect the recorded values shown in **Figure 1**, it is recommended that the THCSD Standards use 160 gal/day·HE and two peaking factors: a peaking factor using EQ-1 for new construction and a peaking factor of 6 for all replacements or repairs to existing infrastructure.

Flow recorded during a series of dry days in a wet season can be used to estimate collection system infiltration. For THCSD, there are five periods with six to seven dry days in the winter or fall that can be used to estimate infiltration (flows are shown in **Table 1**). Two of these periods have significantly higher flows, likely a result of seasonal snowmelt. Using the remaining data, the infiltration can then be approximated by subtracting the average flow for the days less the ADWF, infiltration = 0.04 MGD. This would place infiltration lower than anticipated values from the THCSD Design Standards.

Table 1: Average flows used to determine Infiltration. Red values were ignored.

Date	Flow (MGD)
1/23/2019 to 1/30/2019	0.17
2/19/2019 to 2/26/2019	0.30
3/14/2019 to 3/19/2019	0.23
4/7/2019 to 4/15/2019	0.17
12/16/2019 to 12/23/2019	0.17
Average:	**0.17**

The collection system inflow can be approximated by subtracting the PHWWF from the PHDWF and the Infiltration.

0.85 MGD – (0.48 MGD + 0.04 MGD) = 0.33 MGD EQ-2

From this analysis, it appears that the collection system is impacted by direct and indirect inflow much more than infiltration.

The previously discussed ADWF and PHWWF values were used to calculate the model wastewater generation rate.

$$\frac{ADWF}{Parcel} = Model\ Generation\ Rate$$ EQ-3

Using the updated wastewater generation rate of 106 gal/day·parcel, adjusted flows were assigned to manholes based on the number of adjacent parcels. The flow from manholes not included in the hydraulic model were added to the closest downstream manhole included in the model.

Flows conveyed by sewer lift stations were incorporated into the model. The flow for each sewer lift station was added to the closest downstream manhole in the model. Part of the Inflow and Infiltration Project as identified in the Plan of Study [2] includes an evaluation of proposed flows from the Sherwood Forest Development. Flows were estimated and developed in the DRAFT Sherwood Forest Evaluation [3]. The proposed flows from the Sherwood Forest development will be included as an alternative in the hydraulic model. The existing and proposed sewer lift stations and the corresponding force mains (FM) are described in **Table 2**, with pump flow measured in gallons per minute (gpm) and force main velocity measured in feet per second (fps).

Table 2: Sewer Lift Stations

Lift Station	Installation Year	Pump Flow (gpm)	FM Diameter (in)	FM Velocity (fps)	Hydraulic Model Manhole Connection Point
Redwing	2000	90	8	1.02	SP30
Mark Twain	2010	105	8	1.19	MH38
Shady Brook	2011	160	8	1.82	MH33
Sherwood Forest (Proposed)	Future	119	8	1.35	SP184

HYDRAULIC MODEL EVALUATION CRITERIA

Evaluation Criteria

The THCSD Standards [1] have the following design criteria which are used to evaluate the sewer collection system:

- Maximum depth of flow divided by pipe diameter (d/D ratio) of 0.7 [1] (2.4)
- Minimum sewer main cover of 3 feet [1] (2.5.3)
- Minimum daily scouring velocity of 2 feet per second
- Minimum slope as follows [1] (2.5.4)
    - 6-inch Diameter: 0.0049
    - 8-inch Diameter: 0.0033
    - 10-inch Diameter: 0.0024

Pipes and manholes that exceed the evaluation criteria are identified in this TM and capital improvement projects are presented to address the deficiencies.

MODEL RESULTS

InfoSewer is a GIS-based sewer modeling software that uses upstream and downstream invert elevation, pipe diameter, roughness coefficient, and wastewater flow to calculate the d/D ratio and pipe velocity. The software uses rim elevation, invert elevation, manhole diameter, and wastewater flow data to calculate manhole surcharge depth.

The hydraulic model was run assuming uniform flow and steady-state flow to identify portions of the collection system that are deficient in either capacity or compliance with THCSD Standards. Four scenarios were analyzed:

1. ADWF
2. PHDWF
3. PHWWF
4. PHWWF with proposed Sherwood Forest Flow

Attachment B includes results for each of these scenarios with tabular data for each of the scenarios.

Pipe Depth to Diameter Ratio (d/D) and Manhole Surcharge Depth

The primary evaluation criterion for hydraulic capacity in gravity sewers is the d/D ratio. With THCSD Standards, any gravity segment with a d/D ratio greater than 0.70 (70% full by depth) for each model scenario is considered hydraulically deficient. **Table 3** shows all pipes that exceed the d/D criterion.

If the wastewater surface level in a manhole is above the crown of the connected pipes, it is considered to be surcharged. If the level continues to rise and exits through the rim of the manhole, then the system is considered to have a sanitary sewer overflow (SSO). **Table 4** presents manholes identified with surcharge conditions for each scenario. No SSO conditions were identified for the modeling scenarios.

Table 3: Pipelines exceeding d/D Ratio Criteria

Pipe	Depth over Diameter			
	ADWF	PHDWF	PHWWF	PHWWF + Sherwood
P43	1	1	1	1
P215	1	1	1	1
P238	1	1	1	1
P240	1	1	1	1
P241	1	1	1	1
P13	0.49	0.57	0.74	0.74

Table 4: Surcharge height above the crown of outlet in MH

MH	Height above the crown of the pipe			
	ADWF	PHDWF	PHWWF	PHWWF + Sherwood
SP26	4 3/8"	4 1/2"	4 1/2"	4 1/2"
SP186	1/2"	1/2"	1/2"	1/2"
SP61	2 1/2"	3"	4 1/8"	4"
SP63	3/4"	3/4"	1"	1"
SP64	1/8"	1/4"	1/2"	4 1/2"
DMH10	7 7/8"	10 3/4"	1'- 2"	1'- 6 3/4"
MH13A	NA	NA	2 3/8"	7 1/8"

The results shown in **Table 4** are higher than observed depths from the MH Inspections conducted as part of the Condition Assessment. Each of these MH's excluding MH13A (not part of the Inspections) were observed to have high d/Ds with stagnant flows. The stagnant flow combined with high d/D's confirms the adverse or shallow slopes at these locations. Further flow monitoring is recommended to confirm exact flows at these locations.

Pipe Velocity

Each sewer line should reach 2 fps daily to flush the line and avoid deposition of solids. Lines with velocities below 2 fps during PHDWF may not adequately convey solids through the collection system and buildup and blockages within the system may occur as a result. Pipelines with velocities less than 2 fps were identified in **Appendix C**. **Table 4** lists the pipelines in the model not meeting the minimum velocity criterion. All of the pipe velocities in the four hydraulic model scenarios were below 10 fps. Pipelines with the lowest scouring velocities should be given the highest priority. As pointed out in **Table 5**, seven pipes do not achieve velocities greater than 1 ft/s.

Table 5: Pipelines not meeting minimum velocity criteria during PHDWF

Pipe	Velocity (fps)	d/D
P215	0.05	1.00
P241	0.21	1.00
P240	0.21	1.00
P238	0.22	1.00
P43	0.55	1.00
P171	0.83	0.23
P239	1.00	0.27
P177	1.19	0.17
P131	1.19	0.27
P168	1.26	0.04
P242	1.51	0.20
P329	1.53	0.07

Pipe	Velocity (fps)	d/D
P212	1.54	0.08
P214	1.60	0.07
P218	1.63	0.10
P237	1.69	0.19
P328	1.71	0.07
P133	1.77	0.09
P13	1.82	0.57
P132	1.92	0.11
P219	1.92	0.09
P321	1.93	0.12
P330	1.95	0.05
P14	1.97	0.45

Pipe Slope

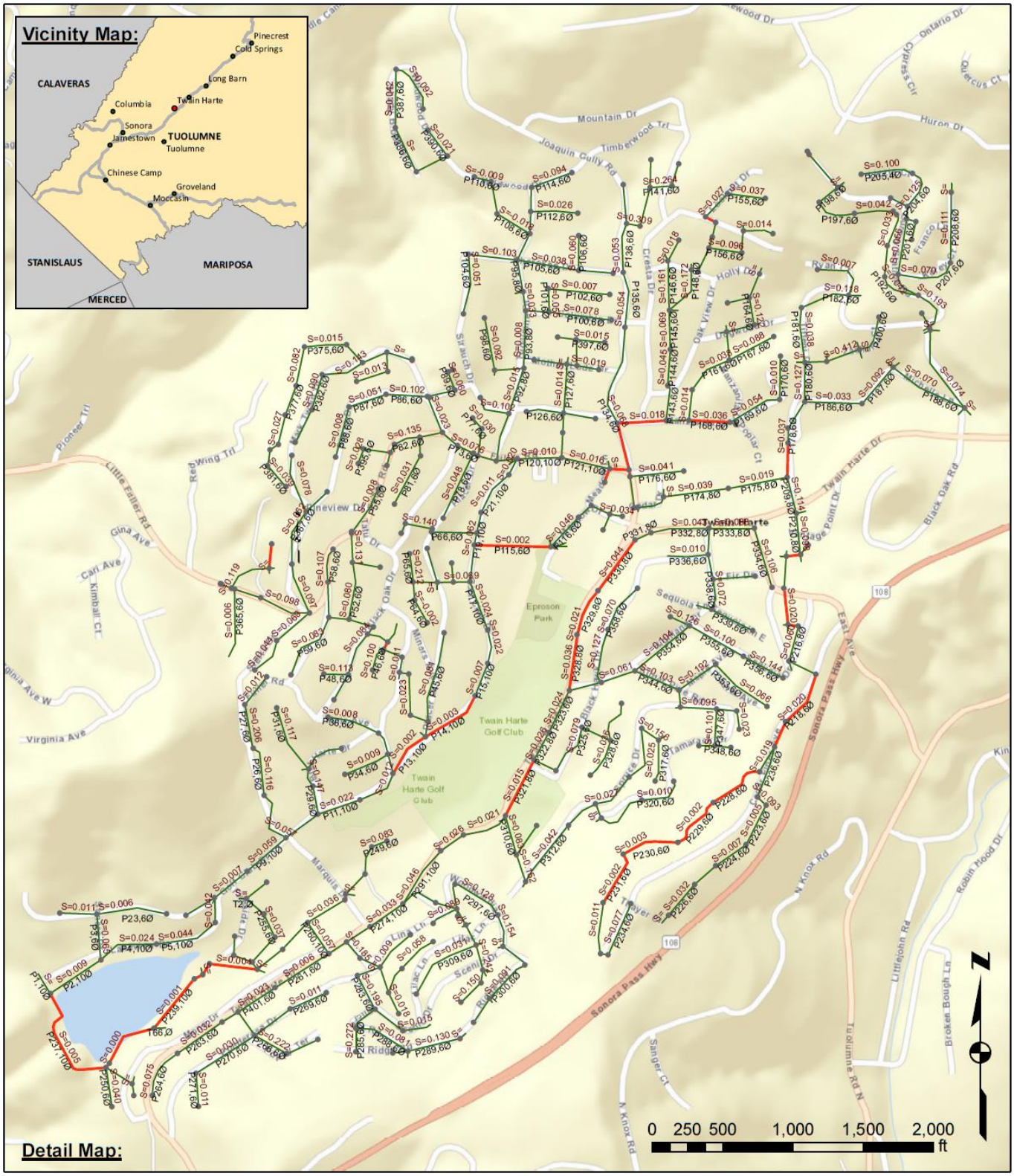
Pipe slope and cover for the THCSD sewer collection system were calculated using available pipe lengths, with rim and invert elevations from the NorthStar survey. These calculations were performed using a spreadsheet to include pipes outside of the primary flow paths. Pipes with slope or cover below THCSD standards should be considered for capital improvement projects.

Table 6 presents pipes that do not meet the minimum slope criterion. Some of the pipes in the system have negative or adverse slopes (slopes that are in the reverse direction of flow). Adverse slopes are a result of pipelines not constructed as designed or settlement. **Figure 2** shows the pipe slopes for all pipelines in the system where data was available.

Table 6: Pipes Not Meeting Minimum Slope Criterion

Pipe	Diameter (in.)	Slope	Length (lf)
P43	6	-0.0047	60
P240	10	-0.0009	68
P215	8	-0.0005	76
P238	10	-0.0005	440
P241	10	-0.0001	92
P364	6	0	174
P122	6	0.0011	104
P239	10	0.0012	452
P171	8	0.0013	47
P13	10	0.0018	355
P229	6	0.0019	397
P231	6	0.0020	399
P131	8	0.0022	140
P228	6	0.0024	424
P115	6	0.0024	542
P14	6	0.0026	475
P230	6	0.0030	411
P246	6	0.0035	43
P153	6	0.0043	82
Total			**4,904**

Figure 2: Slopes That Do Not Meet THCSD Criteria



Sewer Main Cover

Attachment D includes an exhibit of pipes with less than 3 feet of cover and tabular data with additional detail. Pipeline cover is calculated for each pipe with known data using the manhole rim elevation, invert elevation, and pipe diameter. The calculation was run for the upstream and downstream elevations. Pipes with less than 3 feet of cover can sustain damage from the ground freezing or traffic loads. Manholes with less than 3 feet of depth are susceptible to overflow during peak flow conditions.

CAPITAL IMPROVEMENT PROJECT RECOMMENDATIONS

Capital Improvement recommendations are based on the results for capacity (measured by d/D), slope velocity, and cover. Capital Improvements were provided based on the following criteria.

Primary CIP's

- Pipes with scouring velocities less than 1 ft/s (THCSD standard is 2 ft/s)
- Pipes with d/D greater than 0.7 during PWWF
- Adverse and horizontal slopes

Secondary CIP's

- Less than 2 ft of cover (THCSD standard is 3 ft of cover)
- Pipes with slopes less than THCSD Standards but not horizontal or adverse

The Capital Improvement Project (CIP) lists are provided in **Tables 7 and 8**. These projects are being further evaluated along with recommendations from the condition assessment in the engineering report. Improvements were prioritized first by modifying the invert elevations of the pipes. If the pipeline was identified to still be hydraulically deficient, the pipeline diameter was upsized. It is recommended that 1,764 ft of pipe be replaced as part of the primary CIPs. Additionally, it is recommended that THCSD investigate the secondary CIPs for their cost-effectiveness and associated risk. The secondary CIPs total 9,458 lf.

Before implementation of the CIP projects, an additional topographic survey is recommended to verify assumed model data and may affect the modeling results and recommended system improvements. Invert elevations for the pipeline on Golf Club Drive between Fuller Road and Placer Drive should be verified. This pipeline segment includes three manholes with interpolated invert elevations, as well as four manholes with inverts approximated using manhole depth measurements. The hydraulic model indicates that Golf Club Drive may experience SSO during PWWF, so THCSD would benefit from confirming the results of this section before any improvements are made.

Table 7: Primary Capital Improvement Projects

Pipe	Reason for Project	Diameter (in)	Length (ft)	Description of Project
P13	d/D is greater than 0.7	10	355	Lower DMH4 to 3602.9 to increase slope.
P43	d/D is greater than 0.7, adverse slope.	6	60	Lower DMH2 to 3644.9.
P171	Velocity less than 1.0 ft/s	8	47	Lower MH25 and SP71
P215	d/D is greater than 0.7, adverse slope.	8	76	Lower SP185 to 3767.8
P238	d/D is greater than 0.7, adverse slope	10	440	Lower SP61 outlet from 3509.2 and inlet to MH49A to 3509.1
P239	Velocity = 1.0 ft/s	10	452	Lower the outlet from SP62 to 3511.7 and inlet to SP61 to 3510.5
P240	d/D is greater than 0.7, adverse slope	10	68	Lower the outlet from SP63 to 3512 and inlet to SP62 to 3511.8
P241	d/D is greater than 0.7, adverse slope	10	92	Lower the inlet to SP63 to 3512.2
P364	Horizontal slope	6	174	Lower SP58

Table 8: Secondary Capital Improvement Projects

Pipe	Reason for Project	Diameter (in)	Length (ft)	Description of Project
P7	Insufficient Cover	6	240	Lower LH32 to provide 3 ft of cover.
P14	Slope less than Standard	10	475	Lower DMH5 to increase slope and or increase pipe diameter to 12".
P69	Cover less than 2 ft	6	75	Lower Pipe and SP136.
P78	Cover less than 2 ft	6	511	Lower LH76.
P84	Cover less than 2 ft	6	191	Lower SP121.
P98	Cover less than 2 ft	6	379	Lower LH67.
P106	Cover less than 2 ft	6	244	Lower LH65.
P112	Cover less than 2 ft	6	334	Lower LH69.
P115	Slope less than Standard	6	542	Raise MH13A and DMH13
P122	Slope less than Standard	6	104	Upsize Pipe to 8". Lower SP71.
P131	Slope less than Standard	8	140	Lower SP71 and DMH16.
P142	Cover less than 2 ft	6	164	Lower LH52A to provide cover.
P145	Cover less than 2 ft	6	278	Lower SP91 to provide cover.
P146	Cover less than 2 ft	6	350	Lower SP91 to provide cover.
P148	Cover less than 2 ft	6	168	Lower SP91 to provide cover.
P153	Slope less than Standard	6	82	Lower SP95 to provide cover and MH30 to provide minimum slope.
P156	Cover less than 2 ft	6	231	Lower SP97
P157	Cover less than 2 ft	6	155	Lower SP97
P228	Slope less than Standard	6	424	Upsize Pipe to 8"
P229	Slope less than Standard	6	397	Upsize Pipe to 8"
P230	Slope less than Standard	6	411	Upsize Pipe to 8"
P231	Slope less than Standard	6	399	Upsize Pipe to 8"
P242	Cover less than 2 ft	10	341	Lower SP64
P246	Slope less than Standard	6	43	Lower MH20
P308	Cover less than 2 ft	6	196	Lower entire line
P317	Cover less than 2 ft	6	297	Lower entire line
P318	Cover less than 2 ft	6	108	Lower Connection to MH11
P334	Cover less than 2 ft	6	439	Lower LH16 to provide cover.
P349	Cover less than 2 ft	6	110	Lower LH8 to provide cover.
P358	Cover less than 2 ft	6	367	Lower entire line
P378	Cover less than 2 ft	6	215	Lower Line
P379	Cover less than 2 ft	6	69	Lower Line
P380	Cover less than 2 ft	6	116	Lower Line
P381	Cover less than 2 ft	6	192	Lower Line
P382	Cover less than 2 ft	6	260	Lower Line
P383	Cover less than 2 ft	6	258	Lower Line
P406	Cover less than 2 ft	6	153	Lower LH5

CONCLUSION

The system deficiencies identified in this memo have adverse effects on the performance of the collection system, likely increasing O&M costs and increasing the risk of SSOs. The pipes and manholes that do not meet THCSD Standards should be further be evaluated using the CCTV results and an additional topographic survey. If the deficiencies are confirmed, then future capital improvements should be planned to correct deficiencies.

ATTACHMENT A

PRIMARY FLOW PATHS

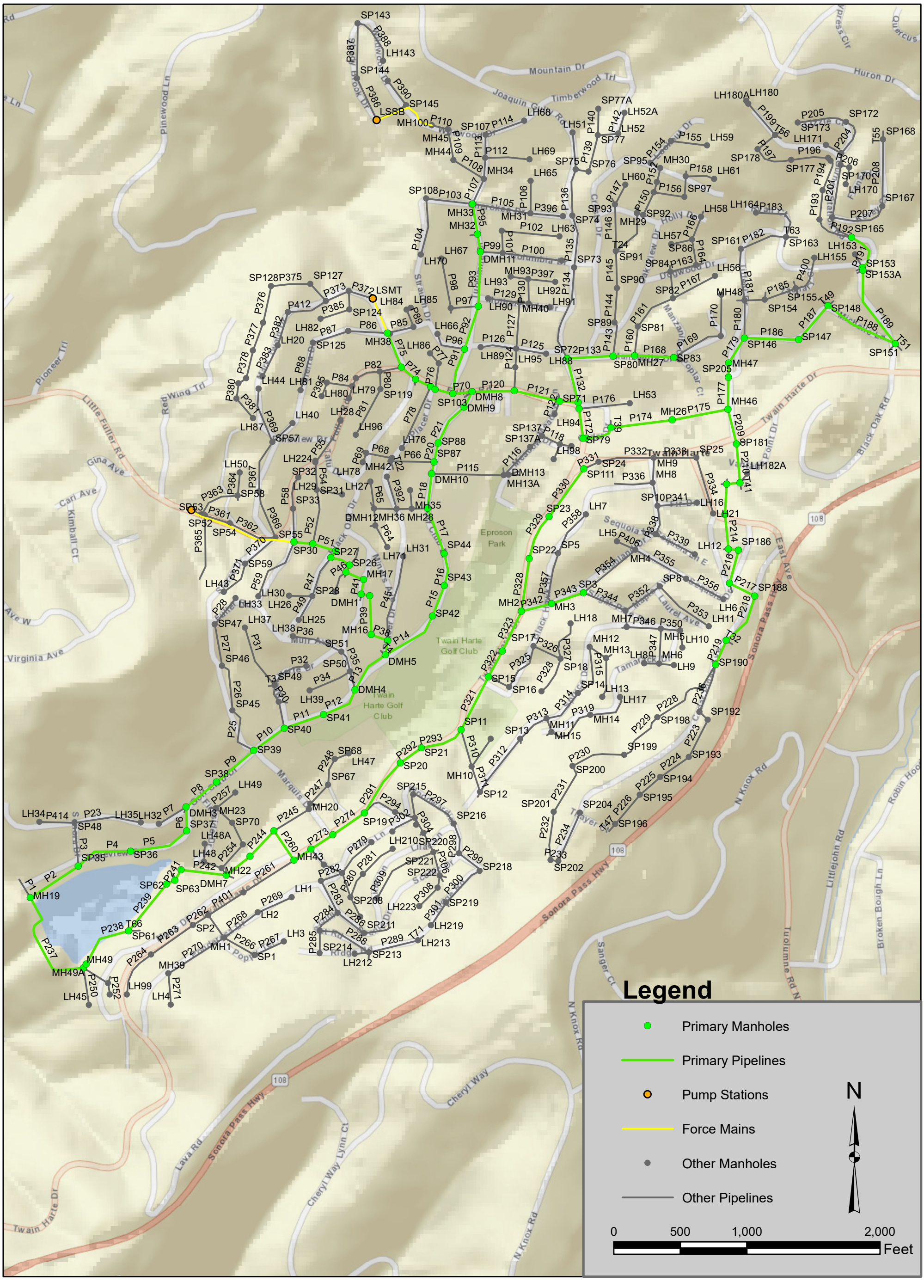
BLACK WATER CONSULTING ENGINEERS, INC.

THCSD Sewer Collection

Primary Flow Paths

DRAWN BY: CG DATE: 10/13/2020
CREDIT: 2007 NORTHSTAR SURVEY

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

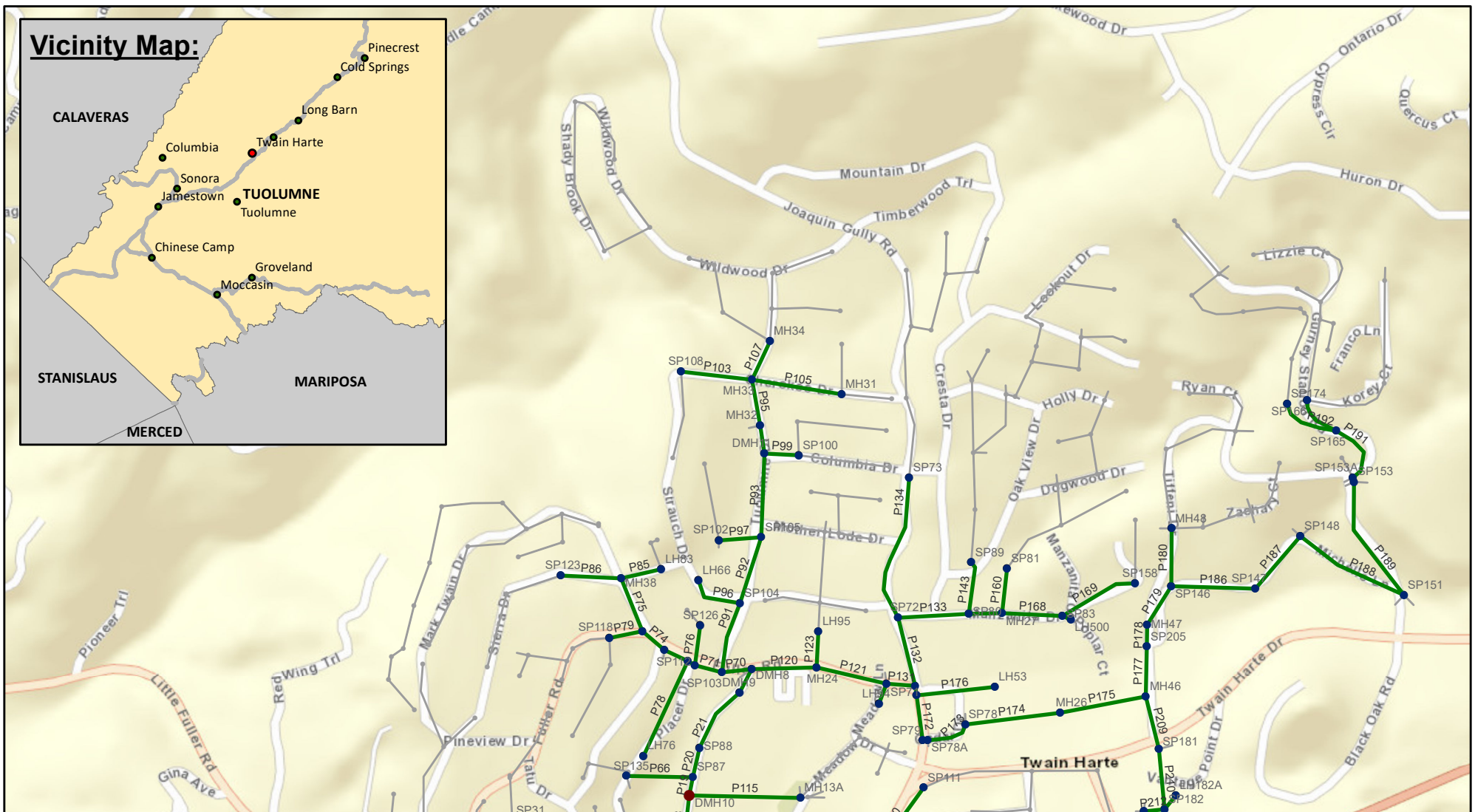


ATTACHMENT B

EXHIBITS FOR D/D AND SURCHARGE

Vicinity Map:

Detail Map:



TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

Depth/Diameter

- <75% d/D
- 75% - 99% d/D
- >99% d/D
- Not Modeled

Manhole

- MH not surcharged
- MH surcharged
- Not Modeled

I&I Identification Reduction Project
ADWF Hydraulic Model

ADWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P10	SP40	SP39	10	290.3	0.063	0.911	Free Surface	6.101	0.195	0.166	0.162	0.295	3.197	11.001	No	0.162	6.101
P103	SP108	MH33	6	354.9	0.101	0	Free Surface	0	0	0	0	0	0	3.581	Yes	0.012	0
P105	MH31	MH33	6	446.7	0.038	0	Free Surface	0	0	0	0	0	0	2.185	Yes	0.012	0
P107	MH34	MH33	6	206.326	0.048	0	Free Surface	0	0	0	0	0	0	2.455	No	0	0
P11	SP41	SP40	10	316.6	0.022	0.907	Free Surface	4.171	0.253	0.281	0.211	0.294	1.898	6.444	No	0.211	4.171
P115	MH13A	DMH10	6	542.213	0.002	0	Free Surface	0	0	0	0	0	0	0.551	Yes	0.5	0
P12	DMH4	SP41	10	323.547	0.012	0.906	Free Surface	3.36	0.296	0.38	0.246	0.294	1.406	4.761	No	0.246	3.36
P120	MH24	DMH8	10	324.8	0.009	0.061	Free Surface	1.394	0.084	0.029	0.07	0.074	1.129	4.244	No	0.07	1.394
P121	SP71	MH24	10	353.9	0.016	0.053	Free Surface	1.612	0.069	0.019	0.058	0.069	1.438	5.546	No	0.058	1.612
P122	LH94	SP71	6	103.86	0.001	0	Free Surface	0	0	0	0	0	0	0.366	Yes	0.004	0
P123	LH95	MH24	6	175.393	0.01	0	Free Surface	0	0	0	0	0	0	1.146	No	0	0
P13	DMH5	DMH4	10	352.8	0.002	0.901	Free Surface	1.709	0.487	0.956	0.406	0.293	0.535	1.886	No	0.406	1.709
P131	MH25	SP71	8	139.979	0.002	0.052	Free Surface	0.826	0.145	0.09	0.097	0.072	0.565	1.14	No	0.097	0.826
P132	SP72	MH25	8	352.4	0.017	0.022	Free Surface	1.311	0.06	0.014	0.04	0.047	1.407	3.167	No	0.04	1.311
P133	SP80	SP72	8	344.302	0.018	0.016	Free Surface	1.207	0.05	0.01	0.034	0.04	1.414	3.265	No	0.034	1.207
P134	SP73	SP72	6	722.251	0.068	0	Free Surface	0	0	0	0	0	0	2.93	No	0	0
P14	SP42	DMH5	10	468.2	0.003	0.689	Free Surface	1.814	0.38	0.612	0.316	0.255	0.66	2.252	Yes	0.364	3.006
P143	SP89	SP80	6	257.602	0.082	0	Free Surface	0	0	0	0	0	0	3.232	No	0	0
P15	SP43	SP42	10	246.224	0.007	0.689	Free Surface	2.602	0.292	0.371	0.243	0.255	1.097	3.715	No	0.243	2.602
P159	MH27	SP80	6	162.974	0.069	0.007	Free Surface	1.555	0.036	0.005	0.018	0.028	2.494	2.948	No	0.018	1.555
P16	SP44	SP43	10	246.839	0.022	0.688	Free Surface	3.898	0.219	0.21	0.182	0.255	1.92	6.558	Yes	0.195	7.078
P160	SP81	MH27	6	218.316	0.014	0	Free Surface	0	0	0	0	0	0	1.326	No	0	0
P168	SP83	MH27	6	298.2	0.036	0.002	Free Surface	0.856	0.024	0.002	0.012	0.016	1.685	2.121	No	0.012	0.856
P169	SP158	SP83	6	396.843	0.054	0	Free Surface	0	0	0	0	0	0	2.626	No	0	0
P17	MH28	SP44	10	361.825	0.024	0.687	Free Surface	3.988	0.215	0.203	0.179	0.255	1.981	6.774	Yes	0.183	7.73
P171	DMH16	MH25	8	47.239	0.001	0.029	Free Surface	0.573	0.126	0.067	0.084	0.054	0.421	0.864	No	0.084	0.573
P172	SP79	DMH16	8	222.487	0.032	0.029	Free Surface	1.754	0.058	0.013	0.039	0.054	1.911	4.32	No	0.039	1.754
P173	SP78	SP78A	8	225.2	0.035	0.028	Free Surface	1.807	0.057	0.013	0.038	0.053	1.997	4.533	Yes	0.529	0.095
P174	MH26	SP78	8	471.4	0.039	0.028	Free Surface	1.866	0.055	0.012	0.036	0.053	2.097	4.784	Yes	0.037	3.636
P175	MH46	MH26	8	424.927	0.019	0.028	Free Surface	1.442	0.065	0.017	0.043	0.053	1.484	3.304	No	0.043	1.442
P176	LH53	DMH16	6	384.034	0.041	0	Free Surface	0	0	0	0	0	0	2.289	No	0	0
P176A	SP78A	SP79	6	23.041	0.039	0.029	Free Surface	1.956	0.08	0.026	0.04	0.058	2.096	2.211	No	0.04	1.956
P177	SP205	MH46	6	243.207	0.005	0.015	Free Surface	0.817	0.095	0.037	0.047	0.042	0.803	0.829	No	0.047	0.817
P178	MH47	SP205	6	105.911	0.037	0.015	Free Surface	1.596	0.06	0.014	0.03	0.042	1.982	2.176	No	0.03	1.596
P179	SP146	MH47	6	221.262	0.037	0.015	Free Surface	1.589	0.059	0.014	0.03	0.042	1.979	2.174	Yes	0.03	3.165
P18	DMH10	MH28	10	265	0.011	0.683	Pressurized	3.041	0.259	0.295	0.216	0.254	1.367	4.636	Yes	0.833	1.252
P180	MH48	SP146	6	281.716	0.127	0	Free Surface	0	0	0	0	0	0	4.006	No	0	0
P186	SP147	SP146	6	415.5	0.033	0.011	Free Surface	1.38	0.053	0.011	0.026	0.036	1.821	2.033	Yes	0.053	0.988
P187	SP148	SP147	6	337.851	0.092	0.011	Free Surface	1.976	0.042	0.006	0.021	0.036	2.946	3.408	Yes	0.024	3.266
P188	SP151	SP148	6	585.686	0.07	0.011	Free Surface	1.777	0.044	0.007	0.022	0.035	2.584	2.967	No	0.022	1.777
P189	SP153	SP151	6	635.676	0.074	0.01	Free Surface	1.781	0.042	0.006	0.021	0.034	2.653	3.068	No	0.021	1.781

ADWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P19	SP87	DMH10	10	89.808	0.062	0.68	Free Surface	5.589	0.169	0.124	0.141	0.253	3.156	10.981	Yes	0.817	1.252
P190	SP153A	SP153	6	21.886	0.056	0.009	Free Surface	1.558	0.042	0.007	0.021	0.032	2.302	2.657	No	0.021	1.558
P191	SP165	SP153A	6	432.6	0.139	0.009	Free Surface	2.141	0.034	0.004	0.017	0.032	3.523	4.198	Yes	0.099	0.323
P192	SP174	SP165	6	294.009	0.042	0	Free Surface	0	0	0	0	0	0	2.303	Yes	0.094	0
P2	SP35	MH19	10	433.5	0.009	0.922	Free Surface	3.122	0.316	0.432	0.263	0.297	1.26	4.268	No	0.263	3.122
P20	SP88	SP87	10	147.189	0.03	0.679	Free Surface	4.329	0.201	0.177	0.168	0.253	2.228	7.648	No	0.168	4.329
P200	SP166	SP165	6	222.659	0.114	0	Free Surface	0	0	0	0	0	0	3.799	Yes	0.089	0
P209	SP181	MH46	8	269.1	0.112	0.012	Free Surface	2.087	0.029	0.003	0.019	0.035	3.233	8.111	No	0.019	2.087
P21	DMH9	SP88	10	338.632	0.011	0.678	Free Surface	3.035	0.258	0.293	0.215	0.253	1.367	4.636	No	0.215	3.035
P210	SP182	SP181	8	294.452	0.098	0.012	Free Surface	1.962	0.029	0.003	0.02	0.034	3.023	7.57	No	0.02	1.962
P211	LH182A	SP182	8	86.944	0.013	0	Free Surface	0	0	0	0	0	0	2.763	No	0	0
P212	SP183	SP182	8	100.434	0.017	0.011	Free Surface	1.051	0.043	0.007	0.029	0.033	1.331	3.143	Yes	0.667	0.032
P213	SP184	SP183	8	227.462	0.072	0.011	Free Surface	1.726	0.03	0.003	0.02	0.033	2.615	6.515	No	0.02	1.726
P214	SP185	SP184	8	260.509	0.02	0.01	Free Surface	1.091	0.04	0.006	0.027	0.032	1.432	3.417	No	0.027	1.091
P215	SP186	SP185	8	75.925	-0.001	0.01	Pressurized	0.015	1		0.667	0	0.003		No	0.667	0.015
P216	SP187	SP186	8	257.803	0.06	0.01	Free Surface	1.589	0.031	0.003	0.02	0.032	2.394	5.957	Yes	0.319	0.061
P217	SP188	SP187	6	213.014	0.122	0.01	Free Surface	2.092	0.036	0.005	0.018	0.033	3.33	3.928	No	0.018	2.092
P218	SP189	SP188	6	412.074	0.02	0.009	Free Surface	1.112	0.054	0.012	0.027	0.033	1.446	1.607	No	0.027	1.112
P219	SP190	SP189	6	198.326	0.034	0.009	Free Surface	1.311	0.048	0.009	0.024	0.032	1.827	2.073	Yes	0.03	1.81
P22	DMH8	DMH9	10	129.235	0.02	0.677	Free Surface	3.748	0.222	0.217	0.185	0.253	1.829	6.244	Yes	0.203	6.598
P235	SP197	SP190	6	206.457	0.019	0	Free Surface	0	0	0	0	0	0	1.56	No	0	0
P236	SP191	SP190	6	375.372	0.092	0	Free Surface	0	0	0	0	0	0	3.409	No	0	0
P237	MH49	MH19	10	852.75	0.005	0.069	Free Surface	1.161	0.103	0.045	0.086	0.079	0.845	3.094	Yes	0.833	0.127
P238	SP61	MH49A	10	440.393	0	0.068	Pressurized	0.062	1		0.833	0	0.012		No	0.833	0.062
P239	SP62	SP61	10	451.542	0.001	0.066	Free Surface	0.691	0.143	0.088	0.119	0.077	0.426	1.505	Yes	0.695	0.136
P240	SP63	SP62	10	67.848	-0.001	0.065	Pressurized	0.06	1		0.833	0	0.012		No	0.833	0.06
P241	SP64	SP63	10	91.883	0	0.065	Pressurized	0.06	1		0.833	0	0.012		No	0.833	0.06
P242	DMH7	SP64	10	341.477	0.004	0.065	Free Surface	1.04	0.107	0.048	0.089	0.077	0.743	2.711	Yes	0.392	0.258
P243	SP65	DMH7	10	228.486	0.035	0.062	Free Surface	2.217	0.062	0.015	0.051	0.075	2.099	8.226	Yes	0.23	0.502
P244	SP66	SP65	10	269.4	0.026	0.061	Free Surface	1.989	0.066	0.017	0.055	0.074	1.818	7.057	No	0.055	1.989
P245	MH20	SP66	6	309.212	0.036	0	Free Surface	0	0	0	0	0	0	2.12	No	0	0
P25	SP45	SP39	6	401.509	0.057	0	Free Surface	0	0	0	0	0	0	2.695	No	0	0
P250	LH45	MH49	6	281.774	0.04	0	Free Surface	0	0	0	0	0	0	2.246	No	0	0
P251	SP60	MH49	6	219.301	0.21	0	Free Surface	0	0	0	0	0	0	5.154	No	0	0
P253	MH22	DMH7	6	62.688	0.007	0	Free Surface	0	0	0	0	0	0	0.932	Yes	0.085	0
P260	MH43	SP66	10	267.19	0.057	0.059	Free Surface	2.592	0.054	0.011	0.045	0.073	2.627	10.493	No	0.045	2.592
P261	SP138	MH43	6	449.059	0.006	0	Free Surface	0	0	0	0	0	0	0.863	No	0	0
P272	MH51	MH43	10	146.3	0.034	0.05	Free Surface	2.068	0.056	0.012	0.047	0.067	2.047	8.122	No	0.047	2.068
P273	MH139	MH51	10	198.079	0.027	0.043	Free Surface	1.818	0.055	0.012	0.046	0.062	1.818	7.234	Yes	0.047	3.582
P274	SP19	MH139	10	287.107	0.033	0.043	Free Surface	1.936	0.053	0.011	0.044	0.062	1.981	7.933	Yes	0.045	3.742
P275	SP206	MH51	6	151.821	0.185	0	Free Surface	0	0	0	0	0	0	4.835	Yes	0.5	0

ADWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P29	DMH6	SP40	6	201.685	0.131	0	Free Surface	0	0	0	0	0	0	4.072	No	0	0
P291	SP20	SP19	10	472.4	0.046	0.036	Free Surface	2.064	0.045	0.008	0.037	0.057	2.293	9.406	Yes	0.041	3.638
P292	SP21	SP20	10	193.767	0.026	0.036	Free Surface	1.698	0.051	0.01	0.043	0.057	1.767	7.114	No	0.043	1.698
P293	SP11	SP21	10	342.355	0.021	0.036	Free Surface	1.562	0.054	0.011	0.045	0.057	1.581	6.314	No	0.045	1.562
P294	LH55	SP19	6	282.11	0.088	0	Free Surface	0	0	0	0	0	0	3.337	No	0	0
P3	SP48	SP35	6	327.147	0.065	0	Free Surface	0	0	0	0	0	0	2.86	Yes	0.074	0
P310	MH10	SP11	6	287.838	0.083	0	Free Surface	0	0	0	0	0	0	3.241	No	0	0
P321	SP15	SP11	8	446.822	0.015	0.027	Free Surface	1.319	0.068	0.018	0.045	0.052	1.328	2.938	No	0.045	1.319
P322	SP110	SP15	8	224.3	0.025	0.025	Free Surface	1.545	0.057	0.013	0.038	0.05	1.697	3.846	No	0.038	1.545
P323	MH2	SP110	6	335	0.023	0.024	Free Surface	1.556	0.083	0.028	0.041	0.053	1.634	1.716	No	0.041	1.556
P324	SP16	SP15	6	174.409	0.06	0	Free Surface	0	0	0	0	0	0	2.753	No	0	0
P328	SP22	MH2	8	401.431	0.026	0.01	Free Surface	1.168	0.037	0.005	0.024	0.031	1.605	3.883	No	0.024	1.168
P329	SP23	SP22	8	352.604	0.021	0.008	Free Surface	1.043	0.036	0.005	0.024	0.029	1.445	3.506	Yes	0.024	2.062
P33	SP50	DMH4	6	142.229	0.193	0	Free Surface	0	0	0	0	0	0	4.945	Yes	0.015	0
P330	SP111	SP23	8	444.391	0.044	0.008	Free Surface	1.328	0.029	0.003	0.02	0.028	2.04	5.105	Yes	0.022	2.261
P342	MH3	MH2	8	233.125	0.057	0.014	Free Surface	1.717	0.036	0.005	0.024	0.037	2.389	5.801	No	0.024	1.717
P343	SP3	MH3	6	254.799	0.061	0.012	Free Surface	1.748	0.047	0.008	0.024	0.037	2.448	2.78	Yes	0.049	1.192
P344	SP6	SP3	6	341.914	0.103	0	Free Surface	0	0	0	0	0	0	3.616	No	0	0
P354	MH4	SP3	6	504.705	0.104	0	Free Surface	0	0	0	0	0	0	3.632	No	0	0
P357	SP5	MH3	6	392.336	0.127	0	Free Surface	0	0	0	0	0	0	4.003	Yes	0.027	0
P37	SP34	DMH5	10	110.176	0.104	0.212	Free Surface	4.707	0.085	0.03	0.071	0.139	3.775	14.157	Yes	0.141	3.479
P38	MH16	SP34	6	132.958	0.08	0.209	Free Surface	4.571	0.174	0.132	0.087	0.16	3.279	3.174	No	0.087	4.571
P39	SP141	MH16	6	292.273	0.023	0.209	Free Surface	2.94	0.237	0.246	0.118	0.16	1.791	1.7	No	0.118	2.94
P4	SP36	SP35	10	427	0.025	0.919	Free Surface	4.413	0.246	0.265	0.205	0.296	2.042	6.939	No	0.205	4.413
P40	DMH1	SP141	6	66.86	0.067	0.207	Free Surface	4.287	0.181	0.142	0.09	0.159	3.015	2.909	No	0.09	4.287
P404	MH49A	MH49	10	37.524	0.042	0.068	Free Surface	2.425	0.062	0.015	0.051	0.078	2.294	8.987	No	0.051	2.425
P408	LH500	SP83	4	43.659	0.015	0	Free Surface	0	0	0	0	0	0	0.473	No	0	0
P41	MH17	DMH1	6	102	0.012	0.206	Free Surface	2.354	0.275	0.33	0.137	0.159	1.324	1.251	No	0.137	2.354
P42	DMH2	MH17	6	154.4	0.04	0.205	Free Surface	3.574	0.204	0.182	0.102	0.158	2.359	2.256	No	0.102	3.574
P43	SP26	DMH2	6	60.085	-0.005	0.205	Pressurized	0.521	1		0.5	0	0.13		No	0.5	0.521
P44	SP27	SP26	6	154.961	0.067	0.204	Free Surface	4.278	0.179	0.14	0.089	0.158	3.024	2.92	Yes	0.426	1.143
P45	LH31	SP34	6	648.338	0.081	0	Free Surface	0	0	0	0	0	0	3.203	Yes	0.026	0
P46	LH23	DMH2	6	177.623	0.1	0	Free Surface	0	0	0	0	0	0	3.557	Yes	0.002	0
P47	SP28	SP27	6	323.957	0.084	0	Free Surface	0	0	0	0	0	0	3.255	No	0	0
P5	SP37	SP36	10	464.34	0.044	0.917	Free Surface	5.377	0.214	0.2	0.178	0.296	2.682	9.173	Yes	0.196	9.392
P50	SP29	SP27	6	65.181	0.012	0.202	Free Surface	2.334	0.272	0.324	0.136	0.157	1.319	1.247	No	0.136	2.334
P51	MH18	SP29	6	187.1	0.037	0.202	Free Surface	3.459	0.206	0.186	0.103	0.157	2.268	2.169	No	0.103	3.459
P52	SP31	MH18	6	410.931	0.08	0	Free Surface	0	0	0	0	0	0	3.181	No	0	0
P56	SP30	MH18	6	141.361	0.111	0.201	Free Surface	5.074	0.157	0.107	0.079	0.156	3.838	3.747	No	0.079	5.074
P57	SP33	SP30	6	249.63	0.045	0	Free Surface	0	0	0	0	0	0	2.394	No	0	0
P59	LH30	SP30	6	518.482	0.083	0	Free Surface	0	0	0	0	0	0	3.242	No	0	0

ADWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P6	DMH3	SP37	10	179.545	0.042	0.916	Free Surface	5.324	0.215	0.202	0.179	0.296	2.647	9.051	Yes	0.183	10.332
P60	MH35	MH28	6	118.401	0.069	0	Free Surface	0	0	0	0	0	0	2.952	Yes	0.091	0
P66	SP135	SP87	6	324.653	0.111	0	Free Surface	0	0	0	0	0	0	3.754	Yes	0.071	0
P7	LH32	DMH3	6	240.205	0.111	0	Free Surface	0	0	0	0	0	0	3.741	No	0	0
P70	SP103	DMH8	8	146.579	0.054	0.614	Free Surface	5.291	0.223	0.218	0.149	0.257	2.883	5.633	No	0.149	5.291
P71	SP112	SP103	8	140.1	0.032	0.244	Free Surface	3.347	0.161	0.113	0.107	0.159	2.164	4.328	Yes	0.121	5.648
P72	SP113	SP112	6	39.216	0.053	0.243	Free Surface	4.125	0.207	0.188	0.104	0.173	2.699	2.579	Yes	0.107	7.873
P73	SP114	SP113	6	125.389	0.076	0.24	Free Surface	4.676	0.188	0.155	0.094	0.172	3.217	3.094	No	0.094	4.676
P74	MH37	SP114	6	142.208	0.08	0.24	Free Surface	4.758	0.186	0.151	0.093	0.172	3.296	3.173	No	0.093	4.758
P75	MH38	MH37	6	276.642	0.023	0.234	Free Surface	3.028	0.251	0.276	0.126	0.169	1.788	1.693	No	0.126	3.028
P76	SP126	SP112	6	196.298	0.04	0	Free Surface	0	0	0	0	0	0	2.25	Yes	0.024	0
P78	LH76	SP113	6	510.568	0.048	0	Free Surface	0	0	0	0	0	0	2.475	No	0	0
P79	SP118	MH37	6	164.077	0.101	0	Free Surface	0	0	0	0	0	0	3.582	No	0	0
P8	SP38	DMH3	10	294.719	0.007	0.916	Free Surface	2.787	0.341	0.501	0.284	0.295	1.077	3.655	No	0.284	2.787
P85	LH83	MH38	6	201.023	0.03	0	Free Surface	0	0	0	0	0	0	1.949	No	0	0
P86	SP123	MH38	6	294.219	0.102	0	Free Surface	0	0	0	0	0	0	3.595	No	0	0
P9	SP39	SP38	10	373.6	0.059	0.915	Free Surface	5.971	0.198	0.172	0.165	0.295	3.098	10.647	No	0.165	5.971
P91	SP104	SP103	8	350.624	0.016	0.37	Free Surface	2.996	0.233	0.238	0.155	0.198	1.595	3.109	No	0.155	2.996
P92	SP105	SP104	8	337.259	0.015	0.37	Free Surface	2.929	0.237	0.246	0.158	0.197	1.546	3.012	No	0.158	2.929
P93	DMH11	SP105	8	409.479	0.008	0.368	Free Surface	2.281	0.282	0.346	0.188	0.197	1.096	2.125	No	0.188	2.281
P94	MH32	DMH11	8	134.8	0.034	0.364	Free Surface	3.85	0.193	0.163	0.129	0.196	2.264	4.462	No	0.129	3.85
P95	MH33	MH32	8	227.328	0.042	0.363	Free Surface	4.135	0.184	0.147	0.122	0.196	2.497	4.941	Yes	0.127	7.819
P96	LH66	SP104	6	265.519	0.102	0	Free Surface	0	0	0	0	0	0	3.6	Yes	0.054	0
P97	SP102	SP105	6	206.081	0.125	0	Free Surface	0	0	0	0	0	0	3.981	No	0	0
P99	SP100	DMH11	6	167.289	0.021	0	Free Surface	0	0		0	0	0	1.634	Yes	0.02	0

ADWF -MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
DMH1	3,645.04	0.001	0.001	0	3,637.48	Not Full	No	-0.408	7.558
DMH10	3,629.76	0.003	0.003	0	3,621.58	Not Full	No	0.658	8.179
DMH11	3,667.36	0.004	0.004	0	3,659.00	Not Full	No	-0.477	8.361
DMH16	3,653.63	0	0	0	3,646.06	Not Full	Yes	-0.583	7.566
DMH2	3,655.29	0.001	0.001	0	3,645.59	Not Full	No	-0.396	9.696
DMH3	3,563.69	0.001	0.001	0	3,549.82	Not Full	No	-0.65	13.867
DMH4	3,615.98	0.005	0.005	0	3,603.41	Not Full	No	-0.583	12.569
DMH5	3,613.93	0	0	0	3,604.24	Not Full	Yes	-0.423	9.69
DMH6	3,628.84	0	0	0	3,619.09	Not Full	No	-0.5	9.75
DMH7	3,522.22	0.003	0.003	0	3,513.93	Not Full	Yes	-0.744	8.291
DMH8	3,644.59	0.002	0.002	0	3,636.73	Not Full	No	-0.646	7.862
DMH9	3,641.93	0.001	0.001	0	3,634.15	Not Full	No	-0.616	7.782
LH182A	3,747.64	0	0	0	3,747.64	Full	No	-0.667	0
LH23	3,666.84	0	0	0	3,663.34	Not Full	No	-0.5	3.5
LH30	3,727.99	0	0	0	3,723.09	Not Full	No	-0.5	4.9
LH31	3,671.72	0	0	0	3,668.02	Not Full	No	-0.5	3.7
LH32	3,578.96	0	0	0	3,576.56	Not Full	No	-0.5	2.4
LH45	3,520.47	0	0	0	3,520.47	Full	No	-0.5	0
LH500	3,685.76	0	0	0	3,682.12	Not Full	No	-0.333	3.64
LH53	3,668.67	0	0	0	3,664.77	Not Full	No	-0.5	3.9
LH55	3,598.29	0	0	0	3,593.29	Not Full	No	-0.5	5
LH66	3,680.15	0	0	0	3,677.58	Not Full	No	-0.5	2.57
LH76	3,678.26	0	0	0	3,676.06	Not Full	No	-0.5	2.2
LH83	3,688.41	0	0	0	3,684.61	Not Full	No	-0.5	3.8
LH94	3,648.42	0	0	0	3,645.62	Not Full	No	-0.5	2.8
LH95	3,646.54	0	0	0	3,641.84	Not Full	No	-0.5	4.7
MH10	3,628.10	0	0	0	3,624.80	Not Full	No	-0.5	3.3
MH139	3,562.01	0	0	0	3,557.46	Not Full	No	-0.787	4.554
MH13A	3,631.84	0	0	0	3,621.58	Not Full	No	-0.309	10.259
MH16	3,634.38	0	0	0	3,626.14	Not Full	No	-0.411	8.241
MH17	3,644.50	0.001	0.001	0	3,639.04	Not Full	No	-0.361	5.461
MH18	3,669.60	0.002	0.002	0	3,663.91	Not Full	No	-0.395	5.695
MH2	3,626.31	0.001	0.001	0	3,620.95	Not Full	No	-0.459	5.359
MH20	3,546.44	0	0	0	3,539.75	Not Full	No	-0.5	6.69
MH22	3,518.93	0	0	0	3,514.19	Not Full	No	-0.5	4.74
MH24	3,645.52	0.008	0.008	0	3,639.84	Not Full	No	-0.763	5.68
MH25	3,653.52	0	0	0	3,645.92	Not Full	Yes	-0.57	7.603
MH26	3,685.98	0	0	0	3,679.52	Not Full	No	-0.63	6.464
MH27	3,675.65	0.005	0.005	0	3,670.27	Not Full	No	-0.482	5.382
MH28	3,626.14	0.004	0.004	0	3,621.32	Not Full	No	-0.652	4.818
MH3	3,638.35	0.002	0.002	0	3,634.37	Not Full	No	-0.643	3.976
MH31	3,699.23	0	0	0	3,694.23	Not Full	No	-0.5	5
MH32	3,673.93	0.001	0.001	0	3,667.96	Not Full	No	-0.536	5.97
MH33	3,684.08	0.363	0.363	0	3,677.40	Not Full	No	-0.543	6.676
MH34	3,692.70	0	0	0	3,687.40	Not Full	No	-0.5	5.3

ADWF -MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
MH35	3,634.94	0	0	0	3,629.29	Not Full	No	-0.5	5.65
MH37	3,677.34	0.006	0.006	0	3,672.14	Not Full	No	-0.405	5.205
MH38	3,684.18	0.234	0.234	0	3,678.53	Not Full	No	-0.372	5.652
MH4	3,708.71	0	0	0	3,702.88	Not Full	No	-0.5	5.83
MH43	3,552.81	0.009	0.009	0	3,544.16	Not Full	No	-0.788	8.655
MH46	3,703.90	0	0	0	3,687.52	Not Full	No	-0.623	16.377
MH47	3,702.00	0	0	0	3,697.93	Not Full	No	-0.47	4.07
MH48	3,747.67	0	0	0	3,741.98	Not Full	No	-0.5	5.69
MH49	3,514.02	0.002	0.002	0	3,509.11	Not Full	Yes	-0.747	4.914
MH49A	3,515.09	0	0	0	3,511.84	Not Full	No	-0.782	3.249
MH51	3,557.00	0.007	0.007	0	3,552.09	Not Full	No	-0.786	4.913
SP100	3,666.19	0	0	0	3,662.49	Not Full	No	-0.5	3.7
SP102	3,686.56	0	0	0	3,681.76	Not Full	No	-0.5	4.8
SP103	3,648.66	0	0	0	3,644.71	Not Full	No	-0.513	3.947
SP104	3,654.80	0	0	0	3,650.51	Not Full	No	-0.51	4.293
SP105	3,659.66	0.002	0.002	0	3,655.77	Not Full	No	-0.507	3.89
SP108	3,716.92	0	0	0	3,713.32	Not Full	No	-0.5	3.6
SP11	3,605.97	0.009	0.009	0	3,600.82	Not Full	No	-0.788	5.155
SP110	3,617.69	0.001	0.001	0	3,613.06	Not Full	No	-0.628	4.632
SP111	3,662.70	0.008	0.008	0	3,658.42	Not Full	No	-0.647	4.28
SP112	3,653.89	0.001	0.001	0	3,649.16	Not Full	No	-0.559	4.732
SP113	3,656.31	0.003	0.003	0	3,651.22	Not Full	No	-0.394	5.094
SP114	3,665.33	0	0	0	3,660.81	Not Full	No	-0.403	4.523
SP118	3,692.79	0	0	0	3,688.79	Not Full	No	-0.5	4
SP123	3,712.66	0	0	0	3,708.86	Not Full	No	-0.5	3.8
SP126	3,659.81	0	0	0	3,656.96	Not Full	No	-0.5	2.85
SP135	3,665.49	0	0	0	3,661.84	Not Full	No	-0.5	3.65
SP138	3,551.28	0	0	0	3,546.85	Not Full	No	-0.5	4.43
SP141	3,637.12	0.002	0.002	0	3,632.84	Not Full	No	-0.38	4.28
SP146	3,712.21	0.004	0.004	0	3,706.19	Not Full	No	-0.47	6.02
SP147	3,724.77	0	0	0	3,719.71	Not Full	No	-0.474	5.064
SP148	3,755.02	0	0	0	3,750.69	Not Full	No	-0.479	4.329
SP15	3,612.03	0.002	0.002	0	3,607.39	Not Full	No	-0.621	4.645
SP151	3,798.21	0.001	0.001	0	3,791.47	Not Full	No	-0.478	6.738
SP153	3,843.11	0.001	0.001	0	3,838.81	Not Full	No	-0.479	4.299
SP153A	3,845.17	0	0	0	3,840.03	Not Full	No	-0.479	5.139
SP158	3,707.33	0	0	0	3,702.61	Not Full	No	-0.5	4.72
SP16	3,622.04	0	0	0	3,618.17	Not Full	No	-0.5	3.87
SP165	3,903.92	0.009	0.009	0	3,900.09	Not Full	No	-0.483	3.833
SP166	3,931.44	0	0	0	3,925.29	Not Full	No	-0.5	6.15
SP174	3,915.61	0	0	0	3,912.22	Not Full	No	-0.5	3.39
SP181	3,724.25	0.001	0.001	0	3,717.72	Not Full	No	-0.647	6.531
SP182	3,749.67	0.001	0.001	0	3,746.47	Not Full	No	-0.647	3.2
SP183	3,749.80	0	0	0	3,746.47	Not Full	No	-0.637	3.33
SP184	3,766.77	0	0	0	3,762.92	Not Full	No	-0.646	3.85

ADWF -MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP185	3,771.48	0	0	0	3,768.12	Not Full	No	-0.64	3.363
SP186	3,783.96	0	0	0	3,768.85	Not Full	Yes	0.04	15.113
SP187	3,793.39	0	0	0	3,783.83	Not Full	No	-0.646	9.56
SP188	3,820.18	0	0	0	3,812.55	Not Full	No	-0.482	7.632
SP189	3,825.22	0	0	0	3,821.21	Not Full	No	-0.473	4.013
SP19	3,571.37	0.007	0.007	0	3,566.81	Not Full	No	-0.789	4.556
SP190	3,832.74	0.009	0.009	0	3,827.92	Not Full	No	-0.476	4.816
SP191	3,866.95	0	0	0	3,862.39	Not Full	No	-0.5	4.56
SP197	3,837.08	0	0	0	3,831.99	Not Full	No	-0.5	5.09
SP20	3,593.32	0	0	0	3,588.46	Not Full	No	-0.796	4.863
SP205	3,700.88	0	0	0	3,693.95	Not Full	Yes	-0.453	6.933
SP206	3,579.92	0	0	0	3,575.08	Not Full	No	-0.5	4.84
SP21	3,598.70	0	0	0	3,593.74	Not Full	No	-0.791	4.957
SP22	3,635.69	0.001	0.001	0	3,631.32	Not Full	No	-0.642	4.366
SP23	3,643.23	0.001	0.001	0	3,638.70	Not Full	No	-0.643	4.526
SP26	3,649.01	0.001	0.001	0	3,646.17	Not Full	Yes	0.361	2.839
SP27	3,659.20	0.002	0.002	0	3,655.94	Not Full	No	-0.409	3.259
SP28	3,686.61	0	0	0	3,683.31	Not Full	No	-0.5	3.3
SP29	3,661.15	0	0	0	3,656.94	Not Full	No	-0.362	4.212
SP3	3,654.44	0.012	0.012	0	3,649.88	Not Full	No	-0.476	4.556
SP30	3,683.28	0.201	0.201	0	3,679.86	Not Full	No	-0.42	3.42
SP31	3,700.75	0	0	0	3,696.85	Not Full	No	-0.5	3.9
SP33	3,696.25	0	0	0	3,691.38	Not Full	No	-0.5	4.87
SP34	3,619.67	0.003	0.003	0	3,615.54	Not Full	No	-0.762	4.129
SP35	3,514.73	0.004	0.004	0	3,511.33	Not Full	No	-0.566	3.402
SP36	3,525.35	0.001	0.001	0	3,521.99	Not Full	No	-0.624	3.361
SP37	3,545.72	0.001	0.001	0	3,542.20	Not Full	No	-0.651	3.518
SP38	3,555.81	0	0	0	3,552.10	Not Full	No	-0.545	3.711
SP39	3,578.00	0.005	0.005	0	3,574.22	Not Full	No	-0.664	3.78
SP40	3,595.28	0.004	0.004	0	3,592.57	Not Full	No	-0.667	2.714
SP41	3,603.01	0.001	0.001	0	3,599.53	Not Full	No	-0.618	3.485
SP42	3,609.56	0.001	0.001	0	3,605.38	Not Full	Yes	-0.515	4.181
SP43	3,611.46	0.001	0.001	0	3,607.25	Not Full	No	-0.588	4.215
SP44	3,619.54	0.001	0.001	0	3,612.73	Not Full	No	-0.649	6.815
SP45	3,600.78	0	0	0	3,597.28	Not Full	No	-0.5	3.5
SP48	3,536.07	0	0	0	3,532.32	Not Full	No	-0.5	3.75
SP5	3,686.85	0	0	0	3,683.98	Not Full	No	-0.5	2.87
SP50	3,634.21	0	0	0	3,630.85	Not Full	No	-0.5	3.36
SP6	3,689.52	0	0	0	3,685.54	Not Full	No	-0.5	3.98
SP60	3,559.21	0	0	0	3,555.61	Not Full	No	-0.5	3.6
SP61	3,516.29	0.002	0.002	0	3,512.63	Not Full	No	0.204	3.662
SP62	3,515.75	0.001	0.001	0	3,512.63	Not Full	No	-0.402	3.118
SP63	3,515.65	0	0	0	3,513.18	Not Full	No	0.061	2.466
SP64	3,515.34	0	0	0	3,513.23	Not Full	No	0.011	2.106
SP65	3,525.63	0	0	0	3,521.58	Not Full	No	-0.782	4.049

ADWF -MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP66	3,532.17	0.002	0.002	0	3,528.58	Not Full	No	-0.778	3.595
SP71	3,649.31	0.002	0.002	0	3,645.52	Not Full	No	-0.776	3.792
SP72	3,658.01	0.006	0.006	0	3,652.23	Not Full	No	-0.627	5.78
SP73	3,706.39	0	0	0	3,701.74	Not Full	No	-0.5	4.65
SP78	3,664.94	0.001	0.001	0	3,661.15	Not Full	No	-0.629	3.792
SP78A	3,659.53	0	0	0	3,654.25	Not Full	No	-0.46	5.28
SP79	3,659.40	0	0	0	3,653.14	Not Full	No	-0.628	6.261
SP80	3,664.81	0.009	0.009	0	3,658.70	Not Full	No	-0.633	6.106
SP81	3,676.54	0	0	0	3,673.38	Not Full	No	-0.5	3.16
SP83	3,684.65	0.002	0.002	0	3,680.91	Not Full	No	-0.488	3.738
SP87	3,631.45	0.001	0.001	0	3,625.84	Not Full	No	-0.69	5.607
SP88	3,635.66	0.001	0.001	0	3,630.33	Not Full	No	-0.663	5.33
SP89	3,683.90	0	0	0	3,680.05	Not Full	No	-0.5	3.85



Detail Map:

0 250 500 1,000 1,500 2,000 ft

N

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

D OVER D

- < 75% d/D
- 75% -99% d/D
- > 99% d/D
- Not Modeled

Manhole

- MH not surcharged
- MH surcharged
- Not Modeled

I&I Identification Reduction Project
PHDWF Hydraulic Model

PHDWF - PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P10	SP40	SP39	10	290.3	0.063	1.21	Free Surface	6.63	0.224	0.22	0.187	0.342	3.224	11.001	No	0.187	6.63
P103	SP108	MH33	6	354.9	0.101	0	Free Surface	0	0	0	0	0	0	3.581	Yes	0.014	0
P105	MH31	MH33	6	446.7	0.038	0	Free Surface	0	0	0	0	0	0	2.185	Yes	0.014	0
P107	MH34	MH33	6	206.326	0.048	0	Free Surface	0	0	0	0	0	0	2.455	No	0	0
P11	SP41	SP40	10	316.6	0.022	1.196	Free Surface	4.516	0.292	0.371	0.243	0.34	1.903	6.444	No	0.243	4.516
P115	MH13A	DMH10	6	542.213	0.002	0	Free Surface	0	0	0	0	0	0	0.551	Yes	0.5	0
P12	DMH4	SP41	10	323.547	0.012	1.193	Free Surface	3.63	0.341	0.501	0.284	0.339	1.403	4.761	No	0.284	3.63
P120	MH24	DMH8	10	324.8	0.009	0.214	Free Surface	2.031	0.153	0.101	0.127	0.14	1.209	4.244	No	0.127	2.031
P121	SP71	MH24	10	353.9	0.016	0.186	Free Surface	2.352	0.125	0.067	0.105	0.131	1.549	5.546	No	0.105	2.352
P122	LH94	SP71	6	103.86	0.001	0	Free Surface	0	0	0	0	0	0	0.366	Yes	0.027	0
P123	LH95	MH24	6	175.393	0.01	0	Free Surface	0	0	0	0	0	0	1.146	No	0	0
P13	DMH5	DMH4	10	352.8	0.002	1.177	Free Surface	1.823	0.572	1.248	0.477	0.337	0.514	1.886	No	0.477	1.823
P131	MH25	SP71	8	139.979	0.002	0.181	Free Surface	1.193	0.269	0.317	0.179	0.137	0.588	1.14	No	0.179	1.193
P132	SP72	MH25	8	352.4	0.017	0.078	Free Surface	1.915	0.108	0.049	0.072	0.089	1.519	3.167	No	0.072	1.915
P133	SP80	SP72	8	344.302	0.018	0.056	Free Surface	1.765	0.091	0.034	0.061	0.075	1.533	3.265	No	0.061	1.765
P134	SP73	SP72	6	722.251	0.068	0	Free Surface	0	0	0	0	0	0	2.93	No	0	0
P14	SP42	DMH5	10	468.2	0.003	0.936	Free Surface	1.969	0.449	0.831	0.374	0.299	0.648	2.252	Yes	0.432	3.282
P143	SP89	SP80	6	257.602	0.082	0	Free Surface	0	0	0	0	0	0	3.232	No	0	0
P15	SP43	SP42	10	246.224	0.007	0.934	Free Surface	2.835	0.342	0.503	0.285	0.299	1.094	3.715	No	0.285	2.835
P159	MH27	SP80	6	162.974	0.069	0.024	Free Surface	2.279	0.065	0.017	0.032	0.054	2.716	2.948	No	0.032	2.279
P16	SP44	SP43	10	246.839	0.022	0.932	Free Surface	4.258	0.255	0.284	0.212	0.298	1.933	6.558	Yes	0.233	7.467
P160	SP81	MH27	6	218.316	0.014	0	Free Surface	0	0	0	0	0	0	1.326	No	0	0
P168	SP83	MH27	6	298.2	0.036	0.007	Free Surface	1.256	0.043	0.007	0.021	0.029	1.842	2.121	No	0.021	1.256
P169	SP158	SP83	6	396.843	0.054	0	Free Surface	0	0	0	0	0	0	2.626	No	0	0
P17	MH28	SP44	10	361.825	0.024	0.93	Free Surface	4.353	0.25	0.274	0.209	0.298	1.995	6.774	Yes	0.215	8.345
P171	DMH16	MH25	8	47.239	0.001	0.102	Free Surface	0.829	0.232	0.235	0.154	0.102	0.443	0.864	No	0.154	0.829
P172	SP79	DMH16	8	222.487	0.032	0.1	Free Surface	2.564	0.105	0.046	0.07	0.101	2.065	4.32	Yes	0.087	3.717
P173	SP78	SP78A	8	225.2	0.031	0.099	Free Surface	2.519	0.106	0.047	0.07	0.101	2.026	4.235	No	0.07	2.519
P174	MH26	SP78	8	471.4	0.039	0.097	Free Surface	2.727	0.099	0.041	0.066	0.1	2.269	4.784	Yes	0.068	5.175
P175	MH46	MH26	8	424.927	0.019	0.097	Free Surface	2.106	0.118	0.059	0.079	0.1	1.6	3.304	No	0.079	2.106
P176	LH53	DMH16	6	384.034	0.041	0	Free Surface	0	0	0	0	0	0	2.289	No	0	0
P176A	SP78A	SP79	6	23.041	0.039	0.1	Free Surface	2.851	0.145	0.091	0.073	0.11	2.248	2.211	No	0.073	2.851
P177	SP205	MH46	6	243.207	0.005	0.054	Free Surface	1.189	0.173	0.13	0.086	0.08	0.856	0.829	No	0.086	1.189
P178	MH47	SP205	6	105.911	0.037	0.053	Free Surface	2.331	0.108	0.049	0.054	0.079	2.141	2.176	No	0.054	2.331
P179	SP146	MH47	6	221.262	0.037	0.053	Free Surface	2.322	0.107	0.048	0.054	0.079	2.138	2.174	Yes	0.054	4.613
P18	DMH10	MH28	10	265	0.011	0.914	Pressurized	3.305	0.301	0.394	0.251	0.295	1.369	4.636	Yes	0.833	1.676
P180	MH48	SP146	6	281.716	0.127	0	Free Surface	0	0	0	0	0	0	4.006	No	0	0
P186	SP147	SP146	6	415.5	0.033	0.039	Free Surface	2.018	0.096	0.038	0.048	0.067	1.972	2.033	Yes	0.076	2.056
P187	SP148	SP147	6	337.851	0.092	0.039	Free Surface	2.893	0.075	0.023	0.037	0.067	3.202	3.408	Yes	0.043	4.768
P188	SP151	SP148	6	585.686	0.07	0.037	Free Surface	2.601	0.079	0.025	0.039	0.066	2.807	2.967	No	0.039	2.601

PHDWF - PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P189	SP153	SP151	6	635.676	0.074	0.035	Free Surface	2.608	0.075	0.023	0.037	0.064	2.884	3.068	No	0.037	2.608
P19	SP87	DMH10	10	89.808	0.062	0.903	Free Surface	6.077	0.194	0.164	0.162	0.293	3.19	10.981	Yes	0.833	1.655
P190	SP153A	SP153	6	21.886	0.056	0.031	Free Surface	2.281	0.076	0.024	0.038	0.061	2.503	2.657	No	0.038	2.281
P191	SP165	SP153A	6	432.6	0.139	0.031	Free Surface	3.137	0.061	0.015	0.031	0.061	3.84	4.198	Yes	0.114	0.922
P192	SP174	SP165	6	294.009	0.042	0	Free Surface	0	0	0	0	0	0	2.303	Yes	0.1	0
P2	SP35	MH19	10	433.5	0.009	1.251	Free Surface	3.398	0.371	0.586	0.309	0.347	1.252	4.268	No	0.309	3.398
P20	SP88	SP87	10	147.189	0.03	0.9	Free Surface	4.701	0.232	0.235	0.193	0.293	2.245	7.648	No	0.193	4.701
P200	SP166	SP165	6	222.659	0.114	0	Free Surface	0	0	0	0	0	0	3.799	Yes	0.095	0
P209	SP181	MH46	8	269.1	0.112	0.042	Free Surface	3.059	0.052	0.01	0.035	0.065	3.529	8.111	No	0.035	3.059
P21	DMH9	SP88	10	338.632	0.011	0.898	Free Surface	3.288	0.298	0.387	0.249	0.292	1.369	4.636	No	0.249	3.288
P210	SP182	SP181	8	294.452	0.006	0.04	Free Surface	1.074	0.102	0.044	0.068	0.064	0.877	1.841	No	0.068	1.074
P211	LH182A	SP182	8	86.944	0.033	0	Free Surface	0	0	0	0	0	0	4.418	Yes	0.667	0
P212	SP183	SP182	8	100.434	0.017	0.039	Free Surface	1.538	0.078	0.025	0.052	0.062	1.446	3.143	Yes	0.667	0.11
P213	SP184	SP183	8	227.462	0.072	0.037	Free Surface	2.53	0.054	0.011	0.036	0.061	2.853	6.515	Yes	0.048	3.357
P214	SP185	SP184	8	260.509	0.02	0.036	Free Surface	1.598	0.072	0.021	0.048	0.06	1.558	3.417	No	0.048	1.598
P215	SP186	SP185	8	75.925	-0.001	0.036	Pressurized	0.051	1		0.667	0	0.011		No	0.667	0.051
P216	SP187	SP186	8	257.803	0.06	0.035	Free Surface	2.329	0.055	0.012	0.037	0.059	2.613	5.957	Yes	0.327	0.205
P217	SP188	SP187	6	213.014	0.122	0.034	Free Surface	3.065	0.066	0.017	0.033	0.063	3.626	3.928	No	0.033	3.065
P218	SP189	SP188	6	412.074	0.02	0.032	Free Surface	1.625	0.098	0.04	0.049	0.062	1.565	1.607	No	0.049	1.625
P219	SP190	SP189	6	198.326	0.034	0.031	Free Surface	1.919	0.086	0.03	0.043	0.061	1.983	2.073	Yes	0.051	2.963
P22	DMH8	DMH9	10	129.235	0.02	0.893	Free Surface	4.061	0.256	0.286	0.213	0.292	1.84	6.244	Yes	0.235	7.078
P235	SP197	SP190	6	206.457	0.019	0	Free Surface	0	0	0	0	0	0	1.56	No	0	0
P236	SP191	SP190	6	375.372	0.092	0	Free Surface	0	0	0	0	0	0	3.409	Yes	0.001	0
P237	MH49	MH19	10	852.75	0.005	0.242	Free Surface	1.687	0.189	0.156	0.158	0.149	0.897	3.094	Yes	0.833	0.443
P238	SP61	MH49A	10	440.393	0	0.236	Pressurized	0.217	1		0.833	0	0.042		No	0.833	0.217
P239	SP62	SP61	10	451.542	0.001	0.231	Free Surface	0.999	0.265	0.307	0.221	0.146	0.444	1.505	Yes	0.765	0.44
P240	SP63	SP62	10	67.848	-0.001	0.229	Pressurized	0.21	1		0.833	0	0.041		No	0.833	0.21
P241	SP64	SP63	10	91.883	0	0.228	Pressurized	0.209	1		0.833	0	0.04		No	0.833	0.209
P242	DMH7	SP64	10	341.477	0.004	0.228	Free Surface	1.51	0.196	0.168	0.163	0.145	0.788	2.711	Yes	0.434	0.794
P243	SP65	DMH7	10	228.486	0.035	0.215	Free Surface	3.239	0.111	0.052	0.093	0.141	2.266	8.226	Yes	0.288	1.287
P244	SP66	SP65	10	269.4	0.026	0.214	Free Surface	2.904	0.12	0.061	0.1	0.14	1.96	7.057	No	0.1	2.904
P245	MH20	SP66	6	309.212	0.036	0	Free Surface	0	0	0	0	0	0	2.12	No	0	0
P25	SP45	SP39	6	401.509	0.057	0	Free Surface	0	0	0	0	0	0	2.695	No	0	0
P250	LH45	MH49	6	281.774	0.04	0	Free Surface	0	0	0	0	0	0	2.246	No	0	0
P251	SP60	MH49	6	219.301	0.21	0	Free Surface	0	0	0	0	0	0	5.154	No	0	0
P253	MH22	DMH7	6	62.688	0.007	0	Free Surface	0	0	0	0	0	0	0.932	Yes	0.122	0
P260	MH43	SP66	10	267.19	0.057	0.206	Free Surface	3.789	0.097	0.039	0.081	0.138	2.844	10.493	No	0.081	3.789
P261	SP138	MH43	6	449.059	0.006	0	Free Surface	0	0	0	0	0	0	0.863	No	0	0
P272	MH51	MH43	10	146.3	0.034	0.176	Free Surface	3.022	0.102	0.043	0.085	0.127	2.214	8.122	No	0.085	3.022
P273	MH139	MH51	10	198.079	0.027	0.151	Free Surface	2.658	0.1	0.042	0.083	0.117	1.967	7.234	Yes	0.084	5.225

PHDWF - PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P274	SP19	MH139	10	287.107	0.033	0.15	Free Surface	2.831	0.095	0.038	0.079	0.117	2.145	7.933	Yes	0.081	5.461
P275	SP206	MH51	6	151.821	0.185	0	Free Surface	0	0	0	0	0	0	4.835	Yes	0.5	0
P29	DMH6	SP40	6	201.685	0.131	0	Free Surface	0	0	0	0	0	0	4.072	No	0	0
P291	SP20	SP19	10	472.4	0.046	0.125	Free Surface	3.021	0.081	0.027	0.067	0.107	2.49	9.406	Yes	0.074	5.313
P292	SP21	SP20	10	193.767	0.026	0.125	Free Surface	2.483	0.092	0.035	0.077	0.107	1.915	7.114	No	0.077	2.483
P293	SP11	SP21	10	342.355	0.021	0.125	Free Surface	2.284	0.097	0.04	0.081	0.107	1.712	6.314	No	0.081	2.284
P294	LH55	SP19	6	282.11	0.088	0	Free Surface	0	0	0	0	0	0	3.337	No	0	0
P3	SP48	SP35	6	327.147	0.065	0	Free Surface	0	0	0	0	0	0	2.86	Yes	0.099	0
P310	MH10	SP11	6	287.838	0.083	0	Free Surface	0	0	0	0	0	0	3.241	No	0	0
P321	SP15	SP11	8	446.822	0.015	0.095	Free Surface	1.925	0.123	0.065	0.082	0.098	1.43	2.938	No	0.082	1.925
P322	SP110	SP15	8	224.3	0.025	0.086	Free Surface	2.259	0.104	0.045	0.069	0.094	1.835	3.846	No	0.069	2.259
P323	MH2	SP110	6	335	0.023	0.084	Free Surface	2.266	0.151	0.098	0.075	0.1	1.751	1.716	No	0.075	2.266
P324	SP16	SP15	6	174.409	0.06	0	Free Surface	0	0	0	0	0	0	2.753	No	0	0
P328	SP22	MH2	8	401.431	0.026	0.034	Free Surface	1.71	0.066	0.017	0.044	0.058	1.748	3.883	No	0.044	1.71
P329	SP23	SP22	8	352.604	0.021	0.029	Free Surface	1.528	0.065	0.017	0.043	0.054	1.574	3.506	Yes	0.044	3.019
P33	SP50	DMH4	6	142.229	0.193	0	Free Surface	0	0	0	0	0	0	4.945	Yes	0.036	0
P330	SP111	SP23	8	444.391	0.044	0.028	Free Surface	1.946	0.053	0.011	0.035	0.053	2.226	5.105	Yes	0.039	3.312
P342	MH3	MH2	8	233.125	0.057	0.048	Free Surface	2.515	0.064	0.016	0.043	0.07	2.602	5.801	No	0.043	2.515
P343	SP3	MH3	6	254.799	0.061	0.041	Free Surface	2.558	0.085	0.03	0.042	0.069	2.657	2.78	Yes	0.068	2.576
P344	SP6	SP3	6	341.914	0.103	0	Free Surface	0	0	0	0	0	0	3.616	No	0	0
P354	MH4	SP3	6	504.705	0.104	0	Free Surface	0	0	0	0	0	0	3.632	No	0	0
P357	SP5	MH3	6	392.336	0.127	0	Free Surface	0	0	0	0	0	0	4.003	Yes	0.036	0
P37	SP34	DMH5	10	110.176	0.104	0.24	Free Surface	4.887	0.091	0.034	0.075	0.148	3.803	14.157	Yes	0.18	2.768
P38	MH16	SP34	6	132.958	0.08	0.231	Free Surface	4.705	0.182	0.145	0.091	0.168	3.292	3.174	No	0.091	4.705
P39	SP141	MH16	6	292.273	0.023	0.231	Free Surface	3.024	0.249	0.271	0.124	0.168	1.795	1.7	No	0.124	3.024
P4	SP36	SP35	10	427	0.025	1.238	Free Surface	4.807	0.286	0.357	0.238	0.346	2.049	6.939	Yes	0.247	9.159
P40	DMH1	SP141	6	66.86	0.067	0.224	Free Surface	4.386	0.188	0.154	0.094	0.166	3.024	2.909	No	0.094	4.386
P404	MH49A	MH49	10	37.524	0.042	0.236	Free Surface	3.543	0.112	0.053	0.093	0.147	2.477	8.987	No	0.093	3.543
P408	LH500	SP83	4	43.659	0.015	0	Free Surface	0	0	0	0	0	0	0.473	No	0	0
P41	MH17	DMH1	6	102	0.012	0.221	Free Surface	2.401	0.285	0.354	0.142	0.165	1.324	1.251	No	0.142	2.401
P42	DMH2	MH17	6	154.4	0.04	0.218	Free Surface	3.636	0.21	0.193	0.105	0.163	2.363	2.256	No	0.105	3.636
P43	SP26	DMH2	6	60.085	-0.005	0.215	Pressurized	0.548	1		0.5	0	0.137		No	0.5	0.548
P44	SP27	SP26	6	154.961	0.067	0.212	Free Surface	4.329	0.182	0.145	0.091	0.161	3.029	2.92	Yes	0.432	1.178
P45	LH31	SP34	6	648.338	0.081	0	Free Surface	0	0	0	0	0	0	3.203	Yes	0.028	0
P46	LH23	DMH2	6	177.623	0.1	0	Free Surface	0	0	0	0	0	0	3.557	Yes	0.003	0
P47	SP28	SP27	6	323.957	0.084	0	Free Surface	0	0	0	0	0	0	3.255	No	0	0
P5	SP37	SP36	10	464.34	0.044	1.234	Free Surface	5.861	0.248	0.269	0.206	0.345	2.7	9.173	Yes	0.23	10.048
P50	SP29	SP27	6	65.181	0.012	0.206	Free Surface	2.347	0.275	0.331	0.137	0.159	1.32	1.247	No	0.137	2.347
P51	MH18	SP29	6	187.1	0.037	0.206	Free Surface	3.479	0.208	0.19	0.104	0.159	2.27	2.169	No	0.104	3.479
P52	SP31	MH18	6	410.931	0.08	0	Free Surface	0	0	0	0	0	0	3.181	No	0	0

PHDWF - PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P56	SP30	MH18	6	141.361	0.111	0.201	Free Surface	5.074	0.157	0.107	0.079	0.156	3.838	3.747	No	0.079	5.074
P57	SP33	SP30	6	249.63	0.045	0	Free Surface	0	0	0	0	0	0	2.394	No	0	0
P59	LH30	SP30	6	518.482	0.083	0	Free Surface	0	0	0	0	0	0	3.242	No	0	0
P6	DMH3	SP37	10	179.545	0.042	1.23	Free Surface	5.8	0.249	0.272	0.207	0.344	2.665	9.051	Yes	0.215	11.043
P60	MH35	MH28	6	118.401	0.069	0	Free Surface	0	0	0	0	0	0	2.952	Yes	0.107	0
P66	SP135	SP87	6	324.653	0.111	0	Free Surface	0	0	0	0	0	0	3.754	Yes	0.083	0
P7	LH32	DMH3	6	240.205	0.111	0	Free Surface	0	0	0	0	0	0	3.741	No	0	0
P70	SP103	DMH8	8	146.579	0.054	0.674	Free Surface	5.437	0.234	0.239	0.156	0.269	2.89	5.633	No	0.156	5.437
P71	SP112	SP103	8	140.1	0.032	0.268	Free Surface	3.443	0.169	0.124	0.113	0.167	2.173	4.328	Yes	0.127	5.754
P72	SP113	SP112	6	39.216	0.053	0.265	Free Surface	4.231	0.216	0.205	0.108	0.181	2.705	2.579	Yes	0.112	8.029
P73	SP114	SP113	6	125.389	0.076	0.255	Free Surface	4.762	0.194	0.165	0.097	0.177	3.224	3.094	No	0.097	4.762
P74	MH37	SP114	6	142.208	0.08	0.254	Free Surface	4.841	0.191	0.16	0.096	0.177	3.303	3.173	No	0.096	4.841
P75	MH38	MH37	6	276.642	0.023	0.234	Free Surface	3.028	0.251	0.276	0.126	0.169	1.788	1.693	No	0.126	3.028
P76	SP126	SP112	6	196.298	0.04	0	Free Surface	0	0	0	0	0	0	2.25	Yes	0.027	0
P78	LH76	SP113	6	510.568	0.048	0	Free Surface	0	0	0	0	0	0	2.475	No	0	0
P79	SP118	MH37	6	164.077	0.101	0	Free Surface	0	0	0	0	0	0	3.582	No	0	0
P8	SP38	DMH3	10	294.719	0.007	1.227	Free Surface	3.02	0.399	0.672	0.333	0.344	1.067	3.655	No	0.333	3.02
P85	LH83	MH38	6	201.023	0.03	0	Free Surface	0	0	0	0	0	0	1.949	No	0	0
P86	SP123	MH38	6	294.219	0.102	0	Free Surface	0	0	0	0	0	0	3.595	No	0	0
P9	SP39	SP38	10	373.6	0.059	1.226	Free Surface	6.503	0.229	0.23	0.191	0.344	3.124	10.647	No	0.191	6.503
P91	SP104	SP103	8	350.624	0.016	0.405	Free Surface	3.076	0.244	0.261	0.163	0.207	1.598	3.109	No	0.163	3.076
P92	SP105	SP104	8	337.259	0.015	0.404	Free Surface	3.005	0.247	0.268	0.165	0.207	1.549	3.012	No	0.165	3.005
P93	DMH11	SP105	8	409.479	0.008	0.396	Free Surface	2.33	0.293	0.373	0.195	0.205	1.097	2.125	No	0.195	2.33
P94	MH32	DMH11	8	134.8	0.034	0.383	Free Surface	3.907	0.198	0.172	0.132	0.201	2.267	4.462	No	0.132	3.907
P95	MH33	MH32	8	227.328	0.042	0.381	Free Surface	4.193	0.188	0.154	0.125	0.2	2.502	4.941	Yes	0.13	7.907
P96	LH66	SP104	6	265.519	0.102	0	Free Surface	0	0	0	0	0	0	3.6	Yes	0.057	0
P97	SP102	SP105	6	206.081	0.125	0	Free Surface	0	0	0	0	0	0	3.981	No	0	0
P99	SP100	DMH11	6	167.289	0.021	0	Free Surface	0	0		0	0	0	1.634	Yes	0.024	0

PHDWF-MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
DMH1	3,645.04	0.002	0.002	0	3,637.49	Not Full	No	-0.404	7.554
DMH10	3,629.76	0.012	0.012	0	3,621.82	Not Full	No	0.895	7.942
DMH11	3,667.36	0.013	0.013	0	3,659.01	Not Full	No	-0.47	8.353
DMH16	3,653.63	0.001	0.001	0	3,646.14	Not Full	Yes	-0.512	7.495
DMH2	3,655.29	0.002	0.002	0	3,645.60	Not Full	No	-0.393	9.693
DMH3	3,563.69	0.002	0.002	0	3,549.86	Not Full	No	-0.618	13.835
DMH4	3,615.98	0.016	0.016	0	3,603.45	Not Full	No	-0.542	12.528
DMH5	3,613.93	0.001	0.001	0	3,604.31	Not Full	Yes	-0.349	9.616
DMH6	3,628.84	0	0	0	3,619.09	Not Full	No	-0.5	9.75
DMH7	3,522.22	0.012	0.012	0	3,514.00	Not Full	Yes	-0.67	8.216
DMH8	3,644.59	0.006	0.006	0	3,636.76	Not Full	No	-0.616	7.833
DMH9	3,641.93	0.004	0.004	0	3,634.18	Not Full	No	-0.581	7.747
LH182A	3,747.64	0	0	0	3,747.64	Full	No	-0.667	0
LH23	3,666.84	0	0	0	3,663.34	Not Full	No	-0.5	3.5
LH30	3,727.99	0	0	0	3,723.09	Not Full	No	-0.5	4.9
LH31	3,671.72	0	0	0	3,668.02	Not Full	No	-0.5	3.7
LH32	3,578.96	0	0	0	3,576.56	Not Full	No	-0.5	2.4
LH45	3,520.47	0	0	0	3,520.47	Full	No	-0.5	0
LH500	3,685.76	0	0	0	3,682.12	Not Full	No	-0.333	3.64
LH53	3,668.67	0	0	0	3,664.77	Not Full	No	-0.5	3.9
LH55	3,598.29	0	0	0	3,593.29	Not Full	No	-0.5	5
LH66	3,680.15	0	0	0	3,677.58	Not Full	No	-0.5	2.57
LH76	3,678.26	0	0	0	3,676.06	Not Full	No	-0.5	2.2
LH83	3,688.41	0	0	0	3,684.61	Not Full	No	-0.5	3.8
LH94	3,648.42	0	0	0	3,645.62	Not Full	No	-0.5	2.8
LH95	3,646.54	0	0	0	3,641.84	Not Full	No	-0.5	4.7
MH10	3,628.10	0	0	0	3,624.80	Not Full	No	-0.5	3.3
MH139	3,562.01	0.001	0.001	0	3,557.49	Not Full	No	-0.75	4.517
MH13A	3,631.84	0	0	0	3,621.82	Not Full	No	-0.072	10.022
MH16	3,634.38	0	0	0	3,626.14	Not Full	No	-0.407	8.237
MH17	3,644.50	0.004	0.004	0	3,639.04	Not Full	No	-0.356	5.456
MH18	3,669.60	0.006	0.006	0	3,663.91	Not Full	No	-0.394	5.694
MH2	3,626.31	0.003	0.003	0	3,620.99	Not Full	No	-0.424	5.324
MH20	3,546.44	0	0	0	3,539.75	Not Full	No	-0.5	6.69
MH22	3,518.93	0	0	0	3,514.19	Not Full	No	-0.5	4.74
MH24	3,645.52	0.028	0.028	0	3,639.90	Not Full	No	-0.706	5.623
MH25	3,653.52	0.001	0.001	0	3,646.00	Not Full	Yes	-0.487	7.52
MH26	3,685.98	0	0	0	3,679.55	Not Full	No	-0.601	6.434
MH27	3,675.65	0.017	0.017	0	3,670.28	Not Full	No	-0.468	5.368
MH28	3,626.14	0.015	0.015	0	3,621.35	Not Full	No	-0.62	4.787
MH3	3,638.35	0.007	0.007	0	3,634.39	Not Full	No	-0.624	3.957
MH31	3,699.23	0	0	0	3,694.23	Not Full	No	-0.5	5
MH32	3,673.93	0.002	0.002	0	3,667.96	Not Full	No	-0.533	5.966
MH33	3,684.08	0.381	0.381	0	3,677.41	Not Full	No	-0.54	6.673
MH34	3,692.70	0	0	0	3,687.40	Not Full	No	-0.5	5.3

PHDWF-MH RESULTS

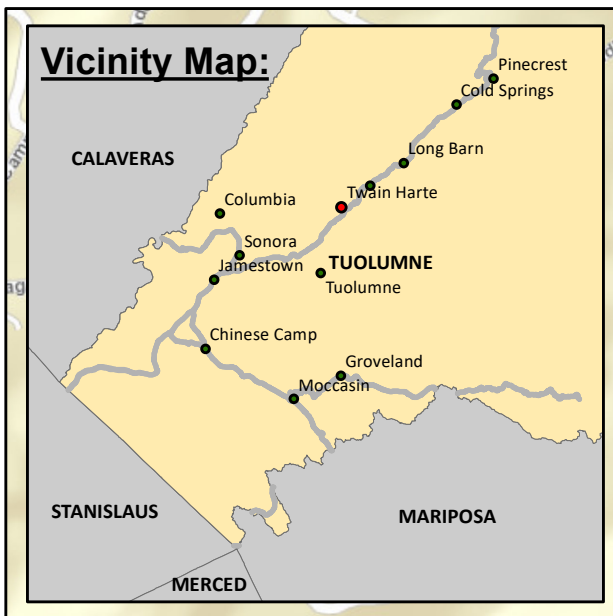
ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
MH35	3,634.94	0	0	0	3,629.29	Not Full	No	-0.5	5.65
MH37	3,677.34	0.02	0.02	0	3,672.14	Not Full	No	-0.402	5.202
MH38	3,684.18	0.234	0.234	0	3,678.53	Not Full	No	-0.372	5.652
MH4	3,708.71	0	0	0	3,702.88	Not Full	No	-0.5	5.83
MH43	3,552.81	0.03	0.03	0	3,544.19	Not Full	No	-0.752	8.619
MH46	3,703.90	0.001	0.001	0	3,687.56	Not Full	No	-0.588	16.341
MH47	3,702.00	0.001	0.001	0	3,697.95	Not Full	No	-0.446	4.046
MH48	3,747.67	0	0	0	3,741.98	Not Full	No	-0.5	5.69
MH49	3,514.02	0.006	0.006	0	3,509.18	Not Full	Yes	-0.675	4.842
MH49A	3,515.09	0	0	0	3,511.88	Not Full	No	-0.74	3.207
MH51	3,557.00	0.026	0.026	0	3,552.13	Not Full	No	-0.748	4.875
SP100	3,666.19	0	0	0	3,662.49	Not Full	No	-0.5	3.7
SP102	3,686.56	0	0	0	3,681.76	Not Full	No	-0.5	4.8
SP103	3,648.66	0.001	0.001	0	3,644.72	Not Full	No	-0.505	3.938
SP104	3,654.80	0.001	0.001	0	3,650.52	Not Full	No	-0.502	4.285
SP105	3,659.66	0.008	0.008	0	3,655.78	Not Full	No	-0.5	3.883
SP108	3,716.92	0	0	0	3,713.32	Not Full	No	-0.5	3.6
SP11	3,605.97	0.03	0.03	0	3,600.85	Not Full	No	-0.752	5.119
SP110	3,617.69	0.002	0.002	0	3,613.09	Not Full	No	-0.598	4.601
SP111	3,662.70	0.028	0.028	0	3,658.44	Not Full	No	-0.631	4.265
SP112	3,653.89	0.004	0.004	0	3,649.16	Not Full	No	-0.553	4.727
SP113	3,656.31	0.009	0.009	0	3,651.22	Not Full	No	-0.389	5.089
SP114	3,665.33	0.001	0.001	0	3,660.81	Not Full	No	-0.4	4.52
SP118	3,692.79	0	0	0	3,688.79	Not Full	No	-0.5	4
SP123	3,712.66	0	0	0	3,708.86	Not Full	No	-0.5	3.8
SP126	3,659.81	0	0	0	3,656.96	Not Full	No	-0.5	2.85
SP135	3,665.49	0	0	0	3,661.84	Not Full	No	-0.5	3.65
SP138	3,551.28	0	0	0	3,546.85	Not Full	No	-0.5	4.43
SP141	3,637.12	0.007	0.007	0	3,632.85	Not Full	No	-0.373	4.273
SP146	3,712.21	0.014	0.014	0	3,706.21	Not Full	No	-0.446	5.996
SP147	3,724.77	0	0	0	3,719.73	Not Full	No	-0.452	5.042
SP148	3,755.02	0.001	0.001	0	3,750.71	Not Full	No	-0.463	4.313
SP15	3,612.03	0.009	0.009	0	3,607.42	Not Full	No	-0.584	4.608
SP151	3,798.21	0.002	0.002	0	3,791.49	Not Full	No	-0.461	6.721
SP153	3,843.11	0.004	0.004	0	3,838.83	Not Full	No	-0.462	4.282
SP153A	3,845.17	0	0	0	3,840.05	Not Full	No	-0.462	5.122
SP158	3,707.33	0	0	0	3,702.61	Not Full	No	-0.5	4.72
SP16	3,622.04	0	0	0	3,618.17	Not Full	No	-0.5	3.87
SP165	3,903.92	0.031	0.031	0	3,900.10	Not Full	No	-0.469	3.819
SP166	3,931.44	0	0	0	3,925.29	Not Full	No	-0.5	6.15
SP174	3,915.61	0	0	0	3,912.22	Not Full	No	-0.5	3.39
SP181	3,724.25	0.002	0.002	0	3,717.74	Not Full	No	-0.632	6.515
SP182	3,749.67	0.002	0.002	0	3,746.52	Not Full	Yes	-0.598	3.152
SP183	3,749.80	0.001	0.001	0	3,746.52	Not Full	No	-0.587	3.281
SP184	3,766.77	0.001	0.001	0	3,762.94	Not Full	No	-0.63	3.834

PHDWF-MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP185	3,771.48	0.001	0.001	0	3,768.14	Not Full	No	-0.618	3.342
SP186	3,783.96	0.001	0.001	0	3,768.85	Not Full	Yes	0.041	15.113
SP187	3,793.39	0.001	0.001	0	3,783.85	Not Full	No	-0.63	9.543
SP188	3,820.18	0.001	0.001	0	3,812.56	Not Full	No	-0.467	7.617
SP189	3,825.22	0.001	0.001	0	3,821.23	Not Full	No	-0.451	3.991
SP19	3,571.37	0.024	0.024	0	3,566.85	Not Full	No	-0.754	4.52
SP190	3,832.74	0.031	0.031	0	3,827.94	Not Full	No	-0.457	4.797
SP191	3,866.95	0	0	0	3,862.39	Not Full	No	-0.5	4.56
SP197	3,837.08	0	0	0	3,831.99	Not Full	No	-0.5	5.09
SP20	3,593.32	0.001	0.001	0	3,588.49	Not Full	No	-0.766	4.833
SP205	3,700.88	0.001	0.001	0	3,693.99	Not Full	Yes	-0.414	6.894
SP206	3,579.92	0	0	0	3,575.08	Not Full	No	-0.5	4.84
SP21	3,598.70	0	0	0	3,593.78	Not Full	No	-0.757	4.923
SP22	3,635.69	0.004	0.004	0	3,631.34	Not Full	No	-0.623	4.346
SP23	3,643.23	0.002	0.002	0	3,638.72	Not Full	No	-0.623	4.507
SP26	3,649.01	0.003	0.003	0	3,646.18	Not Full	Yes	0.37	2.83
SP27	3,659.20	0.006	0.006	0	3,655.94	Not Full	No	-0.407	3.257
SP28	3,686.61	0	0	0	3,683.31	Not Full	No	-0.5	3.3
SP29	3,661.15	0	0	0	3,656.94	Not Full	No	-0.361	4.211
SP3	3,654.44	0.041	0.041	0	3,649.90	Not Full	No	-0.458	4.538
SP30	3,683.28	0.201	0.201	0	3,679.86	Not Full	No	-0.42	3.42
SP31	3,700.75	0	0	0	3,696.85	Not Full	No	-0.5	3.9
SP33	3,696.25	0	0	0	3,691.38	Not Full	No	-0.5	4.87
SP34	3,619.67	0.009	0.009	0	3,615.55	Not Full	No	-0.758	4.124
SP35	3,514.73	0.013	0.013	0	3,511.38	Not Full	No	-0.516	3.353
SP36	3,525.35	0.004	0.004	0	3,522.03	Not Full	No	-0.587	3.324
SP37	3,545.72	0.004	0.004	0	3,542.23	Not Full	No	-0.619	3.486
SP38	3,555.81	0.001	0.001	0	3,552.15	Not Full	No	-0.493	3.659
SP39	3,578.00	0.017	0.017	0	3,574.25	Not Full	No	-0.635	3.751
SP40	3,595.28	0.013	0.013	0	3,592.59	Not Full	No	-0.639	2.686
SP41	3,603.01	0.004	0.004	0	3,599.56	Not Full	No	-0.583	3.449
SP42	3,609.56	0.002	0.002	0	3,605.44	Not Full	Yes	-0.454	4.121
SP43	3,611.46	0.002	0.002	0	3,607.29	Not Full	No	-0.544	4.171
SP44	3,619.54	0.002	0.002	0	3,612.76	Not Full	No	-0.617	6.783
SP45	3,600.78	0	0	0	3,597.28	Not Full	No	-0.5	3.5
SP48	3,536.07	0	0	0	3,532.32	Not Full	No	-0.5	3.75
SP5	3,686.85	0	0	0	3,683.98	Not Full	No	-0.5	2.87
SP50	3,634.21	0	0	0	3,630.85	Not Full	No	-0.5	3.36
SP6	3,689.52	0	0	0	3,685.54	Not Full	No	-0.5	3.98
SP60	3,559.21	0	0	0	3,555.61	Not Full	No	-0.5	3.6
SP61	3,516.29	0.006	0.006	0	3,512.68	Not Full	No	0.251	3.615
SP62	3,515.75	0.002	0.002	0	3,512.73	Not Full	No	-0.308	3.025
SP63	3,515.65	0.001	0.001	0	3,513.19	Not Full	No	0.068	2.459
SP64	3,515.34	0.001	0.001	0	3,513.24	Not Full	No	0.02	2.096
SP65	3,525.63	0.001	0.001	0	3,521.62	Not Full	No	-0.74	4.007

PHDWF-MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP66	3,532.17	0.008	0.008	0	3,528.62	Not Full	No	-0.733	3.55
SP71	3,649.31	0.006	0.006	0	3,645.57	Not Full	No	-0.729	3.745
SP72	3,658.01	0.023	0.023	0	3,652.26	Not Full	No	-0.594	5.748
SP73	3,706.39	0	0	0	3,701.74	Not Full	No	-0.5	4.65
SP78	3,664.94	0.002	0.002	0	3,661.18	Not Full	No	-0.596	3.759
SP78A	3,659.53	0.001	0.001	0	3,654.28	Not Full	No	-0.427	5.247
SP79	3,659.40	0	0	0	3,653.17	Not Full	No	-0.596	6.23
SP80	3,664.81	0.031	0.031	0	3,658.73	Not Full	No	-0.606	6.079
SP81	3,676.54	0	0	0	3,673.38	Not Full	No	-0.5	3.16
SP83	3,684.65	0.007	0.007	0	3,680.92	Not Full	No	-0.479	3.729
SP87	3,631.45	0.003	0.003	0	3,625.87	Not Full	No	-0.668	5.584
SP88	3,635.66	0.002	0.002	0	3,630.36	Not Full	No	-0.636	5.303
SP89	3,683.90	0	0	0	3,680.05	Not Full	No	-0.5	3.85



Detail Map:

0 250 500 1,000 1,500 2,000 ft

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

D over D

- <75% d/D
- 75% - 99% d/D
- >99% d/D
- Not Modeled

Manhole

- MH not surcharged
- MH surcharged
- Not Modeled

I&I Identification Reduction Project
PHWWF Hydraulic Model

BLACKWATER CONSULTING ENGINEERS, INC.

PHWWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P10	SP40	SP39	10	290.3	0.063	1.485	Free Surface	7.036	0.248	0.27	0.207	0.38	3.239	11.001	No	0.207	7.036
P103	SP108	MH33	6	354.9	0.101	0	Free Surface	0	0	0	0	0	0	3.581	Yes	0.015	0
P105	MH31	MH33	6	446.7	0.038	0	Free Surface	0	0	0	0	0	0	2.185	Yes	0.015	0
P107	MH34	MH33	6	206.326	0.048	0	Free Surface	0	0	0	0	0	0	2.455	No	0	0
P11	SP41	SP40	10	316.6	0.022	1.462	Free Surface	4.779	0.324	0.454	0.27	0.377	1.902	6.444	No	0.27	4.779
P115	MH13A	DMH10	6	542.213	0.002	0	Pressurized	0	0	0	0	0	0	0.551	Yes	0.5	0
P12	DMH4	SP41	10	323.547	0.012	1.456	Free Surface	3.836	0.379	0.612	0.316	0.376	1.395	4.761	No	0.316	3.836
P120	MH24	DMH8	10	324.8	0.009	0.354	Free Surface	2.359	0.195	0.167	0.163	0.181	1.233	4.244	No	0.163	2.359
P121	SP71	MH24	10	353.9	0.016	0.308	Free Surface	2.735	0.16	0.111	0.133	0.169	1.587	5.546	No	0.133	2.735
P122	LH94	SP71	6	103.86	0.001	0	Free Surface	0	0	0	0	0	0	0.366	Yes	0.042	0
P123	LH95	MH24	6	175.393	0.01	0	Free Surface	0	0	0	0	0	0	1.146	No	0	0
P13	DMH5	DMH4	10	352.8	0.002	1.43	Free Surface	1.901	0.651	1.517	0.543	0.373	0.487	1.886	No	0.543	1.901
P131	MH25	SP71	8	139.979	0.002	0.299	Free Surface	1.376	0.35	0.525	0.233	0.177	0.586	1.14	No	0.233	1.376
P132	SP72	MH25	8	352.4	0.017	0.13	Free Surface	2.228	0.138	0.082	0.092	0.115	1.56	3.167	No	0.092	2.228
P133	SP80	SP72	8	344.302	0.018	0.092	Free Surface	2.055	0.116	0.057	0.077	0.097	1.578	3.265	No	0.077	2.055
P134	SP73	SP72	6	722.251	0.068	0	Free Surface	0	0	0	0	0	0	2.93	No	0	0
P14	SP42	DMH5	10	468.2	0.003	1.163	Free Surface	2.081	0.51	1.032	0.425	0.335	0.633	2.252	Yes	0.492	3.465
P143	SP89	SP80	6	257.602	0.082	0	Free Surface	0	0	0	0	0	0	3.232	No	0	0
P15	SP43	SP42	10	246.224	0.007	1.16	Free Surface	3.009	0.384	0.624	0.32	0.334	1.088	3.715	No	0.32	3.009
P159	MH27	SP80	6	162.974	0.069	0.041	Free Surface	2.655	0.082	0.028	0.041	0.069	2.805	2.948	No	0.041	2.655
P16	SP44	SP43	10	246.839	0.022	1.156	Free Surface	4.529	0.284	0.353	0.237	0.334	1.937	6.558	Yes	0.265	7.741
P160	SP81	MH27	6	218.316	0.014	0	Free Surface	0	0	0	0	0	0	1.326	No	0	0
P168	SP83	MH27	6	298.2	0.036	0.012	Free Surface	1.465	0.054	0.011	0.027	0.038	1.907	2.121	No	0.027	1.465
P169	SP158	SP83	6	396.843	0.054	0	Free Surface	0	0	0	0	0	0	2.626	No	0	0
P17	MH28	SP44	10	361.825	0.024	1.152	Free Surface	4.63	0.279	0.34	0.233	0.333	2	6.774	Yes	0.242	8.777
P171	DMH16	MH25	8	47.239	0.001	0.168	Free Surface	0.959	0.299	0.39	0.2	0.132	0.446	0.864	No	0.2	0.959
P172	SP79	DMH16	8	222.487	0.032	0.166	Free Surface	2.983	0.134	0.077	0.089	0.131	2.122	4.32	Yes	0.12	3.902
P173	SP78	SP78A	8	225.2	0.031	0.164	Free Surface	2.931	0.135	0.078	0.09	0.13	2.081	4.235	No	0.09	2.931
P174	MH26	SP78	8	471.4	0.039	0.161	Free Surface	3.174	0.126	0.067	0.084	0.129	2.334	4.784	Yes	0.087	6.005
P175	MH46	MH26	8	424.927	0.019	0.161	Free Surface	2.449	0.15	0.098	0.1	0.129	1.641	3.304	No	0.1	2.449
P176	LH53	DMH16	6	384.034	0.041	0	Free Surface	0	0	0	0	0	0	2.289	No	0	0
P176A	SP78A	SP79	6	23.041	0.039	0.166	Free Surface	3.312	0.186	0.15	0.093	0.142	2.296	2.211	No	0.093	3.312
P177	SP205	MH46	6	243.207	0.005	0.089	Free Surface	1.379	0.222	0.215	0.111	0.103	0.871	0.829	No	0.111	1.379
P178	MH47	SP205	6	105.911	0.037	0.088	Free Surface	2.713	0.137	0.081	0.069	0.103	2.199	2.176	Yes	0.07	5.273
P179	SP146	MH47	6	221.262	0.037	0.087	Free Surface	2.702	0.137	0.08	0.068	0.102	2.196	2.174	Yes	0.069	5.348
P18	DMH10	MH28	10	265	0.011	1.127	Pressurized	3.505	0.336	0.486	0.28	0.329	1.367	4.636	Yes	0.833	2.066
P180	MH48	SP146	6	281.716	0.127	0	Free Surface	0	0	0	0	0	0	4.006	No	0	0
P186	SP147	SP146	6	415.5	0.033	0.064	Free Surface	2.349	0.122	0.063	0.061	0.087	2.029	2.033	Yes	0.09	2.667
P187	SP148	SP147	6	337.851	0.092	0.064	Free Surface	3.37	0.095	0.038	0.048	0.087	3.303	3.408	Yes	0.054	5.539
P188	SP151	SP148	6	585.686	0.07	0.062	Free Surface	3.03	0.1	0.042	0.05	0.086	2.894	2.967	No	0.05	3.03
P189	SP153	SP151	6	635.676	0.074	0.058	Free Surface	3.039	0.095	0.038	0.048	0.083	2.974	3.068	No	0.048	3.039

PHWWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P19	SP87	DMH10	10	89.808	0.062	1.108	Free Surface	6.454	0.215	0.202	0.179	0.326	3.211	10.981	Yes	0.833	2.031
P190	SP153A	SP153	6	21.886	0.056	0.052	Free Surface	2.657	0.097	0.039	0.048	0.078	2.581	2.657	No	0.048	2.657
P191	SP165	SP153A	6	432.6	0.139	0.052	Free Surface	3.657	0.078	0.025	0.039	0.078	3.966	4.198	Yes	0.124	1.367
P192	SP174	SP165	6	294.009	0.042	0	Free Surface	0	0	0	0	0	0	2.303	Yes	0.105	0
P2	SP35	MH19	10	433.5	0.009	1.553	Free Surface	3.603	0.417	0.728	0.348	0.389	1.24	4.268	No	0.348	3.603
P20	SP88	SP87	10	147.189	0.03	1.103	Free Surface	4.985	0.257	0.288	0.214	0.325	2.254	7.648	No	0.214	4.985
P200	SP166	SP165	6	222.659	0.114	0	Free Surface	0	0	0	0	0	0	3.799	Yes	0.1	0
P209	SP181	MH46	8	269.1	0.112	0.07	Free Surface	3.567	0.066	0.017	0.044	0.084	3.649	8.111	No	0.044	3.567
P21	DMH9	SP88	10	338.632	0.011	1.1	Free Surface	3.481	0.331	0.474	0.276	0.325	1.367	4.636	No	0.276	3.481
P210	SP182	SP181	8	294.452	0.092	0.067	Free Surface	3.284	0.068	0.018	0.045	0.083	3.316	7.343	No	0.045	3.284
P211	LH182A	SP182	8	86.944	0.033	0	Free Surface	0	0	0	0	0	0	4.418	Yes	0.023	0
P212	SP183	SP182	8	100.434	0.017	0.064	Free Surface	1.792	0.099	0.041	0.066	0.081	1.491	3.143	No	0.066	1.792
P213	SP184	SP183	8	227.462	0.072	0.062	Free Surface	2.95	0.069	0.019	0.046	0.079	2.95	6.515	No	0.046	2.95
P214	SP185	SP184	8	260.509	0.02	0.06	Free Surface	1.862	0.092	0.035	0.061	0.078	1.607	3.417	No	0.061	1.862
P215	SP186	SP185	8	75.925	-0.001	0.059	Pressurized	0.084	1		0.667	0	0.018		No	0.667	0.084
P216	SP187	SP186	8	257.803	0.06	0.058	Free Surface	2.715	0.07	0.019	0.046	0.077	2.701	5.957	Yes	0.332	0.332
P217	SP188	SP187	6	213.014	0.122	0.056	Free Surface	3.572	0.083	0.028	0.042	0.081	3.744	3.928	No	0.042	3.572
P218	SP189	SP188	6	412.074	0.02	0.054	Free Surface	1.892	0.125	0.067	0.063	0.08	1.609	1.607	No	0.063	1.892
P219	SP190	SP189	6	198.326	0.034	0.052	Free Surface	2.234	0.109	0.05	0.054	0.078	2.042	2.073	Yes	0.064	3.556
P22	DMH8	DMH9	10	129.235	0.02	1.093	Free Surface	4.303	0.283	0.35	0.236	0.324	1.844	6.244	Yes	0.262	7.426
P235	SP197	SP190	6	206.457	0.019	0	Free Surface	0	0	0	0	0	0	1.56	No	0	0
P236	SP191	SP190	6	375.372	0.092	0	Free Surface	0	0	0	0	0	0	3.409	Yes	0.007	0
P237	MH49	MH19	10	852.75	0.005	0.401	Free Surface	1.956	0.243	0.259	0.203	0.193	0.91	3.094	Yes	0.833	0.735
P238	SP61	MH49A	10	440.393	0	0.392	Pressurized	0.359	1		0.833	0	0.069		No	0.833	0.359
P239	SP62	SP61	10	451.542	0.001	0.382	Free Surface	1.152	0.344	0.508	0.286	0.188	0.443	1.505	Yes	0.833	0.701
P240	SP63	SP62	10	67.848	-0.001	0.379	Pressurized	0.348	1		0.833	0	0.067		No	0.833	0.348
P241	SP64	SP63	10	91.883	0	0.378	Pressurized	0.347	1		0.833	0	0.067		No	0.833	0.347
P242	DMH7	SP64	10	341.477	0.004	0.377	Free Surface	1.749	0.252	0.278	0.21	0.187	0.798	2.711	Yes	0.466	1.202
P243	SP65	DMH7	10	228.486	0.035	0.357	Free Surface	3.768	0.142	0.087	0.118	0.182	2.326	8.226	Yes	0.325	1.814
P244	SP66	SP65	10	269.4	0.026	0.355	Free Surface	3.377	0.153	0.101	0.127	0.181	2.01	7.057	No	0.127	3.377
P245	MH20	SP66	6	309.212	0.036	0	Free Surface	0	0	0	0	0	0	2.12	No	0	0
P25	SP45	SP39	6	401.509	0.057	0	Free Surface	0	0	0	0	0	0	2.695	Yes	0.012	0
P250	LH45	MH49	6	281.774	0.04	0	Free Surface	0	0	0	0	0	0	2.246	No	0	0
P251	SP60	MH49	6	219.301	0.21	0	Free Surface	0	0	0	0	0	0	5.154	No	0	0
P253	MH22	DMH7	6	62.688	0.007	0	Free Surface	0	0	0	0	0	0	0.932	Yes	0.145	0
P260	MH43	SP66	10	267.19	0.057	0.342	Free Surface	4.411	0.124	0.065	0.103	0.178	2.925	10.493	No	0.103	4.411
P261	SP138	MH43	6	449.059	0.006	0	Free Surface	0	0	0	0	0	0	0.863	Yes	0.002	0
P272	MH51	MH43	10	146.3	0.034	0.292	Free Surface	3.517	0.13	0.072	0.108	0.164	2.276	8.122	No	0.108	3.517
P273	MH139	MH51	10	198.079	0.027	0.25	Free Surface	3.093	0.127	0.069	0.106	0.152	2.022	7.234	Yes	0.107	6.064
P274	SP19	MH139	10	287.107	0.033	0.249	Free Surface	3.296	0.121	0.063	0.101	0.151	2.207	7.933	Yes	0.104	6.341
P275	SP206	MH51	6	151.821	0.185	0	Free Surface	0	0	0	0	0	0	4.835	Yes	0.5	0

PHWWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P29	DMH6	SP40	6	201.685	0.131	0	Free Surface	0	0	0	0	0	0	4.072	No	0	0
P291	SP20	SP19	10	472.4	0.046	0.208	Free Surface	3.519	0.103	0.044	0.086	0.138	2.567	9.406	Yes	0.094	6.172
P292	SP21	SP20	10	193.767	0.026	0.207	Free Surface	2.89	0.117	0.058	0.098	0.138	1.971	7.114	No	0.098	2.89
P293	SP11	SP21	10	342.355	0.021	0.207	Free Surface	2.659	0.124	0.066	0.103	0.138	1.761	6.314	No	0.103	2.659
P294	LH55	SP19	6	282.11	0.088	0	Free Surface	0	0	0	0	0	0	3.337	No	0	0
P3	SP48	SP35	6	327.147	0.065	0	Free Surface	0	0	0	0	0	0	2.86	Yes	0.12	0
P310	MH10	SP11	6	287.838	0.083	0	Free Surface	0	0	0	0	0	0	3.241	No	0	0
P321	SP15	SP11	8	446.822	0.015	0.157	Free Surface	2.238	0.157	0.107	0.105	0.127	1.466	2.938	No	0.105	2.238
P322	SP110	SP15	8	224.3	0.025	0.143	Free Surface	2.628	0.132	0.074	0.088	0.121	1.886	3.846	No	0.088	2.628
P323	MH2	SP110	6	335	0.023	0.14	Free Surface	2.632	0.193	0.163	0.097	0.13	1.787	1.716	No	0.097	2.632
P324	SP16	SP15	6	174.409	0.06	0	Free Surface	0	0	0	0	0	0	2.753	No	0	0
P328	SP22	MH2	8	401.431	0.026	0.056	Free Surface	1.993	0.084	0.029	0.056	0.075	1.804	3.883	No	0.056	1.993
P329	SP23	SP22	8	352.604	0.021	0.049	Free Surface	1.781	0.082	0.028	0.055	0.07	1.626	3.506	Yes	0.055	3.517
P33	SP50	DMH4	6	142.229	0.193	0	Free Surface	0	0	0	0	0	0	4.945	Yes	0.054	0
P330	SP111	SP23	8	444.391	0.044	0.046	Free Surface	2.269	0.067	0.018	0.045	0.068	2.302	5.105	Yes	0.05	3.859
P342	MH3	MH2	8	233.125	0.057	0.079	Free Surface	2.931	0.082	0.027	0.054	0.09	2.687	5.801	No	0.054	2.931
P343	SP3	MH3	6	254.799	0.061	0.068	Free Surface	2.978	0.108	0.049	0.054	0.09	2.737	2.78	Yes	0.079	3.393
P344	SP6	SP3	6	341.914	0.103	0	Free Surface	0	0	0	0	0	0	3.616	No	0	0
P354	MH4	SP3	6	504.705	0.104	0	Free Surface	0	0	0	0	0	0	3.632	No	0	0
P357	SP5	MH3	6	392.336	0.127	0	Free Surface	0	0	0	0	0	0	4.003	Yes	0.042	0
P37	SP34	DMH5	10	110.176	0.104	0.265	Free Surface	5.04	0.095	0.037	0.079	0.156	3.826	14.157	Yes	0.216	2.359
P38	MH16	SP34	6	132.958	0.08	0.25	Free Surface	4.82	0.19	0.158	0.095	0.175	3.302	3.174	No	0.095	4.82
P39	SP141	MH16	6	292.273	0.023	0.25	Free Surface	3.096	0.259	0.294	0.13	0.175	1.797	1.7	No	0.13	3.096
P4	SP36	SP35	10	427	0.025	1.531	Free Surface	5.106	0.319	0.441	0.266	0.386	2.048	6.939	Yes	0.284	9.323
P40	DMH1	SP141	6	66.86	0.067	0.239	Free Surface	4.472	0.194	0.164	0.097	0.171	3.031	2.909	No	0.097	4.472
P404	MH49A	MH49	10	37.524	0.042	0.392	Free Surface	4.121	0.142	0.087	0.119	0.191	2.542	8.987	No	0.119	4.121
P408	LH500	SP83	4	43.659	0.015	0	Free Surface	0	0	0	0	0	0	0.473	No	0	0
P41	MH17	DMH1	6	102	0.012	0.235	Free Surface	2.443	0.294	0.376	0.147	0.17	1.325	1.251	No	0.147	2.443
P42	DMH2	MH17	6	154.4	0.04	0.229	Free Surface	3.69	0.215	0.203	0.108	0.168	2.366	2.256	No	0.108	3.69
P43	SP26	DMH2	6	60.085	-0.005	0.225	Pressurized	0.573	1		0.5	0	0.143		No	0.5	0.573
P44	SP27	SP26	6	154.961	0.067	0.22	Free Surface	4.375	0.186	0.151	0.093	0.164	3.033	2.92	Yes	0.437	1.209
P45	LH31	SP34	6	648.338	0.081	0	Free Surface	0	0	0	0	0	0	3.203	Yes	0.03	0
P46	LH23	DMH2	6	177.623	0.1	0	Free Surface	0	0	0	0	0	0	3.557	Yes	0.005	0
P47	SP28	SP27	6	323.957	0.084	0	Free Surface	0	0	0	0	0	0	3.255	No	0	0
P5	SP37	SP36	10	464.34	0.044	1.524	Free Surface	6.228	0.276	0.332	0.23	0.385	2.708	9.173	Yes	0.26	10.486
P50	SP29	SP27	6	65.181	0.012	0.21	Free Surface	2.359	0.277	0.336	0.139	0.16	1.32	1.247	No	0.139	2.359
P51	MH18	SP29	6	187.1	0.037	0.21	Free Surface	3.496	0.21	0.193	0.105	0.16	2.271	2.169	No	0.105	3.496
P52	SP31	MH18	6	410.931	0.08	0	Free Surface	0	0	0	0	0	0	3.181	No	0	0
P56	SP30	MH18	6	141.361	0.111	0.201	Free Surface	5.074	0.157	0.107	0.079	0.156	3.838	3.747	No	0.079	5.074
P57	SP33	SP30	6	249.63	0.045	0	Free Surface	0	0	0	0	0	0	2.394	No	0	0
P59	LH30	SP30	6	518.482	0.083	0	Free Surface	0	0	0	0	0	0	3.242	No	0	0

PHWWF-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P6	DMH3	SP37	10	179.545	0.042	1.518	Free Surface	6.162	0.277	0.335	0.231	0.385	2.672	9.051	Yes	0.242	11.514
P60	MH35	MH28	6	118.401	0.069	0	Free Surface	0	0	0	0	0	0	2.952	Yes	0.12	0
P66	SP135	SP87	6	324.653	0.111	0	Free Surface	0	0	0	0	0	0	3.754	Yes	0.093	0
P7	LH32	DMH3	6	240.205	0.111	0	Free Surface	0	0	0	0	0	0	3.741	No	0	0
P70	SP103	DMH8	8	146.579	0.054	0.729	Free Surface	5.562	0.243	0.259	0.162	0.281	2.895	5.633	No	0.162	5.562
P71	SP112	SP103	8	140.1	0.032	0.291	Free Surface	3.527	0.176	0.134	0.117	0.174	2.18	4.328	Yes	0.133	5.842
P72	SP113	SP112	6	39.216	0.053	0.285	Free Surface	4.322	0.224	0.221	0.112	0.188	2.711	2.579	Yes	0.117	8.164
P73	SP114	SP113	6	125.389	0.076	0.269	Free Surface	4.838	0.199	0.174	0.1	0.182	3.229	3.094	No	0.1	4.838
P74	MH37	SP114	6	142.208	0.08	0.267	Free Surface	4.914	0.196	0.169	0.098	0.182	3.308	3.173	No	0.098	4.914
P75	MH38	MH37	6	276.642	0.023	0.234	Free Surface	3.028	0.251	0.276	0.126	0.169	1.788	1.693	No	0.126	3.028
P76	SP126	SP112	6	196.298	0.04	0	Free Surface	0	0	0	0	0	0	2.25	Yes	0.029	0
P78	LH76	SP113	6	510.568	0.048	0	Free Surface	0	0	0	0	0	0	2.475	No	0	0
P79	SP118	MH37	6	164.077	0.101	0	Free Surface	0	0	0	0	0	0	3.582	No	0	0
P8	SP38	DMH3	10	294.719	0.007	1.514	Free Surface	3.193	0.449	0.828	0.374	0.384	1.052	3.655	No	0.374	3.193
P85	LH83	MH38	6	201.023	0.03	0	Free Surface	0	0	0	0	0	0	1.949	No	0	0
P86	SP123	MH38	6	294.219	0.102	0	Free Surface	0	0	0	0	0	0	3.595	No	0	0
P9	SP39	SP38	10	373.6	0.059	1.512	Free Surface	6.911	0.255	0.284	0.212	0.384	3.137	10.647	No	0.212	6.911
P91	SP104	SP103	8	350.624	0.016	0.438	Free Surface	3.145	0.253	0.282	0.169	0.215	1.6	3.109	No	0.169	3.145
P92	SP105	SP104	8	337.259	0.015	0.436	Free Surface	3.07	0.257	0.289	0.171	0.215	1.551	3.012	No	0.171	3.07
P93	DMH11	SP105	8	409.479	0.008	0.422	Free Surface	2.373	0.302	0.398	0.202	0.211	1.097	2.125	No	0.202	2.373
P94	MH32	DMH11	8	134.8	0.034	0.4	Free Surface	3.958	0.202	0.179	0.135	0.206	2.271	4.462	No	0.135	3.958
P95	MH33	MH32	8	227.328	0.042	0.397	Free Surface	4.244	0.192	0.161	0.128	0.205	2.505	4.941	Yes	0.133	7.985
P96	LH66	SP104	6	265.519	0.102	0	Free Surface	0	0	0	0	0	0	3.6	Yes	0.061	0
P97	SP102	SP105	6	206.081	0.125	0	Free Surface	0	0	0	0	0	0	3.981	No	0	0
P99	SP100	DMH11	6	167.289	0.021	0	Free Surface	0	0		0	0	0	1.634	Yes	0.027	0

PHWWF-MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
DMH10	3,629.76	0.019	0.019	0	3,622.09	Not Full	No	1.163	7.673
DMH11	3,667.36	0.022	0.022	0	3,659.01	Not Full	No	-0.463	8.346
DMH16	3,653.63	0.002	0.002	0	3,646.18	Not Full	Yes	-0.467	7.45
DMH2	3,655.29	0.004	0.004	0	3,645.60	Not Full	No	-0.39	9.69
DMH3	3,563.69	0.004	0.004	0	3,549.88	Not Full	No	-0.59	13.807
DMH4	3,615.98	0.026	0.026	0	3,603.49	Not Full	No	-0.506	12.493
DMH5	3,613.93	0.002	0.002	0	3,604.38	Not Full	Yes	-0.28	9.547
DMH6	3,628.84	0	0	0	3,619.09	Not Full	No	-0.5	9.75
DMH7	3,522.22	0.02	0.02	0	3,514.05	Not Full	Yes	-0.623	8.169
DMH8	3,644.59	0.009	0.009	0	3,636.78	Not Full	No	-0.591	7.808
DMH9	3,641.93	0.007	0.007	0	3,634.21	Not Full	No	-0.551	7.717
LH182A	3,747.64	0	0	0	3,747.64	Full	No	-0.667	0
LH23	3,666.84	0	0	0	3,663.34	Not Full	No	-0.5	3.5
LH30	3,727.99	0	0	0	3,723.09	Not Full	No	-0.5	4.9
LH31	3,671.72	0	0	0	3,668.02	Not Full	No	-0.5	3.7
LH32	3,578.96	0	0	0	3,576.56	Not Full	No	-0.5	2.4
LH45	3,520.47	0	0	0	3,520.47	Full	No	-0.5	0
LH500	3,685.76	0	0	0	3,682.12	Not Full	No	-0.333	3.64
LH53	3,668.67	0	0	0	3,664.77	Not Full	No	-0.5	3.9
LH55	3,598.29	0	0	0	3,593.29	Not Full	No	-0.5	5
LH66	3,680.15	0	0	0	3,677.58	Not Full	No	-0.5	2.57
LH76	3,678.26	0	0	0	3,676.06	Not Full	No	-0.5	2.2
LH83	3,688.41	0	0	0	3,684.61	Not Full	No	-0.5	3.8
LH94	3,648.42	0	0	0	3,645.62	Not Full	No	-0.5	2.8
LH95	3,646.54	0	0	0	3,641.84	Not Full	No	-0.5	4.7
MH10	3,628.10	0	0	0	3,624.80	Not Full	No	-0.5	3.3
MH139	3,562.01	0.001	0.001	0	3,557.52	Not Full	No	-0.727	4.494
MH13A	3,631.84	0	0	0	3,622.09	Not Full	No	0.197	9.753
MH16	3,634.38	0	0	0	3,626.15	Not Full	No	-0.403	8.233
MH17	3,644.50	0.006	0.006	0	3,639.05	Not Full	No	-0.351	5.451
MH18	3,669.60	0.009	0.009	0	3,663.91	Not Full	No	-0.393	5.693
MH2	3,626.31	0.005	0.005	0	3,621.01	Not Full	No	-0.403	5.303
MH20	3,546.44	0	0	0	3,539.75	Not Full	No	-0.5	6.69
MH22	3,518.93	0	0	0	3,514.19	Not Full	No	-0.5	4.74
MH24	3,645.52	0.046	0.046	0	3,639.93	Not Full	No	-0.67	5.587
MH25	3,653.52	0.001	0.001	0	3,646.05	Not Full	Yes	-0.432	7.466
MH26	3,685.98	0	0	0	3,679.56	Not Full	No	-0.583	6.416
MH27	3,675.65	0.028	0.028	0	3,670.29	Not Full	No	-0.459	5.359
MH28	3,626.14	0.025	0.025	0	3,621.38	Not Full	No	-0.594	4.76
MH3	3,638.35	0.011	0.011	0	3,634.41	Not Full	No	-0.612	3.945
MH31	3,699.23	0	0	0	3,694.23	Not Full	No	-0.5	5
MH32	3,673.93	0.003	0.003	0	3,667.97	Not Full	No	-0.53	5.963
MH33	3,684.08	0.397	0.397	0	3,677.41	Not Full	No	-0.537	6.67
MH34	3,692.70	0	0	0	3,687.40	Not Full	No	-0.5	5.3
MH35	3,634.94	0	0	0	3,629.29	Not Full	No	-0.5	5.65

PHWWF-MH RESULTS

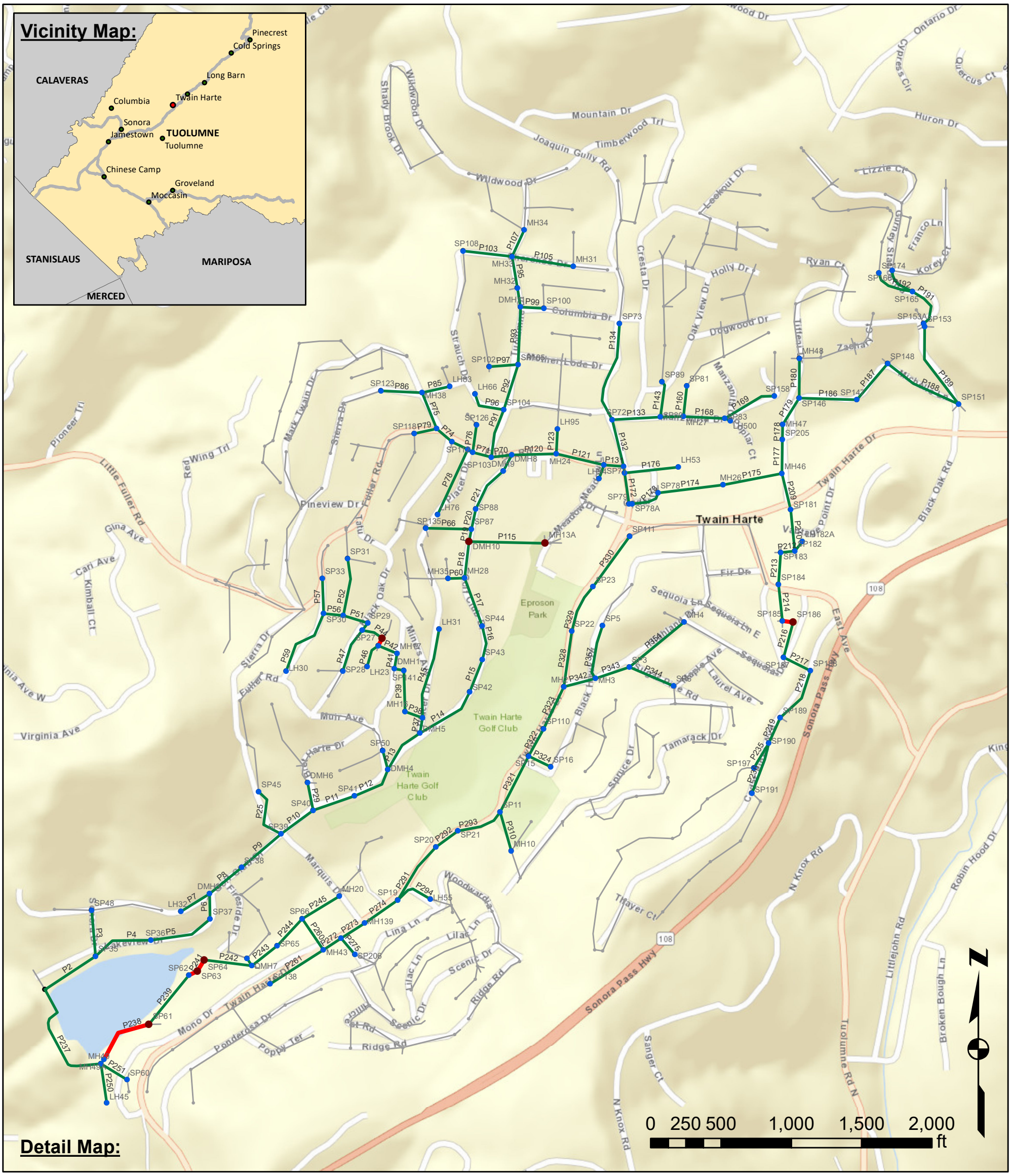
ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
MH37	3,677.34	0.033	0.033	0	3,672.14	Not Full	No	-0.399	5.199
MH38	3,684.18	0.234	0.234	0	3,678.53	Not Full	No	-0.372	5.652
MH4	3,708.71	0	0	0	3,702.88	Not Full	No	-0.5	5.83
MH43	3,552.81	0.05	0.05	0	3,544.21	Not Full	No	-0.73	8.596
MH46	3,703.90	0.002	0.002	0	3,687.58	Not Full	No	-0.566	16.319
MH47	3,702.00	0.001	0.001	0	3,697.97	Not Full	No	-0.431	4.031
MH48	3,747.67	0	0	0	3,741.98	Not Full	No	-0.5	5.69
MH49	3,514.02	0.009	0.009	0	3,509.22	Not Full	Yes	-0.63	4.797
MH49A	3,515.09	0	0	0	3,511.91	Not Full	No	-0.714	3.181
MH51	3,557.00	0.043	0.043	0	3,552.15	Not Full	No	-0.725	4.851
SP100	3,666.19	0	0	0	3,662.49	Not Full	No	-0.5	3.7
SP102	3,686.56	0	0	0	3,681.76	Not Full	No	-0.5	4.8
SP103	3,648.66	0.001	0.001	0	3,644.73	Not Full	No	-0.498	3.931
SP104	3,654.80	0.002	0.002	0	3,650.52	Not Full	No	-0.495	4.279
SP105	3,659.66	0.013	0.013	0	3,655.78	Not Full	No	-0.493	3.876
SP108	3,716.92	0	0	0	3,713.32	Not Full	No	-0.5	3.6
SP11	3,605.97	0.05	0.05	0	3,600.87	Not Full	No	-0.73	5.096
SP110	3,617.69	0.003	0.003	0	3,613.11	Not Full	No	-0.579	4.582
SP111	3,662.70	0.046	0.046	0	3,658.45	Not Full	No	-0.622	4.255
SP112	3,653.89	0.006	0.006	0	3,649.17	Not Full	No	-0.549	4.722
SP113	3,656.31	0.015	0.015	0	3,651.23	Not Full	No	-0.385	5.085
SP114	3,665.33	0.002	0.002	0	3,660.81	Not Full	No	-0.397	4.517
SP118	3,692.79	0	0	0	3,688.79	Not Full	No	-0.5	4
SP123	3,712.66	0	0	0	3,708.86	Not Full	No	-0.5	3.8
SP126	3,659.81	0	0	0	3,656.96	Not Full	No	-0.5	2.85
SP135	3,665.49	0	0	0	3,661.84	Not Full	No	-0.5	3.65
SP138	3,551.28	0	0	0	3,546.85	Not Full	No	-0.5	4.43
SP141	3,637.12	0.011	0.011	0	3,632.85	Not Full	No	-0.368	4.268
SP146	3,712.21	0.023	0.023	0	3,706.23	Not Full	No	-0.431	5.981
SP147	3,724.77	0	0	0	3,719.74	Not Full	No	-0.439	5.029
SP148	3,755.02	0.002	0.002	0	3,750.72	Not Full	No	-0.452	4.302
SP15	3,612.03	0.014	0.014	0	3,607.45	Not Full	No	-0.562	4.585
SP151	3,798.21	0.004	0.004	0	3,791.50	Not Full	No	-0.45	6.71
SP153	3,843.11	0.006	0.006	0	3,838.84	Not Full	No	-0.452	4.272
SP153A	3,845.17	0	0	0	3,840.06	Not Full	No	-0.452	5.112
SP158	3,707.33	0	0	0	3,702.61	Not Full	No	-0.5	4.72
SP16	3,622.04	0	0	0	3,618.17	Not Full	No	-0.5	3.87
SP165	3,903.92	0.052	0.052	0	3,900.11	Not Full	No	-0.461	3.811
SP166	3,931.44	0	0	0	3,925.29	Not Full	No	-0.5	6.15
SP174	3,915.61	0	0	0	3,912.22	Not Full	No	-0.5	3.39
SP181	3,724.25	0.003	0.003	0	3,717.74	Not Full	No	-0.623	6.506
SP182	3,749.67	0.003	0.003	0	3,744.80	Not Full	No	-0.622	4.875
SP183	3,749.80	0.002	0.002	0	3,746.51	Not Full	No	-0.601	3.294
SP184	3,766.77	0.002	0.002	0	3,762.95	Not Full	No	-0.621	3.824
SP185	3,771.48	0.001	0.001	0	3,768.15	Not Full	No	-0.605	3.329

PHWWF-MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP186	3,783.96	0.001	0.001	0	3,768.85	Not Full	Yes	0.042	15.111
SP187	3,793.39	0.002	0.002	0	3,783.86	Not Full	No	-0.62	9.534
SP188	3,820.18	0.002	0.002	0	3,812.57	Not Full	No	-0.458	7.608
SP189	3,825.22	0.002	0.002	0	3,821.24	Not Full	No	-0.437	3.977
SP19	3,571.37	0.041	0.041	0	3,566.87	Not Full	No	-0.732	4.499
SP190	3,832.74	0.052	0.052	0	3,827.96	Not Full	No	-0.445	4.785
SP191	3,866.95	0	0	0	3,862.39	Not Full	No	-0.5	4.56
SP197	3,837.08	0	0	0	3,831.99	Not Full	No	-0.5	5.09
SP20	3,593.32	0.001	0.001	0	3,588.51	Not Full	No	-0.747	4.814
SP205	3,700.88	0.001	0.001	0	3,694.01	Not Full	Yes	-0.389	6.869
SP206	3,579.92	0	0	0	3,575.08	Not Full	No	-0.5	4.84
SP21	3,598.70	0	0	0	3,593.80	Not Full	No	-0.735	4.902
SP22	3,635.69	0.007	0.007	0	3,631.36	Not Full	No	-0.611	4.334
SP23	3,643.23	0.003	0.003	0	3,638.74	Not Full	No	-0.612	4.495
SP26	3,649.01	0.005	0.005	0	3,646.19	Not Full	Yes	0.378	2.822
SP27	3,659.20	0.01	0.01	0	3,655.95	Not Full	No	-0.405	3.255
SP28	3,686.61	0	0	0	3,683.31	Not Full	No	-0.5	3.3
SP29	3,661.15	0	0	0	3,656.94	Not Full	No	-0.36	4.21
SP3	3,654.44	0.068	0.068	0	3,649.91	Not Full	No	-0.446	4.526
SP30	3,683.28	0.201	0.201	0	3,679.86	Not Full	No	-0.42	3.42
SP31	3,700.75	0	0	0	3,696.85	Not Full	No	-0.5	3.9
SP33	3,696.25	0	0	0	3,691.38	Not Full	No	-0.5	4.87
SP34	3,619.67	0.015	0.015	0	3,615.55	Not Full	No	-0.754	4.12
SP35	3,514.73	0.021	0.021	0	3,511.42	Not Full	No	-0.473	3.31
SP36	3,525.35	0.007	0.007	0	3,522.06	Not Full	No	-0.555	3.292
SP37	3,545.72	0.006	0.006	0	3,542.26	Not Full	No	-0.591	3.458
SP38	3,555.81	0.002	0.002	0	3,552.20	Not Full	No	-0.448	3.614
SP39	3,578.00	0.027	0.027	0	3,574.27	Not Full	No	-0.609	3.726
SP40	3,595.28	0.022	0.022	0	3,592.62	Not Full	No	-0.615	2.662
SP41	3,603.01	0.006	0.006	0	3,599.59	Not Full	No	-0.552	3.419
SP42	3,609.56	0.003	0.003	0	3,605.49	Not Full	Yes	-0.402	4.068
SP43	3,611.46	0.003	0.003	0	3,607.33	Not Full	No	-0.507	4.133
SP44	3,619.54	0.004	0.004	0	3,612.78	Not Full	No	-0.589	6.756
SP45	3,600.78	0	0	0	3,597.28	Not Full	No	-0.5	3.5
SP48	3,536.07	0	0	0	3,532.32	Not Full	No	-0.5	3.75
SP5	3,686.85	0	0	0	3,683.98	Not Full	No	-0.5	2.87
SP50	3,634.21	0	0	0	3,630.85	Not Full	No	-0.5	3.36
SP6	3,689.52	0	0	0	3,685.54	Not Full	No	-0.5	3.98
SP60	3,559.21	0	0	0	3,555.61	Not Full	No	-0.5	3.6
SP61	3,516.29	0.009	0.009	0	3,512.77	Not Full	No	0.341	3.525
SP62	3,515.75	0.003	0.003	0	3,512.90	Not Full	No	-0.13	2.847
SP63	3,515.65	0.001	0.001	0	3,513.20	Not Full	No	0.081	2.446
SP64	3,515.34	0.001	0.001	0	3,513.26	Not Full	No	0.038	2.079
SP65	3,525.63	0.002	0.002	0	3,521.65	Not Full	No	-0.714	3.981
SP66	3,532.17	0.013	0.013	0	3,528.65	Not Full	No	-0.706	3.522

PHWWF-MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP71	3,649.31	0.009	0.009	0	3,645.59	Not Full	No	-0.699	3.716
SP72	3,658.01	0.038	0.038	0	3,652.28	Not Full	No	-0.574	5.728
SP73	3,706.39	0	0	0	3,701.74	Not Full	No	-0.5	4.65
SP78	3,664.94	0.003	0.003	0	3,661.20	Not Full	No	-0.577	3.74
SP78A	3,659.53	0.002	0.002	0	3,654.30	Not Full	No	-0.406	5.226
SP79	3,659.40	0	0	0	3,653.19	Not Full	No	-0.577	6.21
SP80	3,664.81	0.052	0.052	0	3,658.75	Not Full	No	-0.59	6.063
SP81	3,676.54	0	0	0	3,673.38	Not Full	No	-0.5	3.16
SP83	3,684.65	0.012	0.012	0	3,680.93	Not Full	No	-0.473	3.723
SP87	3,631.45	0.005	0.005	0	3,625.89	Not Full	No	-0.648	5.565
SP88	3,635.66	0.003	0.003	0	3,630.38	Not Full	No	-0.613	5.28
SP89	3,683.90	0	0	0	3,680.05	Not Full	No	-0.5	3.85



Detail Map:

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

Pipelines

- <75% d/D
- 75% - 99% d/D
- >99% d/D
- Not Modeled

Manhole

- MH not surcharged
- MH surcharged
- Not Modeled

I&I Identification Reduction Project
PHWWF from Sherwood Forest

PHWWF SHER-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P10	SP40	SP39	10	290.3	0.063	1.75	Free Surface	7.376	0.27	0.318	0.225	0.414	3.246	11.001	No	0.225	7.376
P103	SP108	MH33	6	354.9	0.101	0	Free Surface	0	0	0	0	0	0	3.581	Yes	0.015	0
P105	MH31	MH33	6	446.7	0.038	0	Free Surface	0	0	0	0	0	0	2.185	Yes	0.015	0
P107	MH34	MH33	6	206.326	0.048	0	Free Surface	0	0	0	0	0	0	2.455	No	0	0
P11	SP41	SP40	10	316.6	0.022	1.728	Free Surface	5.006	0.354	0.536	0.295	0.411	1.896	6.444	No	0.295	5.006
P115	MH13A	DMH10	6	542.213	0.002	0	Pressurized	0	0	0	0	0	0	0.551	Yes	0.5	0
P12	DMH4	SP41	10	323.547	0.012	1.722	Free Surface	4.013	0.416	0.723	0.346	0.411	1.384	4.761	No	0.346	4.013
P120	MH24	DMH8	10	324.8	0.009	0.619	Free Surface	2.776	0.258	0.292	0.215	0.241	1.251	4.244	No	0.215	2.776
P121	SP71	MH24	10	353.9	0.016	0.574	Free Surface	3.283	0.217	0.207	0.181	0.232	1.623	5.546	No	0.181	3.283
P122	LH94	SP71	6	103.86	0.001	0	Free Surface	0	0	0	0	0	0	0.366	Yes	0.078	0
P123	LH95	MH24	6	175.393	0.01	0	Free Surface	0	0	0	0	0	0	1.146	No	0	0
P13	DMH5	DMH4	10	352.8	0.002	1.695	Free Surface	1.956	0.741	1.798	0.617	0.407	0.448	1.886	No	0.617	1.956
P131	MH25	SP71	8	139.979	0.002	0.564	Free Surface	1.629	0.497	0.99	0.331	0.246	0.563	1.14	No	0.331	1.629
P132	SP72	MH25	8	352.4	0.017	0.13	Free Surface	2.228	0.138	0.082	0.092	0.115	1.56	3.167	No	0.092	2.228
P133	SP80	SP72	8	344.302	0.018	0.092	Free Surface	2.055	0.116	0.057	0.077	0.097	1.578	3.265	No	0.077	2.055
P134	SP73	SP72	6	722.251	0.068	0	Free Surface	0	0	0	0	0	0	2.93	No	0	0
P14	SP42	DMH5	10	468.2	0.003	1.428	Free Surface	2.185	0.578	1.268	0.482	0.372	0.611	2.252	Yes	0.562	3.646
P143	SP89	SP80	6	257.602	0.082	0	Free Surface	0	0	0	0	0	0	3.232	No	0	0
P15	SP43	SP42	10	246.224	0.007	1.425	Free Surface	3.18	0.43	0.767	0.358	0.372	1.075	3.715	No	0.358	3.18
P159	MH27	SP80	6	162.974	0.069	0.041	Free Surface	2.655	0.082	0.028	0.041	0.069	2.805	2.948	No	0.041	2.655
P16	SP44	SP43	10	246.839	0.022	1.422	Free Surface	4.802	0.316	0.434	0.264	0.372	1.936	6.558	Yes	0.301	7.993
P160	SP81	MH27	6	218.316	0.014	0	Free Surface	0	0	0	0	0	0	1.326	No	0	0
P168	SP83	MH27	6	298.2	0.036	0.012	Free Surface	1.465	0.054	0.011	0.027	0.038	1.907	2.121	No	0.027	1.465
P169	SP158	SP83	6	396.843	0.054	0	Free Surface	0	0	0	0	0	0	2.626	No	0	0
P17	MH28	SP44	10	361.825	0.024	1.418	Free Surface	4.911	0.31	0.419	0.259	0.371	2	6.774	Yes	0.272	9.184
P171	DMH16	MH25	8	47.239	0.001	0.434	Free Surface	1.238	0.501	1.004	0.334	0.214	0.426	0.864	No	0.334	1.238
P172	SP79	DMH16	8	222.487	0.032	0.431	Free Surface	3.955	0.213	0.2	0.142	0.214	2.206	4.32	Yes	0.216	4.416
P173	SP78	SP78A	8	225.2	0.031	0.429	Free Surface	3.895	0.215	0.203	0.143	0.213	2.164	4.235	No	0.143	3.895
P174	MH26	SP78	8	471.4	0.039	0.426	Free Surface	4.236	0.202	0.178	0.135	0.212	2.434	4.784	Yes	0.141	7.899
P175	MH46	MH26	8	424.927	0.019	0.426	Free Surface	3.259	0.243	0.258	0.162	0.212	1.698	3.304	No	0.162	3.259
P176	LH53	DMH16	6	384.034	0.041	0	Free Surface	0	0	0	0	0	0	2.289	No	0	0
P176A	SP78A	SP79	6	23.041	0.039	0.431	Free Surface	4.366	0.299	0.39	0.15	0.233	2.343	2.211	No	0.15	4.366
P177	SP205	MH46	6	243.207	0.005	0.089	Free Surface	1.379	0.222	0.215	0.111	0.103	0.871	0.829	No	0.111	1.379
P178	MH47	SP205	6	105.911	0.037	0.088	Free Surface	2.713	0.137	0.081	0.069	0.103	2.199	2.176	Yes	0.07	5.273
P179	SP146	MH47	6	221.262	0.037	0.087	Free Surface	2.702	0.137	0.08	0.068	0.102	2.196	2.174	Yes	0.069	5.348
P18	DMH10	MH28	10	265	0.011	1.392	Pressurized	3.716	0.376	0.601	0.313	0.367	1.359	4.636	Yes	0.833	2.553
P180	MH48	SP146	6	281.716	0.127	0	Free Surface	0	0	0	0	0	0	4.006	No	0	0
P186	SP147	SP146	6	415.5	0.033	0.064	Free Surface	2.349	0.122	0.063	0.061	0.087	2.029	2.033	Yes	0.09	2.667
P187	SP148	SP147	6	337.851	0.092	0.064	Free Surface	3.37	0.095	0.038	0.048	0.087	3.303	3.408	Yes	0.054	5.539
P188	SP151	SP148	6	585.686	0.07	0.062	Free Surface	3.03	0.1	0.042	0.05	0.086	2.894	2.967	No	0.05	3.03
P189	SP153	SP151	6	635.676	0.074	0.058	Free Surface	3.039	0.095	0.038	0.048	0.083	2.974	3.068	No	0.048	3.039
P19	SP87	DMH10	10	89.808	0.062	1.373	Free Surface	6.869	0.239	0.25	0.199	0.365	3.228	10.981	Yes	0.833	2.517

PHWWF SHER-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P190	SP153A	SP153	6	21.886	0.056	0.052	Free Surface	2.657	0.097	0.039	0.048	0.078	2.581	2.657	No	0.048	2.657
P191	SP165	SP153A	6	432.6	0.139	0.052	Free Surface	3.657	0.078	0.025	0.039	0.078	3.966	4.198	Yes	0.124	1.367
P192	SP174	SP165	6	294.009	0.042	0	Free Surface	0	0	0	0	0	0	2.303	Yes	0.105	0
P2	SP35	MH19	10	433.5	0.009	1.818	Free Surface	3.756	0.456	0.852	0.38	0.423	1.226	4.268	No	0.38	3.756
P20	SP88	SP87	10	147.189	0.03	1.368	Free Surface	5.303	0.286	0.358	0.239	0.364	2.259	7.648	No	0.239	5.303
P200	SP166	SP165	6	222.659	0.114	0	Free Surface	0	0	0	0	0	0	3.799	Yes	0.1	0
P209	SP181	MH46	8	269.1	0.112	0.335	Free Surface	5.72	0.139	0.083	0.092	0.188	3.998	8.111	Yes	0.094	11.171
P21	DMH9	SP88	10	338.632	0.011	1.365	Free Surface	3.696	0.372	0.589	0.31	0.364	1.36	4.636	No	0.31	3.696
P210	SP182	SP181	8	294.452	0.092	0.332	Free Surface	5.32	0.145	0.09	0.097	0.187	3.635	7.343	No	0.097	5.32
P211	LH182A	SP182	8	86.944	0.033	0	Free Surface	0	0	0	0	0	0	4.418	Yes	0.049	0
P212	SP183	SP182	8	100.434	0.017	0.329	Free Surface	2.918	0.218	0.209	0.146	0.186	1.607	3.143	No	0.146	2.918
P213	SP184	SP183	8	227.462	0.072	0.327	Free Surface	4.868	0.152	0.1	0.102	0.185	3.241	6.515	Yes	0.115	8.138
P214	SP185	SP184	8	260.509	0.02	0.06	Free Surface	1.862	0.092	0.035	0.061	0.078	1.607	3.417	Yes	0.077	2.659
P215	SP186	SP185	8	75.925	-0.001	0.059	Pressurized	0.084	1		0.667	0	0.018		No	0.667	0.084
P216	SP187	SP186	8	257.803	0.06	0.058	Free Surface	2.715	0.07	0.019	0.046	0.077	2.701	5.957	Yes	0.332	0.332
P217	SP188	SP187	6	213.014	0.122	0.056	Free Surface	3.572	0.083	0.028	0.042	0.081	3.744	3.928	No	0.042	3.572
P218	SP189	SP188	6	412.074	0.02	0.054	Free Surface	1.892	0.125	0.067	0.063	0.08	1.609	1.607	No	0.063	1.892
P219	SP190	SP189	6	198.326	0.034	0.052	Free Surface	2.234	0.109	0.05	0.054	0.078	2.042	2.073	Yes	0.064	3.556
P22	DMH8	DMH9	10	129.235	0.02	1.358	Free Surface	4.576	0.317	0.435	0.264	0.363	1.843	6.244	Yes	0.297	7.802
P235	SP197	SP190	6	206.457	0.019	0	Free Surface	0	0	0	0	0	0	1.56	No	0	0
P236	SP191	SP190	6	375.372	0.092	0	Free Surface	0	0	0	0	0	0	3.409	Yes	0.007	0
P237	MH49	MH19	10	852.75	0.005	0.401	Free Surface	1.956	0.243	0.259	0.203	0.193	0.91	3.094	Yes	0.833	0.735
P238	SP61	MH49A	10	440.393	0	0.392	Pressurized	0.359	1		0.833	0	0.069		No	0.833	0.359
P239	SP62	SP61	10	451.542	0.001	0.382	Free Surface	1.152	0.344	0.508	0.286	0.188	0.443	1.505	Yes	0.833	0.701
P240	SP63	SP62	10	67.848	-0.001	0.379	Pressurized	0.348	1		0.833	0	0.067		No	0.833	0.348
P241	SP64	SP63	10	91.883	0	0.378	Pressurized	0.347	1		0.833	0	0.067		No	0.833	0.347
P242	DMH7	SP64	10	341.477	0.004	0.377	Free Surface	1.749	0.252	0.278	0.21	0.187	0.798	2.711	Yes	0.466	1.202
P243	SP65	DMH7	10	228.486	0.035	0.357	Free Surface	3.768	0.142	0.087	0.118	0.182	2.326	8.226	Yes	0.325	1.814
P244	SP66	SP65	10	269.4	0.026	0.355	Free Surface	3.377	0.153	0.101	0.127	0.181	2.01	7.057	No	0.127	3.377
P245	MH20	SP66	6	309.212	0.036	0	Free Surface	0	0	0	0	0	0	2.12	No	0	0
P25	SP45	SP39	6	401.509	0.057	0	Free Surface	0	0	0	0	0	0	2.695	Yes	0.023	0
P250	LH45	MH49	6	281.774	0.04	0	Free Surface	0	0	0	0	0	0	2.246	No	0	0
P251	SP60	MH49	6	219.301	0.21	0	Free Surface	0	0	0	0	0	0	5.154	No	0	0
P253	MH22	DMH7	6	62.688	0.007	0	Free Surface	0	0	0	0	0	0	0.932	Yes	0.145	0
P260	MH43	SP66	10	267.19	0.057	0.342	Free Surface	4.411	0.124	0.065	0.103	0.178	2.925	10.493	No	0.103	4.411
P261	SP138	MH43	6	449.059	0.006	0	Free Surface	0	0	0	0	0	0	0.863	Yes	0.002	0
P272	MH51	MH43	10	146.3	0.034	0.292	Free Surface	3.517	0.13	0.072	0.108	0.164	2.276	8.122	No	0.108	3.517
P273	MH139	MH51	10	198.079	0.027	0.25	Free Surface	3.093	0.127	0.069	0.106	0.152	2.022	7.234	Yes	0.107	6.064
P274	SP19	MH139	10	287.107	0.033	0.249	Free Surface	3.296	0.121	0.063	0.101	0.151	2.207	7.933	Yes	0.104	6.341
P275	SP206	MH51	6	151.821	0.185	0	Free Surface	0	0	0	0	0	0	4.835	Yes	0.5	0
P29	DMH6	SP40	6	201.685	0.131	0	Free Surface	0	0	0	0	0	0	4.072	No	0	0
P291	SP20	SP19	10	472.4	0.046	0.208	Free Surface	3.519	0.103	0.044	0.086	0.138	2.567	9.406	Yes	0.094	6.172

PHWWF SHER-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P292	SP21	SP20	10	193.767	0.026	0.207	Free Surface	2.89	0.117	0.058	0.098	0.138	1.971	7.114	No	0.098	2.89
P293	SP11	SP21	10	342.355	0.021	0.207	Free Surface	2.659	0.124	0.066	0.103	0.138	1.761	6.314	No	0.103	2.659
P294	LH55	SP19	6	282.11	0.088	0	Free Surface	0	0	0	0	0	0	3.337	No	0	0
P3	SP48	SP35	6	327.147	0.065	0	Free Surface	0	0	0	0	0	0	2.86	Yes	0.139	0
P310	MH10	SP11	6	287.838	0.083	0	Free Surface	0	0	0	0	0	0	3.241	No	0	0
P321	SP15	SP11	8	446.822	0.015	0.157	Free Surface	2.238	0.157	0.107	0.105	0.127	1.466	2.938	No	0.105	2.238
P322	SP110	SP15	8	224.3	0.025	0.143	Free Surface	2.628	0.132	0.074	0.088	0.121	1.886	3.846	No	0.088	2.628
P323	MH2	SP110	6	335	0.023	0.14	Free Surface	2.632	0.193	0.163	0.097	0.13	1.787	1.716	No	0.097	2.632
P324	SP16	SP15	6	174.409	0.06	0	Free Surface	0	0	0	0	0	0	2.753	No	0	0
P328	SP22	MH2	8	401.431	0.026	0.056	Free Surface	1.993	0.084	0.029	0.056	0.075	1.804	3.883	No	0.056	1.993
P329	SP23	SP22	8	352.604	0.021	0.049	Free Surface	1.781	0.082	0.028	0.055	0.07	1.626	3.506	Yes	0.055	3.517
P33	SP50	DMH4	6	142.229	0.193	0	Free Surface	0	0	0	0	0	0	4.945	Yes	0.071	0
P330	SP111	SP23	8	444.391	0.044	0.046	Free Surface	2.269	0.067	0.018	0.045	0.068	2.302	5.105	Yes	0.05	3.859
P342	MH3	MH2	8	233.125	0.057	0.079	Free Surface	2.931	0.082	0.027	0.054	0.09	2.687	5.801	No	0.054	2.931
P343	SP3	MH3	6	254.799	0.061	0.068	Free Surface	2.978	0.108	0.049	0.054	0.09	2.737	2.78	Yes	0.079	3.393
P344	SP6	SP3	6	341.914	0.103	0	Free Surface	0	0	0	0	0	0	3.616	No	0	0
P354	MH4	SP3	6	504.705	0.104	0	Free Surface	0	0	0	0	0	0	3.632	No	0	0
P357	SP5	MH3	6	392.336	0.127	0	Free Surface	0	0	0	0	0	0	4.003	Yes	0.042	0
P37	SP34	DMH5	10	110.176	0.104	0.265	Free Surface	5.04	0.095	0.037	0.079	0.156	3.826	14.157	Yes	0.256	1.867
P38	MH16	SP34	6	132.958	0.08	0.25	Free Surface	4.82	0.19	0.158	0.095	0.175	3.302	3.174	No	0.095	4.82
P39	SP141	MH16	6	292.273	0.023	0.25	Free Surface	3.096	0.259	0.294	0.13	0.175	1.797	1.7	No	0.13	3.096
P4	SP36	SP35	10	427	0.025	1.797	Free Surface	5.339	0.347	0.518	0.289	0.42	2.043	6.939	Yes	0.317	9.449
P40	DMH1	SP141	6	66.86	0.067	0.239	Free Surface	4.472	0.194	0.164	0.097	0.171	3.031	2.909	No	0.097	4.472
P404	MH49A	MH49	10	37.524	0.042	0.392	Free Surface	4.121	0.142	0.087	0.119	0.191	2.542	8.987	No	0.119	4.121
P408	LH500	SP83	4	43.659	0.015	0	Free Surface	0	0	0	0	0	0	0.473	No	0	0
P41	MH17	DMH1	6	102	0.012	0.235	Free Surface	2.443	0.294	0.376	0.147	0.17	1.325	1.251	No	0.147	2.443
P42	DMH2	MH17	6	154.4	0.04	0.229	Free Surface	3.69	0.215	0.203	0.108	0.168	2.366	2.256	No	0.108	3.69
P43	SP26	DMH2	6	60.085	-0.005	0.225	Pressurized	0.573	1		0.5	0	0.143		No	0.5	0.573
P44	SP27	SP26	6	154.961	0.067	0.22	Free Surface	4.375	0.186	0.151	0.093	0.164	3.033	2.92	Yes	0.437	1.209
P45	LH31	SP34	6	648.338	0.081	0	Free Surface	0	0	0	0	0	0	3.203	Yes	0.03	0
P46	LH23	DMH2	6	177.623	0.1	0	Free Surface	0	0	0	0	0	0	3.557	Yes	0.005	0
P47	SP28	SP27	6	323.957	0.084	0	Free Surface	0	0	0	0	0	0	3.255	No	0	0
P5	SP37	SP36	10	464.34	0.044	1.789	Free Surface	6.519	0.299	0.39	0.25	0.419	2.71	9.173	Yes	0.286	10.794
P50	SP29	SP27	6	65.181	0.012	0.21	Free Surface	2.359	0.277	0.336	0.139	0.16	1.32	1.247	No	0.139	2.359
P51	MH18	SP29	6	187.1	0.037	0.21	Free Surface	3.496	0.21	0.193	0.105	0.16	2.271	2.169	No	0.105	3.496
P52	SP31	MH18	6	410.931	0.08	0	Free Surface	0	0	0	0	0	0	3.181	No	0	0
P56	SP30	MH18	6	141.361	0.111	0.201	Free Surface	5.074	0.157	0.107	0.079	0.156	3.838	3.747	No	0.079	5.074
P57	SP33	SP30	6	249.63	0.045	0	Free Surface	0	0	0	0	0	0	2.394	No	0	0
P59	LH30	SP30	6	518.482	0.083	0	Free Surface	0	0	0	0	0	0	3.242	No	0	0
P6	DMH3	SP37	10	179.545	0.042	1.783	Free Surface	6.451	0.301	0.394	0.251	0.418	2.673	9.051	Yes	0.267	11.843
P60	MH35	MH28	6	118.401	0.069	0	Free Surface	0	0	0	0	0	0	2.952	Yes	0.135	0
P66	SP135	SP87	6	324.653	0.111	0	Free Surface	0	0	0	0	0	0	3.754	Yes	0.104	0

PHWWF SHER-PIPE RESULTS

ID	From MH ID	To MH ID	Diameter (in)	Length (ft)	Slope (ft/ft)	Total Flow (ft^3/s)	Flow Type	Velocity (ft/s)	d/D	q/Q	Water Depth (ft)	Critical Depth (ft)	Froude No (#/#)	Full Flow (ft^3/s)	Backwater Adj	Adjusted Depth (ft)	Adjusted Vel (ft/s)
P7	LH32	DMH3	6	240.205	0.111	0	Free Surface	0	0	0	0	0	0	3.741	No	0	0
P70	SP103	DMH8	8	146.579	0.054	0.729	Free Surface	5.562	0.243	0.259	0.162	0.281	2.895	5.633	Yes	0.171	10.293
P71	SP112	SP103	8	140.1	0.032	0.291	Free Surface	3.527	0.176	0.134	0.117	0.174	2.18	4.328	Yes	0.133	5.842
P72	SP113	SP112	6	39.216	0.053	0.285	Free Surface	4.322	0.224	0.221	0.112	0.188	2.711	2.579	Yes	0.117	8.164
P73	SP114	SP113	6	125.389	0.076	0.269	Free Surface	4.838	0.199	0.174	0.1	0.182	3.229	3.094	No	0.1	4.838
P74	MH37	SP114	6	142.208	0.08	0.267	Free Surface	4.914	0.196	0.169	0.098	0.182	3.308	3.173	No	0.098	4.914
P75	MH38	MH37	6	276.642	0.023	0.234	Free Surface	3.028	0.251	0.276	0.126	0.169	1.788	1.693	No	0.126	3.028
P76	SP126	SP112	6	196.298	0.04	0	Free Surface	0	0	0	0	0	0	2.25	Yes	0.029	0
P78	LH76	SP113	6	510.568	0.048	0	Free Surface	0	0	0	0	0	0	2.475	No	0	0
P79	SP118	MH37	6	164.077	0.101	0	Free Surface	0	0	0	0	0	0	3.582	No	0	0
P8	SP38	DMH3	10	294.719	0.007	1.779	Free Surface	3.329	0.492	0.974	0.41	0.418	1.036	3.655	No	0.41	3.329
P85	LH83	MH38	6	201.023	0.03	0	Free Surface	0	0	0	0	0	0	1.949	No	0	0
P86	SP123	MH38	6	294.219	0.102	0	Free Surface	0	0	0	0	0	0	3.595	No	0	0
P9	SP39	SP38	10	373.6	0.059	1.777	Free Surface	7.239	0.276	0.334	0.23	0.418	3.143	10.647	No	0.23	7.239
P91	SP104	SP103	8	350.624	0.016	0.438	Free Surface	3.145	0.253	0.282	0.169	0.215	1.6	3.109	No	0.169	3.145
P92	SP105	SP104	8	337.259	0.015	0.436	Free Surface	3.07	0.257	0.289	0.171	0.215	1.551	3.012	No	0.171	3.07
P93	DMH11	SP105	8	409.479	0.008	0.422	Free Surface	2.373	0.302	0.398	0.202	0.211	1.097	2.125	No	0.202	2.373
P94	MH32	DMH11	8	134.8	0.034	0.4	Free Surface	3.958	0.202	0.179	0.135	0.206	2.271	4.462	No	0.135	3.958
P95	MH33	MH32	8	227.328	0.042	0.397	Free Surface	4.244	0.192	0.161	0.128	0.205	2.505	4.941	Yes	0.133	7.985
P96	LH66	SP104	6	265.519	0.102	0	Free Surface	0	0	0	0	0	0	3.6	Yes	0.061	0
P97	SP102	SP105	6	206.081	0.125	0	Free Surface	0	0	0	0	0	0	3.981	No	0	0
P99	SP100	DMH11	6	167.289	0.021	0	Free Surface	0	0		0	0	0	1.634	Yes	0.027	0

PHWWF SHER - MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
DMH1	3,645.04	0.004	0.004	0	3,637.49	Not Full	No	-0.401	7.551
DMH10	3,629.76	0.019	0.019	0	3,622.49	Not Full	No	1.565	7.272
DMH11	3,667.36	0.022	0.022	0	3,659.01	Not Full	No	-0.463	8.346
DMH16	3,653.63	0.002	0.002	0	3,646.32	Not Full	Yes	-0.33	7.313
DMH2	3,655.29	0.004	0.004	0	3,645.60	Not Full	No	-0.39	9.69
DMH3	3,563.69	0.004	0.004	0	3,549.91	Not Full	No	-0.566	13.783
DMH4	3,615.98	0.026	0.026	0	3,603.52	Not Full	No	-0.471	12.458
DMH5	3,613.93	0.002	0.002	0	3,604.46	Not Full	Yes	-0.201	9.468
DMH6	3,628.84	0	0	0	3,619.09	Not Full	No	-0.5	9.75
DMH7	3,522.22	0.02	0.02	0	3,514.05	Not Full	Yes	-0.623	8.169
DMH8	3,644.59	0.009	0.009	0	3,636.81	Not Full	No	-0.56	7.776
DMH9	3,641.93	0.007	0.007	0	3,634.25	Not Full	No	-0.514	7.68
LH182A	3,747.64	0	0	0	3,747.64	Full	No	-0.667	0
LH23	3,666.84	0	0	0	3,663.34	Not Full	No	-0.5	3.5
LH30	3,727.99	0	0	0	3,723.09	Not Full	No	-0.5	4.9
LH31	3,671.72	0	0	0	3,668.02	Not Full	No	-0.5	3.7
LH32	3,578.96	0	0	0	3,576.56	Not Full	No	-0.5	2.4
LH45	3,520.47	0	0	0	3,520.47	Full	No	-0.5	0
LH500	3,685.76	0	0	0	3,682.12	Not Full	No	-0.333	3.64
LH53	3,668.67	0	0	0	3,664.77	Not Full	No	-0.5	3.9
LH55	3,598.29	0	0	0	3,593.29	Not Full	No	-0.5	5
LH66	3,680.15	0	0	0	3,677.58	Not Full	No	-0.5	2.57
LH76	3,678.26	0	0	0	3,676.06	Not Full	No	-0.5	2.2
LH83	3,688.41	0	0	0	3,684.61	Not Full	No	-0.5	3.8
LH94	3,648.42	0	0	0	3,645.64	Not Full	No	-0.477	2.777
LH95	3,646.54	0	0	0	3,641.84	Not Full	No	-0.5	4.7
MH10	3,628.10	0	0	0	3,624.80	Not Full	No	-0.5	3.3
MH139	3,562.01	0.001	0.001	0	3,557.52	Not Full	No	-0.727	4.494
MH13A	3,631.84	0	0	0	3,622.49	Not Full	No	0.598	9.352
MH16	3,634.38	0	0	0	3,626.15	Not Full	No	-0.403	8.233
MH17	3,644.50	0.006	0.006	0	3,639.05	Not Full	No	-0.351	5.451
MH18	3,669.60	0.009	0.009	0	3,663.91	Not Full	No	-0.393	5.693
MH2	3,626.31	0.005	0.005	0	3,621.01	Not Full	No	-0.403	5.303
MH20	3,546.44	0	0	0	3,539.75	Not Full	No	-0.5	6.69
MH22	3,518.93	0	0	0	3,514.19	Not Full	No	-0.5	4.74
MH24	3,645.52	0.046	0.046	0	3,639.99	Not Full	No	-0.616	5.533
MH25	3,653.52	0.001	0.001	0	3,646.16	Not Full	Yes	-0.331	7.365
MH26	3,685.98	0	0	0	3,679.62	Not Full	No	-0.53	6.363
MH27	3,675.65	0.028	0.028	0	3,670.29	Not Full	No	-0.459	5.359
MH28	3,626.14	0.025	0.025	0	3,621.41	Not Full	No	-0.564	4.731
MH3	3,638.35	0.011	0.011	0	3,634.41	Not Full	No	-0.612	3.945
MH31	3,699.23	0	0	0	3,694.23	Not Full	No	-0.5	5
MH32	3,673.93	0.003	0.003	0	3,667.97	Not Full	No	-0.53	5.963
MH33	3,684.08	0.397	0.397	0	3,677.41	Not Full	No	-0.537	6.67
MH34	3,692.70	0	0	0	3,687.40	Not Full	No	-0.5	5.3
MH35	3,634.94	0	0	0	3,629.29	Not Full	No	-0.5	5.65

PHWWF SHER - MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
MH37	3,677.34	0.033	0.033	0	3,672.14	Not Full	No	-0.399	5.199
MH38	3,684.18	0.234	0.234	0	3,678.53	Not Full	No	-0.372	5.652
MH4	3,708.71	0	0	0	3,702.88	Not Full	No	-0.5	5.83
MH43	3,552.81	0.05	0.05	0	3,544.21	Not Full	No	-0.73	8.596
MH46	3,703.90	0.002	0.002	0	3,687.64	Not Full	No	-0.503	16.256
MH47	3,702.00	0.001	0.001	0	3,697.97	Not Full	No	-0.431	4.031
MH48	3,747.67	0	0	0	3,741.98	Not Full	No	-0.5	5.69
MH49	3,514.02	0.009	0.009	0	3,509.22	Not Full	Yes	-0.63	4.797
MH49A	3,515.09	0	0	0	3,511.91	Not Full	No	-0.714	3.181
MH51	3,557.00	0.043	0.043	0	3,552.15	Not Full	No	-0.725	4.851
SP100	3,666.19	0	0	0	3,662.49	Not Full	No	-0.5	3.7
SP102	3,686.56	0	0	0	3,681.76	Not Full	No	-0.5	4.8
SP103	3,648.66	0.001	0.001	0	3,644.73	Not Full	No	-0.498	3.931
SP104	3,654.80	0.002	0.002	0	3,650.52	Not Full	No	-0.495	4.279
SP105	3,659.66	0.013	0.013	0	3,655.78	Not Full	No	-0.493	3.876
SP108	3,716.92	0	0	0	3,713.32	Not Full	No	-0.5	3.6
SP11	3,605.97	0.05	0.05	0	3,600.87	Not Full	No	-0.73	5.096
SP110	3,617.69	0.003	0.003	0	3,613.11	Not Full	No	-0.579	4.582
SP111	3,662.70	0.046	0.046	0	3,658.45	Not Full	No	-0.622	4.255
SP112	3,653.89	0.006	0.006	0	3,649.17	Not Full	No	-0.549	4.722
SP113	3,656.31	0.015	0.015	0	3,651.23	Not Full	No	-0.385	5.085
SP114	3,665.33	0.002	0.002	0	3,660.81	Not Full	No	-0.397	4.517
SP118	3,692.79	0	0	0	3,688.79	Not Full	No	-0.5	4
SP123	3,712.66	0	0	0	3,708.86	Not Full	No	-0.5	3.8
SP126	3,659.81	0	0	0	3,656.96	Not Full	No	-0.5	2.85
SP135	3,665.49	0	0	0	3,661.84	Not Full	No	-0.5	3.65
SP138	3,551.28	0	0	0	3,546.85	Not Full	No	-0.5	4.43
SP141	3,637.12	0.011	0.011	0	3,632.85	Not Full	No	-0.368	4.268
SP146	3,712.21	0.023	0.023	0	3,706.23	Not Full	No	-0.431	5.981
SP147	3,724.77	0	0	0	3,719.74	Not Full	No	-0.439	5.029
SP148	3,755.02	0.002	0.002	0	3,750.72	Not Full	No	-0.452	4.302
SP15	3,612.03	0.014	0.014	0	3,607.45	Not Full	No	-0.562	4.585
SP151	3,798.21	0.004	0.004	0	3,791.50	Not Full	No	-0.45	6.71
SP153	3,843.11	0.006	0.006	0	3,838.84	Not Full	No	-0.452	4.272
SP153A	3,845.17	0	0	0	3,840.06	Not Full	No	-0.452	5.112
SP158	3,707.33	0	0	0	3,702.61	Not Full	No	-0.5	4.72
SP16	3,622.04	0	0	0	3,618.17	Not Full	No	-0.5	3.87
SP165	3,903.92	0.052	0.052	0	3,900.11	Not Full	No	-0.461	3.811
SP166	3,931.44	0	0	0	3,925.29	Not Full	No	-0.5	6.15
SP174	3,915.61	0	0	0	3,912.22	Not Full	No	-0.5	3.39
SP181	3,724.25	0.003	0.003	0	3,717.79	Not Full	No	-0.573	6.456
SP182	3,749.67	0.003	0.003	0	3,744.85	Not Full	No	-0.569	4.822
SP183	3,749.80	0.002	0.002	0	3,746.59	Not Full	No	-0.52	3.213
SP184	3,766.77	0.267	0.267	0	3,763.00	Not Full	No	-0.564	3.767
SP185	3,771.48	0.001	0.001	0	3,768.15	Not Full	No	-0.605	3.329
SP186	3,783.96	0.001	0.001	0	3,768.85	Not Full	Yes	0.042	15.111

PHWWF SHER - MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP187	3,793.39	0.002	0.002	0	3,783.86	Not Full	No	-0.62	9.534
SP188	3,820.18	0.002	0.002	0	3,812.57	Not Full	No	-0.458	7.608
SP189	3,825.22	0.002	0.002	0	3,821.24	Not Full	No	-0.437	3.977
SP19	3,571.37	0.041	0.041	0	3,566.87	Not Full	No	-0.732	4.499
SP190	3,832.74	0.052	0.052	0	3,827.96	Not Full	No	-0.445	4.785
SP191	3,866.95	0	0	0	3,862.39	Not Full	No	-0.5	4.56
SP197	3,837.08	0	0	0	3,831.99	Not Full	No	-0.5	5.09
SP20	3,593.32	0.001	0.001	0	3,588.51	Not Full	No	-0.747	4.814
SP205	3,700.88	0.001	0.001	0	3,694.01	Not Full	Yes	-0.389	6.869
SP206	3,579.92	0	0	0	3,575.08	Not Full	No	-0.5	4.84
SP21	3,598.70	0	0	0	3,593.80	Not Full	No	-0.735	4.902
SP22	3,635.69	0.007	0.007	0	3,631.36	Not Full	No	-0.611	4.334
SP23	3,643.23	0.003	0.003	0	3,638.74	Not Full	No	-0.612	4.495
SP26	3,649.01	0.005	0.005	0	3,646.19	Not Full	Yes	0.378	2.822
SP27	3,659.20	0.01	0.01	0	3,655.95	Not Full	No	-0.405	3.255
SP28	3,686.61	0	0	0	3,683.31	Not Full	No	-0.5	3.3
SP29	3,661.15	0	0	0	3,656.94	Not Full	No	-0.36	4.21
SP3	3,654.44	0.068	0.068	0	3,649.91	Not Full	No	-0.446	4.526
SP30	3,683.28	0.201	0.201	0	3,679.86	Not Full	No	-0.42	3.42
SP31	3,700.75	0	0	0	3,696.85	Not Full	No	-0.5	3.9
SP33	3,696.25	0	0	0	3,691.38	Not Full	No	-0.5	4.87
SP34	3,619.67	0.015	0.015	0	3,615.55	Not Full	No	-0.754	4.12
SP35	3,514.73	0.021	0.021	0	3,511.46	Not Full	No	-0.436	3.273
SP36	3,525.35	0.007	0.007	0	3,522.09	Not Full	No	-0.527	3.264
SP37	3,545.72	0.006	0.006	0	3,542.29	Not Full	No	-0.567	3.434
SP38	3,555.81	0.002	0.002	0	3,552.24	Not Full	No	-0.407	3.573
SP39	3,578.00	0.027	0.027	0	3,574.30	Not Full	No	-0.587	3.703
SP40	3,595.28	0.022	0.022	0	3,592.64	Not Full	No	-0.593	2.639
SP41	3,603.01	0.006	0.006	0	3,599.62	Not Full	No	-0.523	3.39
SP42	3,609.56	0.003	0.003	0	3,605.55	Not Full	Yes	-0.341	4.008
SP43	3,611.46	0.003	0.003	0	3,607.37	Not Full	No	-0.465	4.091
SP44	3,619.54	0.004	0.004	0	3,612.81	Not Full	No	-0.559	6.726
SP45	3,600.78	0	0	0	3,597.28	Not Full	No	-0.5	3.5
SP48	3,536.07	0	0	0	3,532.32	Not Full	No	-0.5	3.75
SP5	3,686.85	0	0	0	3,683.98	Not Full	No	-0.5	2.87
SP50	3,634.21	0	0	0	3,630.85	Not Full	No	-0.5	3.36
SP6	3,689.52	0	0	0	3,685.54	Not Full	No	-0.5	3.98
SP60	3,559.21	0	0	0	3,555.61	Not Full	No	-0.5	3.6
SP61	3,516.29	0.009	0.009	0	3,512.77	Not Full	No	0.341	3.525
SP62	3,515.75	0.003	0.003	0	3,512.90	Not Full	No	-0.13	2.847
SP63	3,515.65	0.001	0.001	0	3,513.20	Not Full	No	0.081	2.446
SP64	3,515.34	0.001	0.001	0	3,513.26	Not Full	No	0.038	2.079
SP65	3,525.63	0.002	0.002	0	3,521.65	Not Full	No	-0.714	3.981
SP66	3,532.17	0.013	0.013	0	3,528.65	Not Full	No	-0.706	3.522
SP71	3,649.31	0.009	0.009	0	3,645.64	Not Full	No	-0.651	3.667
SP72	3,658.01	0.038	0.038	0	3,652.28	Not Full	No	-0.574	5.728

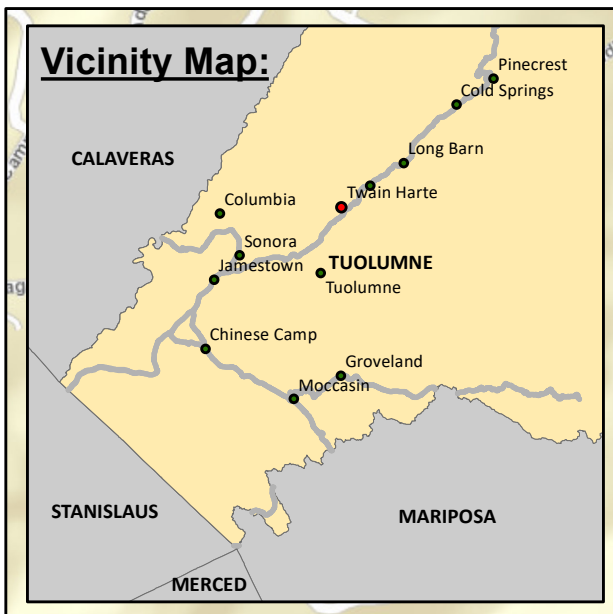
PHWWF SHER - MH RESULTS

ID	Rim Elev (ft)	Base Flow (ft^3/s)	Total Flow (ft^3/s)	Storm Flow (ft^3/s)	Invert Elev (ft)	Status	Hyd Jump	Surcharge Depth (ft)	Freeboard Depth (ft)
SP73	3,706.39	0	0	0	3,701.74	Not Full	No	-0.5	4.65
SP78	3,664.94	0.003	0.003	0	3,661.26	Not Full	No	-0.521	3.684
SP78A	3,659.53	0.002	0.002	0	3,654.37	Not Full	No	-0.343	5.163
SP79	3,659.40	0	0	0	3,653.25	Not Full	No	-0.522	6.155
SP80	3,664.81	0.052	0.052	0	3,658.75	Not Full	No	-0.59	6.063
SP81	3,676.54	0	0	0	3,673.38	Not Full	No	-0.5	3.16
SP83	3,684.65	0.012	0.012	0	3,680.93	Not Full	No	-0.473	3.723
SP87	3,631.45	0.005	0.005	0	3,625.91	Not Full	No	-0.625	5.541
SP88	3,635.66	0.003	0.003	0	3,630.41	Not Full	No	-0.585	5.252
SP89	3,683.90	0	0	0	3,680.05	Not Full	No	-0.5	3.85

ATTACHMENT C

PHDWF SCOURING VELOCITIES

Vicinity Map:



Detail Map:

PARKS & RECREATION
FIRE
WATER
SEWER
COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

VELOCITY

- Less than 0.001
- 0.001~2
- Greater than 2
- Not Modeled

Manhole

- MH not surcharged
- MH surcharged
- Not Modeled

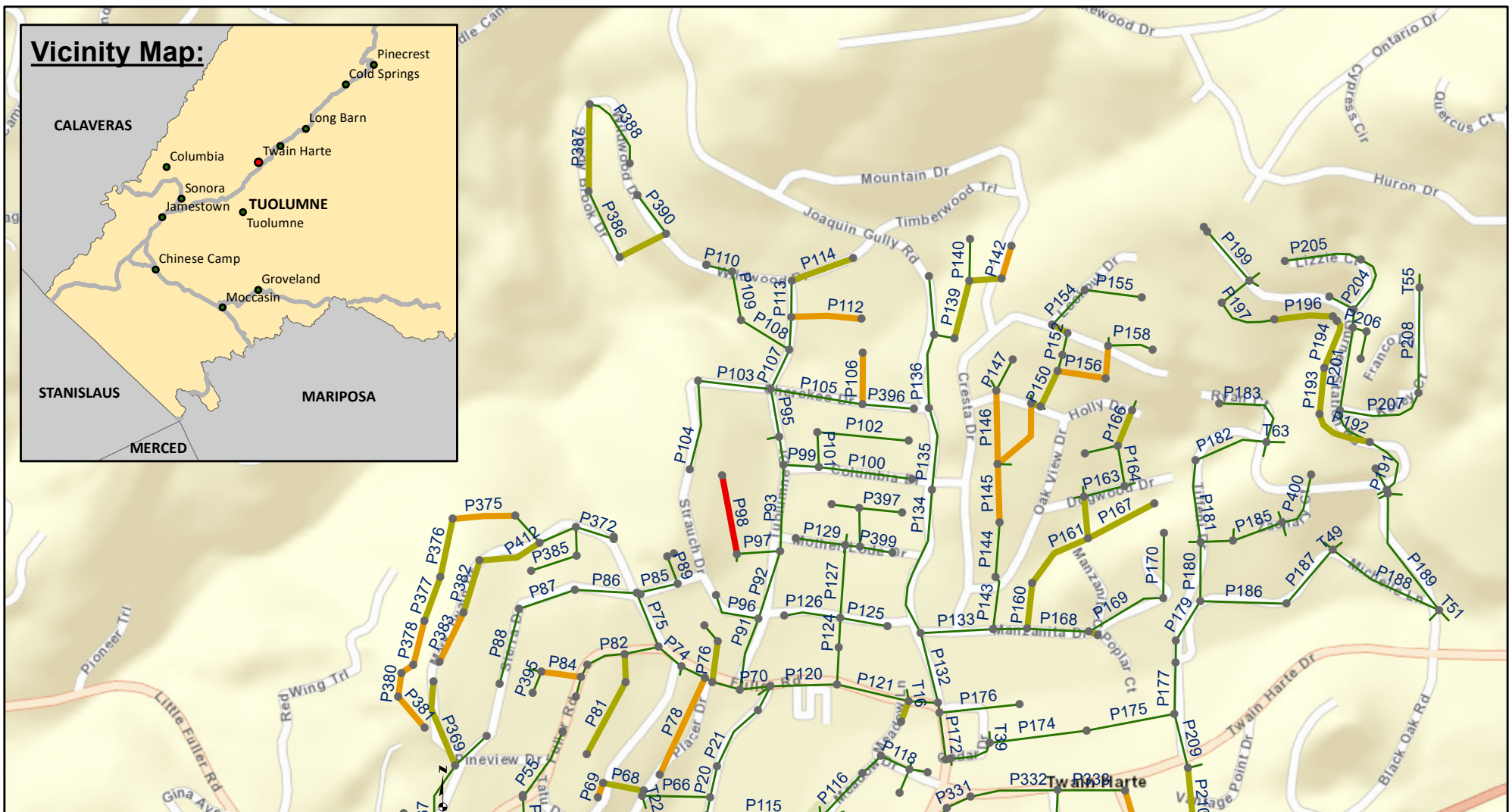
I&I Identification Reduction Project
PHDWF Hydraulic Model

ATTACHMENT D

PIPES WITH COVER BELOW THCSD STANDARDS

Vicinity Map:

Detail Map:



TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

Cover

- > 3.00
- <1.00
- 1.00 - 2.00
- 2.00 - 3.00

I&I Identification Reduction Project
Estimated Cover

Pipes that do not meet THCSD Pipe Cover Standards

*Note: Cells were left blank when inadequate data was available

Pipe	Upstream Cover* (ft)	Downstream Cover* (ft)	Location of Inadequate Pipe Cover
P10		2.9	Downstream
P106	1.8	4.2	Upstream
P112	1.4		Upstream
P114	2.4		Upstream
P122	2.2	3.2	Upstream
P139	3	2.9	Downstream
P141	3.2	2.7	Downstream
P142	1.4	3.2	Upstream
P145	1.7		Upstream
P146		1.5	Downstream
P148	3	1.5	Downstream
P149	2.9	2.9	Both
P150		2.8	Downstream
P153	2.2		Upstream
P156	1.7		Upstream
P157	2.1	1.4	Both
P160	2.6	4.7	Upstream
P161	2.5	2.6	Both
P162	3.6	2.4	Downstream
P166	2.4	2.9	Both
P167	2.3	2.4	Both
P192	2.8		Upstream
P193	2.9	2.8	Both
P194	3.6	2.9	Downstream
P195	2.8	3.5	Upstream
P196	2.9	2.8	Both
P2	2.8	4.5	Upstream
P210	2.5	5.8	Upstream
P212	2.6	2.5	Both
P213	3.2	2.6	Downstream
P214	2.7	3.1	Upstream
P215	15.1	2.6	Downstream
P239	2.7	3.7	Upstream
P240	2.5	2.5	Both
P241	2.1	2.4	Both
P242	7.5	1.9	Downstream
P244	2.8	3.2	Upstream
P245		2.8	Downstream
P247	2.4	4.5	Upstream
P248		2.2	Downstream
P257	2.9	3.9	Upstream

Pipe	Upstream Cover* (ft)	Downstream Cover* (ft)	Location of Cover Below THCSD Standards
P260	7.8	2.4	Downstream
P265	5	2.9	Downstream
P266	2	3.3	Upstream
P270	2.7	4.8	Upstream
P290	0.7		Upstream
P297	2.9	3	Upstream
P298	2.8	2.9	Both
P299	3	2.8	Downstream
P300	2.8	3	Upstream
P307	2.9	3.1	Upstream
P308	1.9	2.8	Both
P309	2.1	3.8	Upstream
P313	2.4		Upstream
P314		2.4	Downstream
P315	2.5		Upstream
P316	2.2	2.5	Both
P317	0.6	2.2	Both
P318		1.9	Downstream
P334	1.5		Upstream
P349	1.5	4.4	Upstream
P352	2.5	3.3	Upstream
P353		2	Downstream
P356	2.9		Upstream
P357	2.3	3.5	Upstream
P358	1.9	2.2	Both
P363	2.3	4.1	Upstream
P369	2.2		Upstream
P370	2.3	5.3	Upstream
P371		2	Downstream
P375	2	3.2	Upstream
P376	2.6	1.6	Both
P377		2.5	Downstream
P378	1.9		Upstream
P379	3.6	1.8	Downstream
P380	1.9	3.6	Upstream
P381	2.5	1.9	Both
P382		2.3	Downstream
P383	1.8		Upstream
P387	9.2	2.9	Downstream
P389	2.9		Upstream
P4	2.7	2.7	Both
P406	1.5		Upstream
P408		2.8	Downstream
P412	2.4	3.1	Upstream
P46	2.9	9.1	Upstream

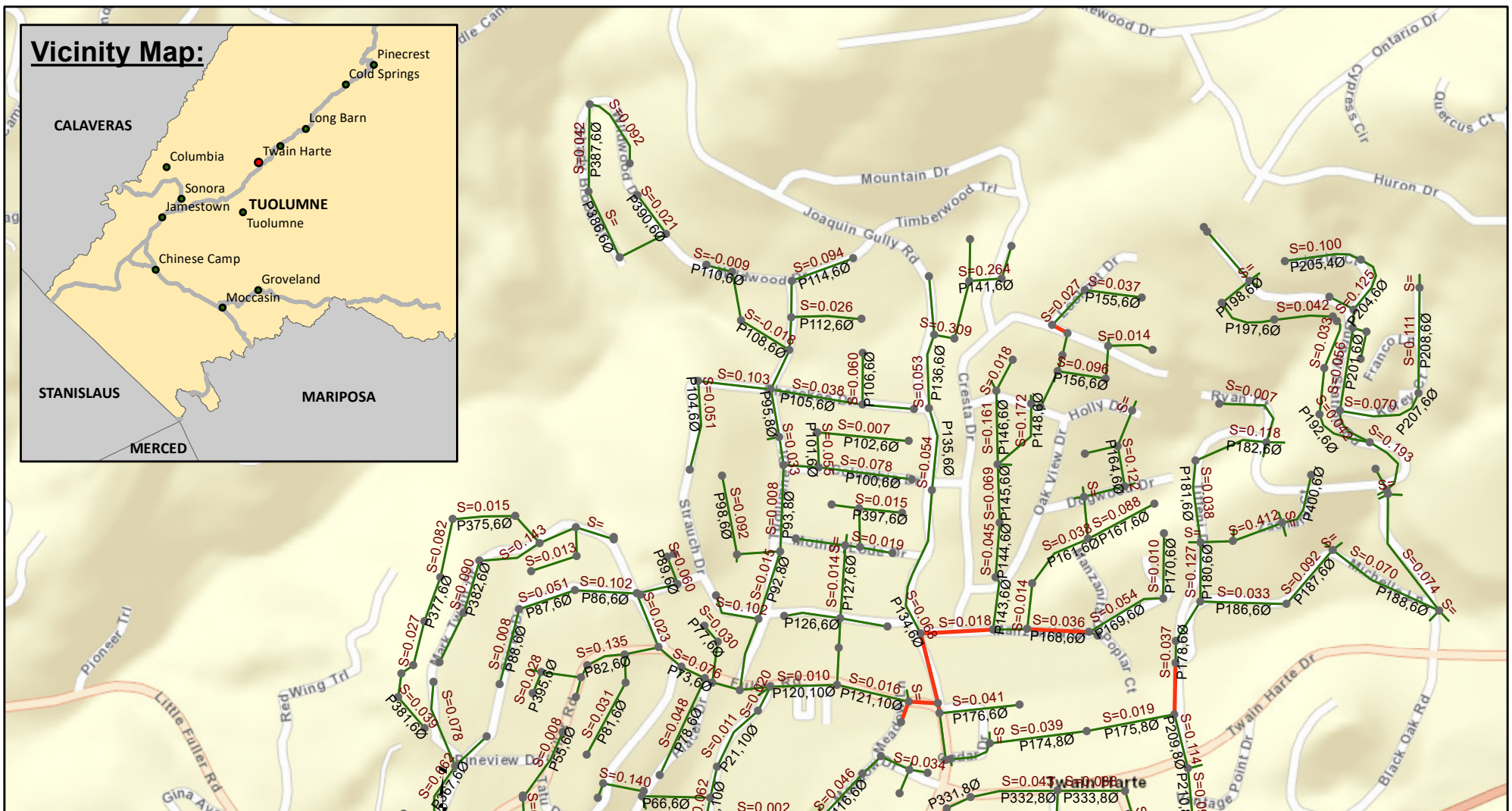
Pipe	Upstream Cover* (ft)	Downstream Cover* (ft)	Location of Cover Below THCSD Standards
P5	2.8	2.7	Both
P6	13.2	2.8	Downstream
P65	2.3	11.7	Upstream
P67	4	2.9	Downstream
P68	2.1	3.8	Upstream
P69		1.9	Downstream
P7	1.8	13.1	Upstream
P76	2.3	4.2	Upstream
P78	1.6	4.4	Upstream
P80	2.1	3.4	Upstream
P81		2.1	Downstream
P84	1.9		Upstream
P9	3.1	2.8	Downstream
P98	0.9		Upstream

ATTACHMENT E

PIPE SLOPES

Vicinity Map:

Detail Map:



TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

I&I Identification Reduction Project Slope

Appendix D

Sherwood Forest Evaluation

Technical Memo

Technical Memorandum

BLACKWATER CONSULTING ENGINEERS, INC.

To: Cheng Vue, State Water Resources Control Board (SENT VIA: EMAIL)

From: Jeff Black, P.E., Black Water Consulting Engineers, Inc.
Tyler Lee, E.I.T., Black Water Consulting Engineers, Inc.

Subject: **FINAL Twain Harte Community Services District**
(Planning Project No. C-06-8408-110)
Sherwood Forest Evaluation

Date: February 24, 2021



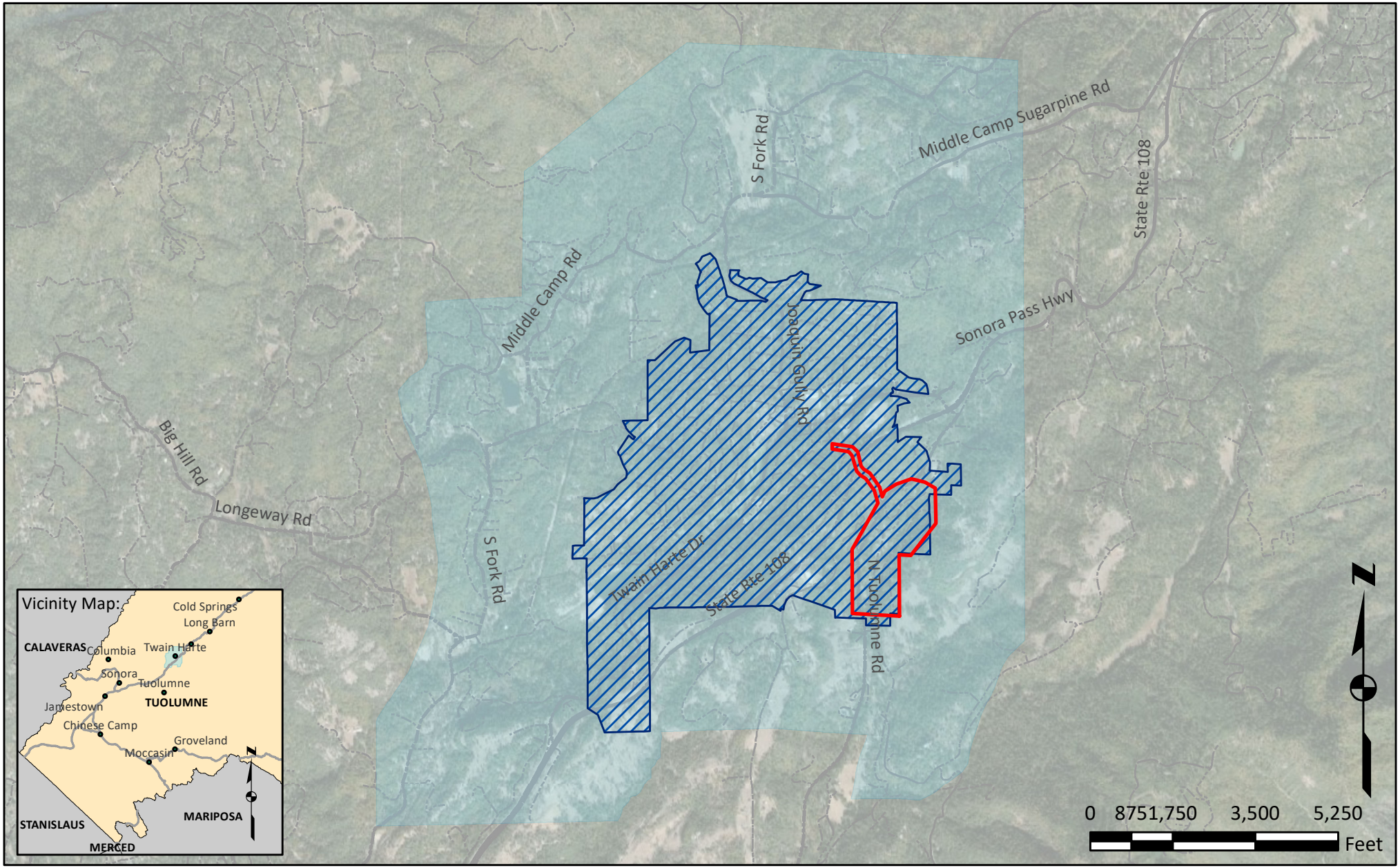
INTRODUCTION

This technical memorandum (memo) has been prepared as part of the Sherwood Forest Evaluation (Task 5) of the Twain Harte Community Services District (THCSD) Inflow/Infiltration Identification and Reduction Planning Project No. C-06-8408-110. This memo will describe the history and the limitations of the current on-site wastewater treatment systems (OWTS) at the Sherwood Forest community. Following the historical background is an evaluation of the potential for a gravity collection system connecting to the THCSD sewer. The evaluation will be based on maintenance requirements, design constraints, potential environmental impacts, and estimated construction costs. This memo will also present the project constraints and a recommended alternative.

BACKGROUND

Sherwood Forest is located southwest of Twain Harte in the county of Tuolumne, CA as shown in **Figure 1**. The Sherwood Forest development was constructed in 1964 and included Cedar Springs Road, King Arthurs Court, Little John Road, Broken Bough Lane, Robin Hood Drive, and Fallen Leaf Lane. After the initial development was constructed, additional houses were built along N. Tuolumne Rd. In this memo, the entire area will be referred to as Sherwood Forest or the Development. At the center of the Development, between Robin Hood Drive and Little John Road, is Turnback Creek with a perennial reservoir. The Development area is shown in **Figure 2**.

As a condition of the Development, each lot line has a 5-ft public utility easement (PUE). Each of the lots was constructed with independent OWTS. Since its approval and initial construction phase, the Development has continued to build-out as planned with each property owner independently maintaining an OWTS. As shown in **Figure 1**, Sherwood Forest is within the THCSD service area and has the potential to connect to the public sewer system. This technical memorandum will evaluate the potential of abandoning the individual OWTS in Sherwood Forest and connecting to the public sewer system.



TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

Figure1: Sherwood Forest Conceptual Collection System - Location Map

Author: Tyler Lee

BLACKWATER CONSULTING ENGINEERS, INC.

- Project Area
- THCSD Boundary
- THCSD Sphere of Influence
- Roads
- Major Roadways

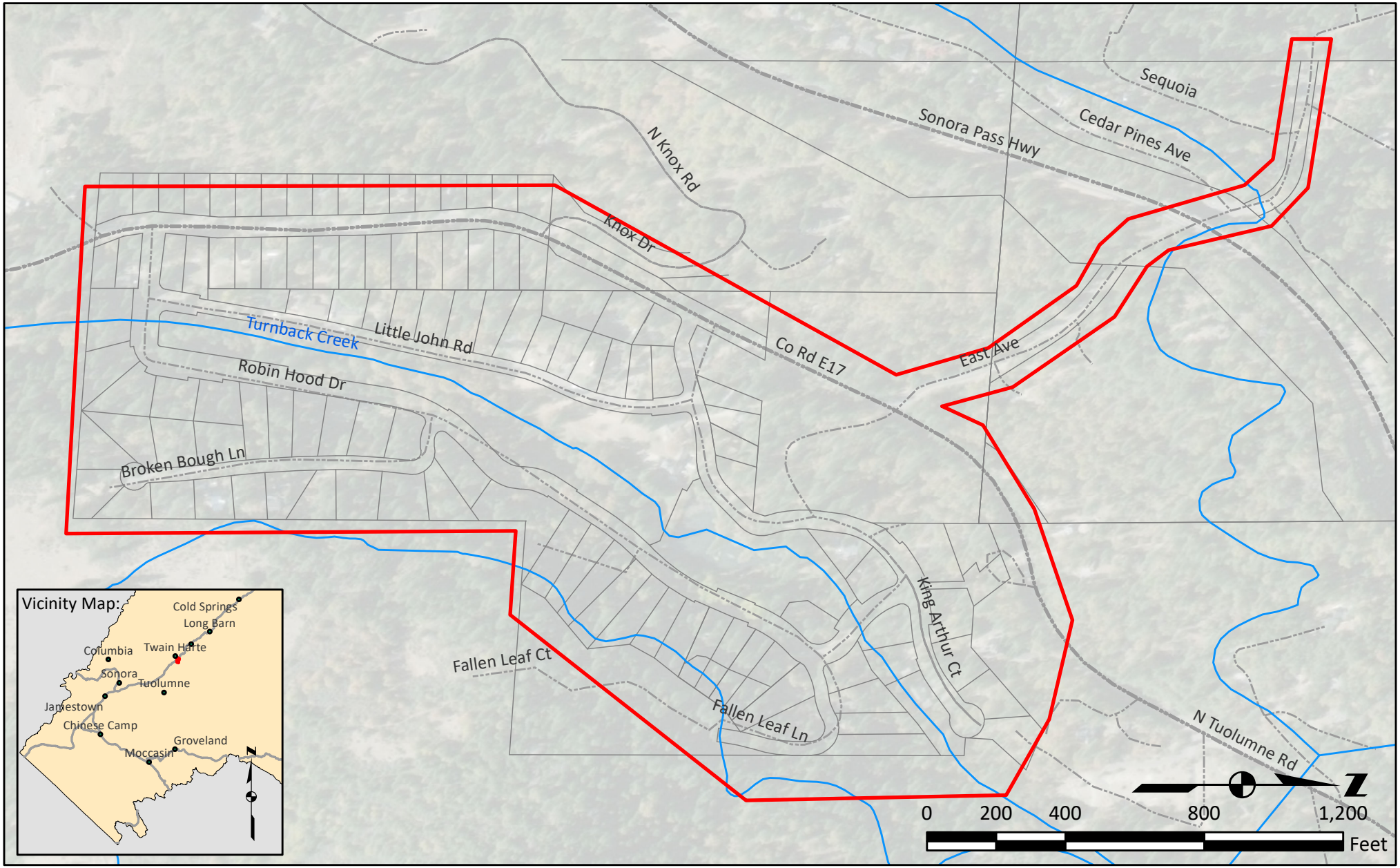


Figure 2: Sherwood Forest Conceptual Collection System - Project Area

Author: Tyler Lee

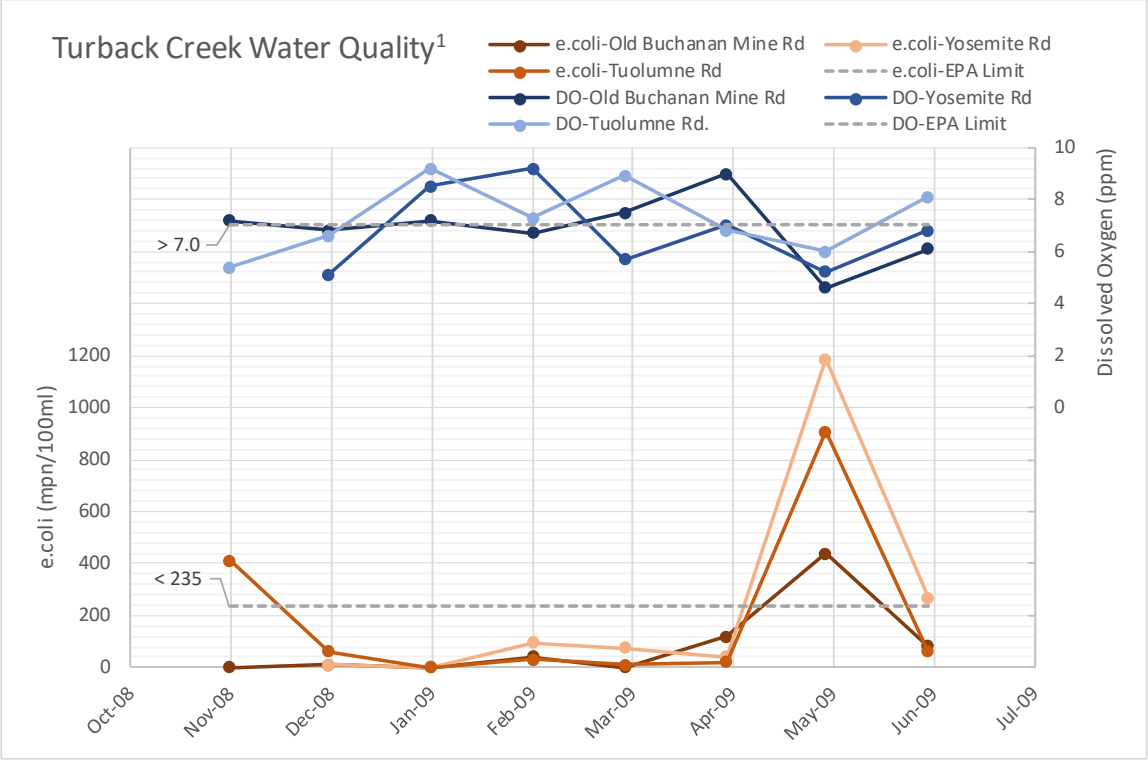
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Project Area
Waterways
Roads
Major Roadways

Sherwood Forest originally received water from the Waterfall Lodge Improvement Company. The water system operated from groundwater well(s). When the water system failed drinking water standards the well was abandoned and the distribution piping was consolidated with the Twain Harte Community Services District water system.

In 2016, the Central Valley Regional Board recommended that Turnback Creek be added to the 303(d) list for impaired surface water. This recommendation was based on water quality samples taken from the creek from 2007 to 2009. The samples collected evaluated pH, turbidity, dissolved oxygen (DO), and the indicator bacteria, E. coli. Of the 19 samples tested for E. coli from 2007 to 2009, five samples exceeded the Environmental Protection Agency (EPA) recreational limits. Of the 46 samples tested for dissolved oxygen, 20 were below the EPA recreational minimums. As a result, the Central Valley Regional Board recommended that Turnback Creek be added to the State's list of impaired surface water. The recommendation was received by the State as part of a multi-county submission in 2016. The State has not ruled on the various recommendations from 2016 and its decision is pending. The values for DO and E. coli reported to the Central Valley Regional Board from November 2008 to June 2009 are shown in **Figure 3.**

Figure 3 - Turnback Creek Impacted Surface Water Recordings for Dissolved Oxygen and E. coli



[1]Tuolumne County Stream Team water Quality Monitoring Report 2008-09, Tuolumne County Resource Conservation District

With the construction of a sewer collection system, all existing OWTS could be removed from service. This would alleviate the possibility of the OWTS impacting the water quality in Turnback Creek.

If the State designates Turnback Creek as an impaired water body as a result of the recorded decline in water quality, then the setbacks for OWTS will increase. The current setbacks are 50 ft for sewer lines, 50 ft for septic tanks, and 100 ft for leach fields. Should the State move forward and designate Turnback Creek as an impaired creek, the new setback requirements for future development at Sherwood Forest would be 50 ft for sewer lines, 600 ft for septic tanks, and 600 ft for leach fields. Since many areas are incapable of meeting these setbacks, future growth in the area would be curbed by the setback requirements of an impaired water source. With the installation of a collection system for the area, development could continue in the area regardless of updated OWTS setbacks.

PURPOSE

The purpose of this memo is to provide preliminary analysis, justification, and design information to the State Water Resources Control Board (SWRCB) for approving the development of design documents for a proposed collection system and sewer lift station in Sherwood Forest and connection to the existing THCSD sewer system. The following sections will provide a detailed evaluation of the Sherwood Forest Development regarding sanitary sewer collection.

DESIGN CONSTRAINTS

The design of the collection system will be based on a design flow derived using the THCSD standards. This design flow accounts for base sanitary flow, inflow, infiltration, and peaking flow. The pump station will also be designed to meet the design flow.

Since the area surrounding Twain Harte is heavily wooded, the collection system has frequent issues with root intrusion. While it is not economical to construct a collection system that prevents all root intrusion, it can be minimized by locating the collection system in the public right-of-way with limited use of utility easements. Where the collection system cannot be installed in the public right-of-way, root intrusion can be minimized with the use of seamless pipe such as high-density polyethylene (HDPE).

The elevations across the Sherwood Forest Development vary from 3557.6 ft to 3752.0 ft above mean sea level (AMSL). The variability in elevation has the potential to result in sewer lines with uncharacteristically steep slopes. If this is the case, then the layout of the collection system will match the topography where possible.

There are two locations where topography will preclude using public rights-of-way. The first location is along the east side of N. Tuolumne Road where the houses are 15-20 ft below the road. The options for this location are presented in Options 1 and 2 described later in this memo. The second location is along Broken Bough Lane. Broken Bough Lane is a dead-end road that starts at Robin Hood Drive. The lane rises from its origin to a high point of ±3,695 AMSL then dips back down to ±3,680 AMSL. Several homes on the end of this road are lower than the high point and would not be able to gravity flow to a public sewer main in the roadway. The options for sewering homes on Broken Bough Lane are presented in Options 1 and 3 of this memo.

SHERWOOD FOREST WASTEWATER FLOWS

In calculating the design flow of the collection system, it is assumed that every parcel is one household equivalent (HE). There are 124 parcels in the Development. Despite a few of the parcels being undeveloped, all vacant lots will also be assigned one HE. This assumption has minimal effect on flow rates and creates a margin of safety in the design. THCSD standards specify a waste generation rate of 437 gpd/HE. Multiplying the generation rate by 124 HE's in the Development, the average flow for the Development is estimated at 54,188 gpd. THCSD standards also specify a peaking factor of 3.0 and 500 gpd/(in·mile) for inflow and infiltration. Assuming 2.19 miles of 8-in pipe, the inflow and infiltration is estimated to be 8,750 gpd. This equates to an estimated design flow of 171,316 gpd. A detailed analysis of the proposed collection system pipeline alignments is provided in **Attachment A**.

Tuolumne Utilities District (TUD) has confirmed capacity at their Sonora Regional WWTP to accept and treat the anticipated flow from 124 HEs at Sherwood Forest.

For a detailed discussion on additional flows from Sherwood Forest using the District's collection system, a system hydraulic model has been developed under Task 6 of the Planning Project No. C-06-8408-110. District standards limit the depth-to-diameter ratio (d/D) to 0.70. The maximum flow recorded annually is referred to as the Peak Wet Weather Flow (PWWF). The PWWF accounts for groundwater infiltration and inflow from surface runoff and peak generation rates from the service connections. It is estimated that under the PWWF flow for the year of 2018, the current number of undersized lines from Sherwood Forest to the TUD collection point is three (3). If the District received additional wastewater flows from Sherwood Forest, the number of undersized lines along this path increases to seven (7). Assuming the three lines will be updated regardless of this project, four additional pipelines would need to be upgraded in the existing collection system to effectively convey flows from Sherwood Forest. The pipelines to be replaced are located between these manholes:

- SP35 to MH19
- SP38 to DMH3
- MH25 to SP71
- DMH16 to MH25

THCSD sewer design standards call for:

- A minimum pipe slope of 0.0033 ft/ft for an 8-inch diameter pipe
- A minimum pipe slope of 0.0049 ft/ft for a 6-inch diameter pipe for top of line sewers less than 400 ft in length

The minimum slope ensures that flows in gravity collection achieve a scouring velocity of 2.0 ft/s at full or half-full pipe. While THCSD does not provide a maximum slope, it is generally recommended that the velocity of gravity sewers not exceed 10.0 ft/s. Using the minimum pipe size permitted by THCSD design standards (8-in), the maximum depth of flow in a pipe at the minimum slope would be approximately 3.4 inches or 0.43 d/D.

THCSD does not have design standards for sewer lift stations but it is recommended that the District utilize the design criteria in **Tables 1** and **2**. Applying these criteria, the wet well requires an active volume of at least 300 gallons (**Attachment B**) and pumps capable of operating with a total dynamic head of 270 ft. The pump station will operate with three (3) submersible pumps (two duty and one standby). THCSD will require an on-site emergency generator with 3,000 gallons of overflow storage. The overflow storage can be provided with either off- or on-line storage as necessary.

Table 1 – Pump System Design

Description	Criteria
System Design	
Flow Rate	120 gpm
Static Head	219 ft
Pump Design	
Number of Active	2
Number of Stand-By	1
Power	10 hp
Pump Type	Submersible
Minimum TDH	270 ft
Maximum Cycles per Hour	
Submersible Pump	6 cycles/hr
Wet Well Design	
Wet Well Depth	72 in
Wet Well Active Volume	300 gal
Design Velocity	
Minimum design velocity	3 ft/s
Maximum design velocity	10 ft/s
Force Main	
Force Main Diameter	4 in
Force Main Length	4140 ft
Material	Ductile Iron
Generator	
Power	14.92 kW
Overflow Storage	
Inline storage	3,000 gal

Table 2 – Design Standards

Element	Design Standard
Pumps	Enclosures must be explosion-proof
	Pump NPSH'r must be met with safety allowances
	Minimum submergence per pump mfr or Froude submergence values, whichever is greater
Redundancy	Emergency Generator capable of meeting peak operating limits
	Pump station shall meet PWWF w/ largest pump out of service
	Bypass pumping locations (suction and discharge)
	2-hour in-line emergency storge
Security and Access	The site shall be designed above the 10-year flood line
	The site shall divert all stormwater away from the wet well
	The site shall be accessible with a 12 ft access gate
	The site shall have 1 hr freeboard with alarm at average flow
	The collection system shall have 2 hours of inline storage at design flow
	The site shall have odor control measures
Control Design	Force main shall have a flow meter rated for the design velocities
	Wet well liquid level shall be reported locally and remotely to the District

OPTION 1

This option uses public rights-of-way and existing PUEs along the common lot lines running parallel to N. Tuolumne Road and Little John Road. The topography along these shared lot lines naturally slopes down from the north to south. THCSD currently has a water main in the PUEs. The water main is difficult for THCSD staff to access and maintain and has been damaged by property owners. As a result of the maintenance issues and to provide separation from the proposed sewer, the water line should be relocated to N. Tuolumne Road and a gravity sewer line installed in its place. The gravity sewer line will be HDPE and backfilled with controlled low strength material (CLSM). The fused joints of the HDPE will minimize root intrusion, and the slurry backfill will protect the sewer main from damage by property owners. The total length of the PUE segment is approximately 1,100 ft. In addition to the 1,100 ft gravity sewer in the PUE, another PUE would be utilized for the sewer pipe segment from Little John Road to two lots on the east side of N. Tuolumne Road.

The residences at the end of Broken Bough Lane would be served by a gravity line within the roadway. This would require either a bore through the hill between two proposed manholes on Broken Bough Lane or a trench having a depth of approximately 15-ft (**Figure 4**). These sub-options have high costs but would allow for a gravity line to reach the end of the street.

The advantage of this option is the limited use of PUEs. When PUEs are required, the sewer pipe will be encased and jointless. The disadvantage of this option is additional coordination during construction. The associated cost estimate for this project is shown in **Table 3**.

Table 3 – Cost Estimate of Option 1

Item	Unit	Quantity	Unit Cost, $	Total Unit Cost, $
Collection System (Option 1)				
Mobilization	ls	1	$ 8,000	$ 8,000
Connections to existing piping	ls	1	$ 1,600	$ 1,600
Collection System Piping	lf	11550	$ 173	$ 1,998,000
6" Lateral Connections	ea	124	$ 1,200	$ 148,800
SS Manhole	ea	46	$ 4,359	$ 200,500
Pump Station/Force Main				
Civil Site Improvements	ls	1	$ 50,000	$ 50,000
Wet Well	ls	1	$ 40,000	$ 40,000
Submersible Pumps	ea	3	$ 16,000	$ 48,000
Force Main Pipe	lf	4200	$ 161	$ 676,650
Electrical and Instrumentation	ls	1	$ 120,000	$ 120,000
Site Piping and Appurtenances	ls	1	$ 150,000	$ 150,000
20 kW Generator	ls	1	$ 60,000	$ 60,000
			Estimated Construction Cost	$ 3,501,550
			40% construction contingency	$ 1,400,620
Engineering, Construction Services, and Administration			Preparation of bid documents	$ 250,000
			Consultant assistance during bidding	$ 9,000
			Engineering services during construction	$ 25,000
			Construction management	$ 150,000
			Estimated Project Cost	$ 5,336,170

[1] Engineering News Record, Construction Cost Index for 2/8/2021=$ 11,698.80

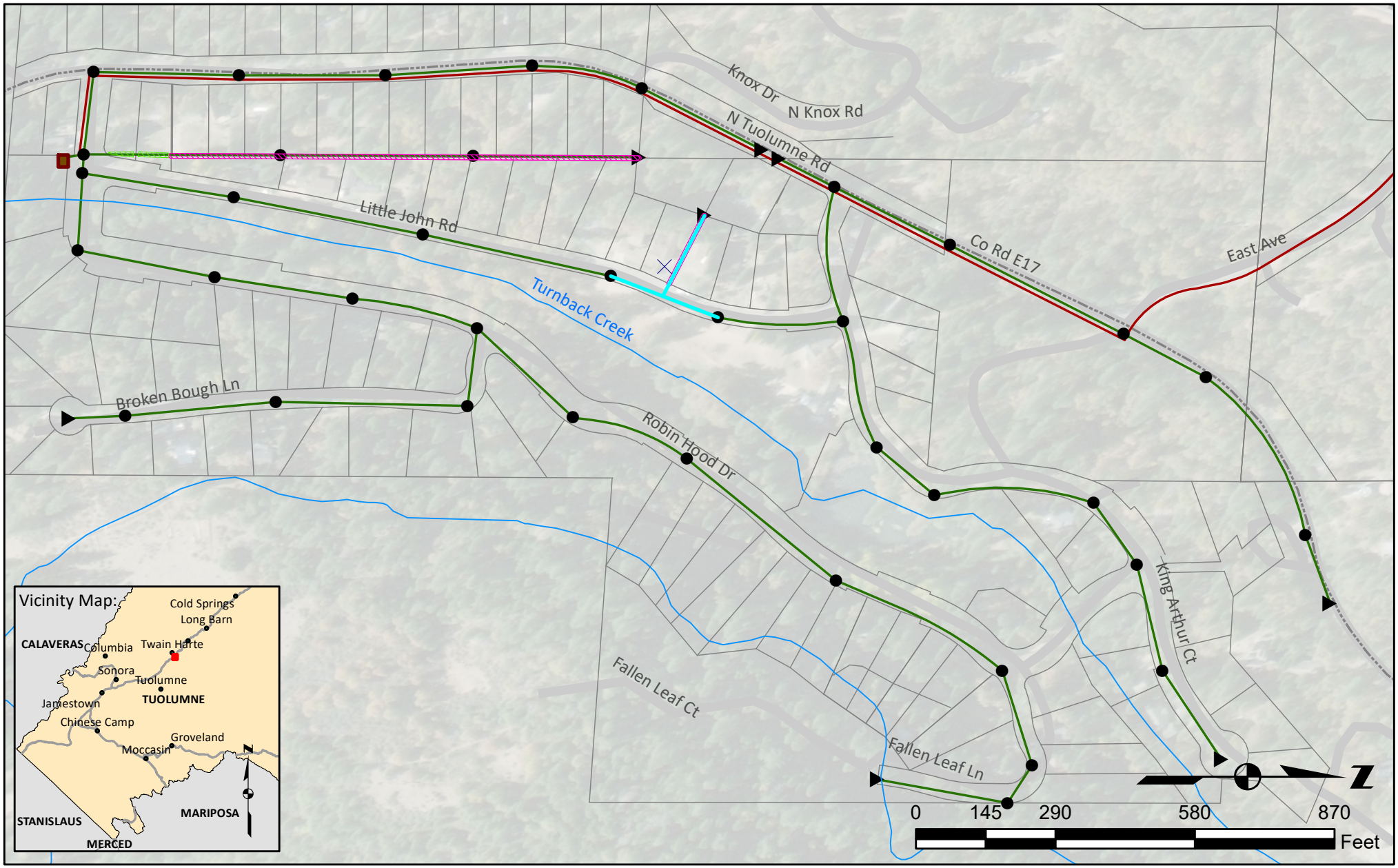


Figure 4: Sherwood Forest Conceptual Collection System - Option 1

Author: Tyler Lee

BLACKWATER CONSULTING ENGINEERS, INC.

- Existing Manhole
- Cleanout
- Manhole
- Force Main
- Gravity Colleciton
- Lot Line
- Major Roadways
- Roads
- Waterways
- Sewer Easement
- PUE
- Pump Station

OPTION 2

This option provides an alternative to the continuous easement between N. Tuolumne Road and Little John Road presented in Option 1. This option uses easements from east to west perpendicular to Little John Road. Each easement would service both the lot west of Little John Road and the lots along the east side of N. Tuolumne Road. Gravity sewers would be encased with CLSM to protect them from accidental damage by property owners. This option would require end of line cleanouts along each of the mains. (**Figure 5**). The additional cleanouts required make this option impractical. This option creates multiple unnecessary crossings of existing utilities. Additionally, this option increases the amount of infrastructure in PUE's which are difficult to access and maintain. Lastly, this option requires additional construction through the front and side yards of the properties along Little John Rd. A preliminary cost estimate is shown in **Table 4**.

Table 4: Cost Estimate for Option 2.

Item	Unit	Quantity	Unit Cost, $	Total Unit Cost, $
Collection System (Option 2)				
Mobilization	ls	1	$ 8,000	$ 8,000
Connections to existing piping	ls	1	$ 1,600	$ 1,600
Collection System Piping	lf	12300	$ 173	$ 2,127,740
6" Lateral Connections	ea	124	$ 1,200	$ 148,800
SS Manhole	ea	52	$ 4,359	$ 226,652
Pump Station/Force Main				
Civil Site Improvements	ls	1	$ 50,000	$ 50,000
Wet Well	ls	1	$ 40,000	$ 40,000
Submersible Pumps	ea	3	$ 16,000	$ 48,000
Force Main Pipe and Spool	lf	4200	$ 161	$ 676,650
Electrical and Instrumentation	ls	1	$ 120,000	$ 120,000
Site Piping and Appurtenances	ls	1	$ 150,000	$ 150,000
20 kW Generator	ls	1	$ 60,000	$ 60,000
			Estimated Construction Cost	$ 3,657,442
			40% construction contingency	$ 1,462,977
Engineering, Construction Services, and Administration			Preparation of bid documents	$ 250,000
			Consultant assistance during bidding	$ 9,000
			Engineering services during construction	$ 25,000
			Construction management	$ 150,000
			Estimated Project Cost	$ 5,554,419

[1] Engineering News Record, Construction Cost Index for 2/8/2021=$ 11,698.80

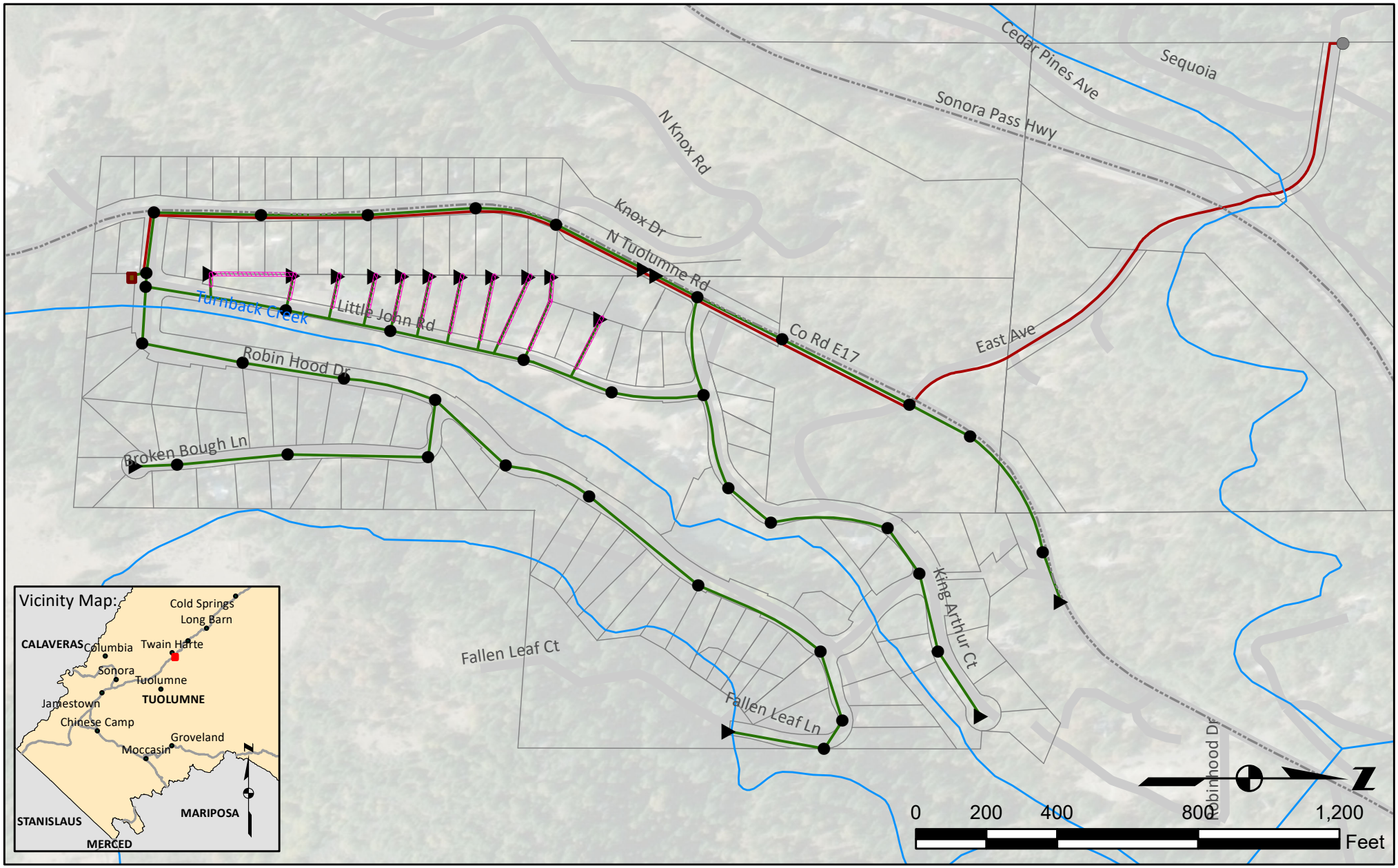


Figure 5: Sherwood Forest Conceptual Collection System - Option 2

Author: Tyler Lee

TWAIN HARTE PARKS & RECREATION FIRE WATER SEWER COMMUNITY SERVICES DISTRICT

BLACKWATER CONSULTING ENGINEERS, INC.

- Existing Manhole
- Proposed Cleanout
- Proposed Manhole
- Force Main
- Gravity Collection
- Lot Line
- Major Roadways
- Roads
- Waterways
- PUE
- Pump Station

OPTION 3

This option provides an alternative to trenching or tunneling through the high point in Broken Bough Lane. This option would use an existing PUE between Robin Hood Drive and Broken Bough Lane. Wastewater from the properties at the end of Broken Bough Lane would flow through this PUE to Robin Hood Drive. This option would require two additional manholes and construction along the steep slope between Broken Bough Lane and Robin Hood Drive (**Figure 6**). In addition to the previous issues, there would be increased construction costs associated with clearing the land and working on the steep slope. Assuming that the contractors were able to work on the slope, this line would require cutoff walls to avoid gradual creep down the hill. This option will have similar costs to Option 1 and would create additional access and maintenance issues associated with steep slopes. The associated cost estimate for Option 3 is shown in **Table 5**.

Table 5: Cost estimate for Option 3.

Item	Unit	Quantity	Unit Cost, $	Total Unit Cost, $
Collection System (Option 3)				
Mobilization	ls	1	$ 8,000	$ 8,000
Connections to existing piping	ls	1	$ 1,600	$ 1,600
Collection System Piping	lf	11825	$ 173	$ 2,045,571
6" Lateral Connections	ea	124	$ 1,200	$ 148,800
SS Manhole	ea	48	$ 4,359	$ 209,217
Pump Station/Force Main				
Civil Site Improvements	ls	1	$ 50,000	$ 50,000
Wet Well	ls	1	$ 40,000	$ 40,000
Submersible Pumps	ea	3	$ 16,000	$ 48,000
Force Main Pipe and Spool	lf	4200	$ 161	$ 676,650
Electrical and Instrumentation	ls	1	$ 120,000	$ 120,000
Site Piping and Appurtenances	ls	1	$ 150,000	$ 150,000
20 kW Generator	ls	1	$ 60,000	$ 60,000
			Estimated Construction Cost	$ 3,557,838
			40% construction contingency	$ 1,423,135
Engineering, Construction Services, and Administration			Preparation of bid documents	$ 250,000
			Consultant assistance during bidding	$ 9,000
			Engineering services during construction	$ 25,000
			Construction management	$ 150,000
			Estimated Project Cost	$ 5,414,973

[1] Engineering News Record, Construction Cost Index for 2/8/2021=$ 11,698.80

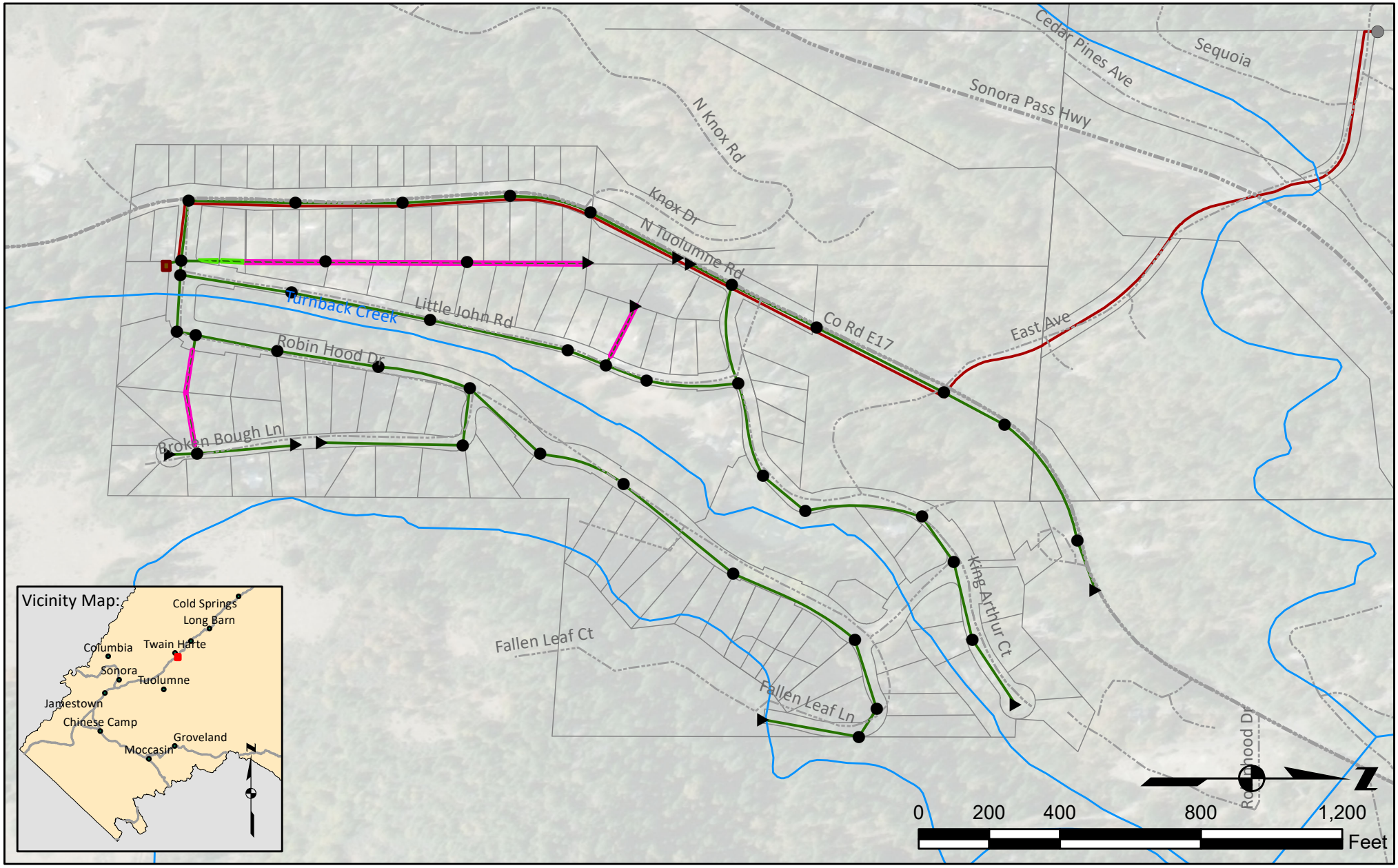


Figure 6: Sherwood Forest Conceptual Collection System-Option 3

Author: Tyler Lee

BLACKWATER CONSULTING ENGINEERS, INC.

- Existing Manhole
- Proposed Cleanout
- Proposed Manhole
- Waterways
- Roads
- Major Roadways
- Sewer Easement
- PUE
- Gravity Collection
- Force Main
- Lot Line

COMPARISON OF OPTIONS

Table 6 compares the three options using the following factors:

- Permitting
- Community and Traffic
- Constructability, Elements, and Schedule
- Environmental Impact
- Utilities
- Operations and Maintenance

Based on this analysis, Option 1 is most desirable for the project. Option 1 is estimated to cost between $5.07 million and $6.14 million. Costs have been estimated using previous construction information from projects in the county of Tuolumne and adjacent counties.

Table 6 – Comparison of Project Options

Item	Weight	Option 1 Recommended Alternative	Rank	Weighted Rank	Option 2 PUE Alternative	Rank	Weighted Rank	Option 3 Broken Bough Ln Alternative	Rank	Weighted Rank
Permitting	5%	**Advantages:** **Disadvantages:**	3	0.15	**Advantages:** **Disadvantages:**	3	0.15	**Advantages:** **Disadvantages:**	3	0.15
Community and Traffic	5%	**Advantages:** • Back yard disruption is less visual than side yard construction. • Does not result in a shared lateral situation. **Disadvantages:**	3	0.15	**Advantages:** **Disadvantages:** • Const. in side yards will be disruptive to property owners. • Additional traffic in Little John Road due to lateral connections.	1	0.05	**Advantages:** • Back yard disruption is less visual than side yard construction. • Does not result in a shared lateral situation. **Disadvantages:** • Extended traffic disruption on Broken Bough associated with boring.	2	0.10
Constructability	50%	**Advantages:** • Least pipe length • Less likely to intersect utilities **Disadvantages:** • Requires bore or deep open cut along Broken Bough • Const. in back yard • Need to relocate existing water main to N Tuolumne Rd	3	1.50	**Advantages:** • Fewest sewer structures **Disadvantages:** •Repeated Utility crossings on Little John Rd. • Const. in side yard • Most potential utility conflicts. • Utility crossings with Water main between N. Tuolumne and Little John	2	1.00	**Advantages:** • Less likely to conflict with existing utilities. **Disadvantages:** •Const. on steep slope between Robin Hood and Broken Bough • Slope requires Cut-off walls. • Const. in back yard • Relocate ex water main to N Tuolumne Rd	1	0.50
Environmental Impact	10%	**Advantages:** • Use of previously impacted area from water relocation project **Disadvantages:** • 1,100 linear ft of impacted property outside of roadway.	3	0.30	**Advantages:** **Disadvantages:** • 1,700 linear ft of impacted property outside of the roadway.	2	0.20	**Advantages:** • Use of previously impacted area from water relocation project **Disadvantages:** • 1,400 linear ft of impacted property outside of roadway. • Potential Environmental impacts between Robin Hood and Broken Bough.	1	0.10
Operations and Maintenance	30%	**Advantages:** **Disadvantages:** • Service lines and main only accessible from back yards.	2	0.60	**Advantages:** • Service lines are accessible from Little John **Disadvantages:**	3	0.90	**Advantages:** **Disadvantages:** • Difficult maintenance between Robin Hood and Broken Bough. • Service lines and main only accessible from back yards.	1	0.30
Total Σ:	100%			**2.70**			**2.30**			**1.15**

*Note :

1. Unweighted Score: Least Desireable = 1, Most Desireable = 3.

RECOMMENDATION

Given THCSD's experience with maintenance and root intrusion, it is recommended that the collection system minimize the number of sewer lines, manholes, cleanouts, and use of PUEs/sewer easements by selecting Option 1. Option 1 provides an effective collection system that limits the need for PUEs. It is recommended upon approval from the SWRCB that THCSD begin developing design documents for this option. It is further recommended that the design follow THCSD standards where applicable. The design documents will provide the locations of manholes and cleanouts that maintain separation from existing water mains and surface water bodies. The collection system should be further evaluated to limit steep slopes that would result in pipe flow velocities above 10.0 ft/s.

In addition to a properly designed collection system, the design documents will include a sewer pump station. The preliminary design documents will outline the design standards required by THCSD. Finally, the force main will be designed to achieve scouring velocities greater than 3.0 ft/s. In addition to velocities above 3.0 ft/s, the force main will be designed with appropriate check valves, control valves, bypass facilities, and air release valves.

CONCLUSION

It is recommended that THCSD proceed with Option 1 by finalizing the planning project, preparing 30% preliminary design documents, initiating CEQA work, and applying for construction funds.

DISCLOSURE STATEMENT

Funding for this project has been provided in full or in part through an agreement with the SWRCB. California's Clean Water State Revolving Fund is capitalized through a variety of funding sources, including grants from the United States Environmental Protection Agency and state bond proceeds. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does mention of trade names or commercial products constitute endorsement or recommendations for use.

REFERENCES

[1] Tuolumne County Setbacks
https://www.tuolumnecounty.ca.gov/DocumentCenter/View/376/Chapter-1308---On-Site-Sewage-Treatment-and-Disposal-Code?bidId=

[2] Tuolumne County Surface Water Quality
https://www.waterboards.ca.gov/water_issues/programs/tmdl/2014_16state_ir_reports/02982.shtml#52461

Attachment A

Table 1 - Valley Vista Sewer Capacity Analysis

Project Name: THCSD Sewer Collection

Legend

Gold Update to Match Project Geometry

Cyan Input

Purple Output

Orange Look up

Preapred By: TCL

Checked By:

Date: 3/19/2020

Black Water Consulting Eng.

Inputs

=IF($J$12="max",VLOOKUP(K16,Sheet1!$D$13:$E$21,2),IF($J$12="min",VLOOKUP(K16,Sheet1!$D$13:$F$21,2),""))

Peaking Factor:	3		P_F	rec max	0.08345		
Pipe Size:	8	in	Ø	min permited	0.00334		
Mannings n:	0.013		n	min designed	0.00334		
Average Flow:	437	gpd/ESFR	E_F				
Infiltration Rate:	500.00	gpd/(in*mile)	I_F	Drop Across MH:	0.2	ft	
Gravity:	32.17	ft/s²	g	Max Recommended Slope	min	r = Ø/2	

Warning Above: 0.7

Pressure Pipe: 1

θ = ∡ CL and Inv to WS

Itterate for Values

R_h = A/P

								Isolated Sewer Segment Flow						Cumulative Basin Flow					Goal Seek Values									Flow Regime Check	
				Inv_1	Inv_2	L	S = (Inv_1 - Inv_2)/L		E	$\alpha = E\ E_F$	P	$I = I_F$ L/5280	$Q_A = \alpha\ P + I$	$Q_B = Q_A$ Convert	$E_S = E$ + (upstream ESFR)	$\alpha_S = E_S\ E_F$	$I_S = I$ + (upstream basin I)	$Q_C = \alpha_S\ P + I_S$	$Q_D = Q_C$ Convert	d/Ø	d	θ = π - cos⁻¹(d/Ø - 1)	A = (2Ø - sin[2Ø])Ø² 0.125	W = θ Ø	V = Q/A	Δ = (Q - Q_D)100	Q = 1.49 S^0.5 $R_h^{0.667}$ A /n	T = sin(q) Ø	= [V /√(g A/T)]²
Upstream Rim Elev.	Downstream Rim Elev.	Upstream MH	Downstream MH	(ft) Upstream Invert	(ft) Downstream Invert	(ft) Pipe Length	(#/#) Slope	(in) Pipe Size	No. of ESFR	(gpd) Avg Daily Flow	Peaking Factor	(gpd) Infiltration	(gpd) Design Flow	(ft³/s) Design Flow	∑ No. of ESFR	(gpd) ∑ Avg Daily Flow	(gpd) ∑ Infiltration	(gpd) ∑ Design Flow	(ft³/s) ∑ Design Flow	% Percent Full	(ft) Depth	(radians) Theta	(ft²) Area	(ft) Wet Perimeter	(ft/s) Velocity	Δ Used for Goal Seek	(ft³/s) Goal Seek Flow	(ft) Top Width	(#/#) Froude Squared
3715.8	3701.0	FL-01	FL-02	3710.57	3696.00	275.00	0.05296	8.00	5	2,185	3.0	208	6,763	0.010	5	2,185	208	6,763	0.0105	4.46%	0.030	0.43	0.0055	0.284	1.900	8.2E-06	0.0105	0.28	5.61
3701.0	3682.5	FL-02	FL-03	3695.80	3677.50	93.47	0.19578	8.00	1	437	3.0	71	1,382	0.002	6	2,622	279	8,145	0.0126	3.59%	0.024	0.38	0.0040	0.254	3.167	7.1E-06	0.0126	0.248	19.41
3682.5	3640.0	FL-03	FL-04	3677.30	3634.99	205.86	0.20551	8.00	4	1,748	3.0	156	5,400	0.008	10	4,370	435	13,545	0.0210	4.50%	0.030	0.43	0.0056	0.285	3.761	1.4E-05	0.0210	0.276	21.81
3640.0	3617.6	FL-04	RH-09	3634.79	3612.65	399.32	0.05546	8.00	6	2,622	3.0	303	8,169	0.013	16	6,992	738	21,714	0.0336	7.63%	0.051	0.56	0.0122	0.373	2.753	3.3E-05	0.0336	0.354	6.83
3617.6	3607.8	RH-09	RH-08	3612.45	3602.83	400.00	0.02404	8.00	6	2,622	3.0	303	8,169	0.013	22	9,614	1,041	29,883	0.0462	10.83%	0.072	0.67	0.0204	0.447	2.264	1.1E-04	0.0462	0.414	3.23
3607.8	3607.0	RH-08	RH-07	3602.63	3601.70	255.36	0.00365	8.00	1	437	3.0	193	1,504	0.002	23	10,051	1,234	31,387	0.0486	19.29%	0.129	0.91	0.0472	0.606	1.259	1.1E+00	0.0594	0.526	0.55
3607.0	3595.0	RH-07	RH-06	3601.50	3590.00	272.27	0.04224	8.00	1	437	3.0	206	1,517	0.002	24	10,488	1,440	32,904	0.0509	9.85%	0.066	0.64	0.0178	0.426	2.827	-6.7E-02	0.0502	0.397	5.55
3680.0	3691.4	BB-01	BB-02	3676.30	3675.91	117.85	0.00334	8.00	6	2,622	3.0	89	7,955	0.012	6	2,622	89	7,955	0.0123	7.10%	0.047	0.54	0.0110	0.360	0.645	-5.2E-01	0.0071	0.342	0.40
3691.4	3675.0	BB-02	BB-03	3675.71	3670.00	314.34	0.01816	8.00	4	1,748	3.0	238	5,482	0.008	10	4,370	327	13,437	0.0208	9%	0.060	0.61	0.0154	0.405	1.744	6.1E-01	0.0269	0.381	2.33
3675.0	3623.1	BB-03	BB-04	3669.80	3618.12	397.80	0.12991	8.00	3	1,311	3.0	301	4,234	0.007	13	5,681	629	17,672	0.0273	5.67%	0.038	0.48	0.0079	0.321	3.478	7.9E-04	0.0274	0.308	14.74
3623.1	3595.0	BB-04	RH-06	3617.92	3590.00	162.65	0.17166	8.00	1	437	3.0	123	1,434	0.002	14	6,118	752	19,106	0.0296	5.51%	0.037	0.47	0.0075	0.316	3.924	8.8E-06	0.0296	0.304	19.32
3595.0	3579.5	RH-06	RH-05	3589.80	3574.50	267.39	0.05722	8.00	3	1,311	3.0	203	4,136	0.006	41	17,917	2,395	56,146	0.0869	11.90%	0.079	0.70	0.0234	0.470	3.706	9.4E-05	0.0869	0.432	7.86
3579.5	3569.6	RH-05	RH-04	3574.30	3564.61	290.00	0.03341	8.00	3	1,311	3.0	220	4,153	0.006	44	19,228	2,615	60,299	0.0933	14.02%	0.093	0.77	0.0298	0.512	3.136	3.6E-06	0.0933	0.463	4.76
3569.6	3560.6	RH-04	RH-03	3564.41	3555.62	290.00	0.03033	8.00	3	1,311	3.0	220	4,153	0.006	47	20,539	2,834	64,451	0.0997	14.82%	0.099	0.79	0.0323	0.527	3.092	1.7E-06	0.0997	0.474	4.36
3560.6	3559.3	RH-03	RH-02	3555.42	3554.27	154.00	0.00745	8.00	2	874	3.0	117	2,739	0.004	49	21,413	2,951	67,190	0.1040	21.32%	0.142	0.96	0.0545	0.640	1.909	2.0E-05	0.1040	0.546	1.14
3667.6	3651.5	KA-03	KA-02	3662.43	3646.46	223.75	0.07137	8.00	4	1,748	3.0	170	5,414	0.008	4	1,748	170	5,414	0.0084	3.75%	0.025	0.39	0.0043	0.260	1.969	2.8E-05	0.0084	0.253	7.17
3651.5	3649.3	KA-02	KA-01	3646.26	3644.27	223.75	0.00889	8.00	4	1,748	3.0	170	5,414	0.008	8	3,496	339	10,827	0.0168	8.47%	0.056	0.59	0.0142	0.394	1.178	2.3E-05	0.0168	0.371	1.13
3649.3	3645.0	KA-01	RH-10	3644.07	3640.00	157.19	0.02589	8.00	2	874	3.0	119	2,741	0.004	10	4,370	458	13,568	0.0210	7.32%	0.049	0.55	0.0115	0.365	1.830	7.9E-05	0.0210	0.347	3.15
3645.0	3622.2	RH-10	RH-11	3639.80	3617.16	335.63	0.06744	8.00	1	437	3.0	254	1,565	0.002	11	4,807	712	15,133	0.0234	6.15%	0.041	0.50	0.0089	0.334	2.641	5.9E-05	0.0234	0.320	7.83
3622.2	3617.9	RH-11	RH-12	3616.96	3613.93	155.83	0.01948	8.00	1	437	3.0	118	1,429	0.002	12	5,244	830	16,562	0.0256	8.04%	0.054	0.57	0.0132	0.383	1.686	-3.4E-01	0.0222	0.363	2.43
3617.9	3625.0	RH-12	LJ-05	3613.73	3611.97	273.18	0.00644	8.00	2	874	3.0	207	2,829	0.004	14	6,118	1,037	19,391	0.0300	14.77%	0.098	0.79	0.0321	0.526	1.422	1.6E+00	0.0457	0.473	0.93
3752.0	3739.6	T-13	T-12	3746.78	3734.63	150.00	0.08102	8.00	2	874	3.0	114	2,736	0.004	2	874	114	2,736	0.0042	2.65%	0.018	0.33	0.0025	0.218	1.670	2.4E-05	0.0042	0.214	7.32
3739.6	3706.6	T-12	T-11	3734.43	3701.60	396.23	0.08286	8.00	1	437	3.0	300	1,611	0.002	3	1,311	414	4,347	0.0067	3.27%	0.022	0.36	0.0035	0.242	1.939	4.2E-05	0.0067	0.237	7.99
3706.6	3690.2	T-11	T-10	3701.40	3685.17	200.00	0.08111	8.00	1	437	3.0	152	1,463	0.002	4	1,748	565	5,809	0.0090	3.76%	0.025	0.39	0.0043	0.260	2.103	5.1E-05	0.0090	0.254	8.16
3690.2	3659.3	T-10	T-09	3684.97	3654.27	400.00	0.07676	8.00		0	3.0	303	303	0.000	4	1,748	868	6,112	0.0095	3.90%	0.026	0.40	0.0045	0.265	2.096	4.3E-05	0.0095	0.258	7.81
3659.3	3652.0	T-09	T-08	3654.07	3647.00	267.92	0.02639	8.00	1	437	3.0	203	1,514	0.002	5	2,185	1,071	7,626	0.0118	5.56%	0.037	0.48	0.0076	0.317	1.547	4.9E-05	0.0118	0.305	2.98
3655.2	3652.0	T-07	T-08	3650.02	3647.00	130.01	0.02323	8.00	2	874	3.0	98	2,720	0.004	2	874	98	2,720	0.0042	3.53%	0.024	0.38	0.0039	0.252	1.081	1.1E-05	0.0042	0.246	2.29
3652.0	3625.0	T-08	LJ-05	3646.80	3611.97	284.51	0.12242	8.00	1	437	3.0	216	1,527	0.002	8	3,496	1,385	11,873	0.0184	4.77%	0.032	0.44	0.0061	0.294	3.018	5.4E-05	0.0184	0.284	13.22
3625.0	3608.2	LJ-05	LJ-04	3611.77	3603.19	261.40	0.03282	8.00	3	1,311	3.0	198	4,131	0.006	25	10,925	2,621	35,396	0.0548	10.90%	0.073	0.67	0.0206	0.449	2.656	2.1E-05	0.0548	0.416	4.42
3608.2	3596.8	LJ-04	LJ-03	3602.99	3591.84	238.71	0.04673	8.00	3	1,311	3.0	181	4,114	0.006	28	12,236	2,802	39,510	0.0611	10.56%	0.070	0.66	0.0197	0.441	3.107	1.2E-04	0.0611	0.410	6.25
3596.8	3584.0	LJ-03	LJ-02	3591.64	3579.00	400.00	0.03159	8.00	5	2,185	3.0	303	6,858	0.011	33	14,421	3,105	46,368	0.0717	12.52%	0.083	0.72	0.0252	0.482	2.843	1.3E-05	0.0717	0.441	4.39
3584.0	3567.0	LJ-02	LJ-01	3578.80	3561.99	400.00	0.04203	8.00	4	1,748	3.0	303	5,547	0.009	37	16,169	3,408	51,915	0.0803	12.34%	0.082	0.72	0.0247	0.479	3.250	6.5E-05	0.0803	0.439	5.82
3567.0	3559.3	LJ-01	RH-02	3561.79	3554.27	319.10	0.02357	8.00	1	437	3.0	242	1,553	0.002	38	16,606	3,649	53,467	0.0827	14.39%	0.096	0.78	0.0309	0.519	2.677	8.8E-04	0.0827	0.468	3.37
3654.0	3646.4	T-06	T-05	3648.80	3641.38	280.14	0.02650	8.00	3	1,311	3.0	212	4,145	0.006	3	1,311	212	4,145	0.0064	4.17%	0.028	0.41	0.0050	0.274	1.287	3.1E-04	0.0064	0.267	2.75
3646.4	3628.7	T-05	T-04	3641.18	3623.68	234.68	0.07456	8.00	2	874	3.0	178	2,800	0.004	5	2,185	390	6,945	0.0107	4.17%	0.028	0.41	0.0050	0.274	2.157	5.2E-04	0.0108	0.267	7.74
3628.7	3613.5	T-04	T-03	3623.48	3608.54	306.07	0.04880	8.00	5	2,185	3.0	232	6,787	0.011	10	4,370	622	13,732	0.0212	6.34%	0.042	0.51	0.0093	0.339	2.291	2.1E-04	0.0212	0.325	5.71
3613.5	3596.3	T-03	T-02	3608.34	3591.27	303.00	0.05636	8.00	4	1,748	3.0	230	5,474	0.008	14	6,118	851	19,205	0.0297	7.18%	0.048	0.54	0.0111	0.362	2.667	4.1E-05	0.0297	0.344	6.83
3596.3	3580.0	T-02	T-01	3591.07	3574.97	303.00	0.05311	8.00	4	1,748	3.0	230	5,474	0.008	18	7,866	1,081	24,679	0.0382	8.19%	0.055	0.58	0.0135	0.387	2.819	2.2E-04	0.0382	0.366	6.67
3580.0	3562.5	T-01	RH-01	3574.77	3553.91	171.95	0.12133	8.00	4	1,748	3.0	130	5,374	0.008	22	9,614	1,211	30,053	0.0465	7.40%	0.049	0.55	0.0117	0.367	3.990	1.5E-04	0.0465	0.349	14.82
3625.0	3604.0	E-03	E-02	3619.80	3599.00	344.05	0.06046	8.00	5	2,185	3.0	261	6,816	0.011	5	2,185	261	6,816	0.0105	4.34%	0.029	0.42	0.0053	0.280	1.994	1.6E-05	0.0105	0.272	6.35
3604.0	3584.0	E-02	E-01	3598.80	3579.00	400.00	0.04950	8.00	5	2,185	3.0	303	6,858	0.011	10	4,370	564	13,674	0.0212	6.30%	0.042	0.51	0.0092	0.338	2.299	1.1E-05	0.0212	0.324	5.79
3584.0	3562.5	E-01	RH-01	3578.80	3553.91	409.65	0.06076	8.00	5	2,185	3.0	310	6,865	0.011	15	6,555	874	20,539	0.0318	7.28%	0.049	0.55	0.0114	0.364	2.794	4.9E-05	0.0318	0.346	7.39
3559.3	3562.5	RH-02	RH-01	3554.07	3553.91	46.00	0.00343	8.00	0	0	3.0	35	35	0.000	87	38,019	6,635	120,692	0.1867	35.05%	0.234	1.27	0.1091	0.845	1.712	1.1E-04	0.1867	0.636	0.53
3562.5	3557.6	RH-01	LS	3553.71	3552.60	41.00	0.02707	8.00	0	0	3.0	31	31	0.000	124	54,188	8,752	171,316	0.2651	24.66%	0.164	1.04	0.0669	0.693	3.960	1.6E-06	0.2651	0.575	4.18
			Maximum Req'd Elevation:	**3746.78**				**Σ Total:**	**124**																				

Total Gravity Collection Length:	11552.07 ft
Total Trench Length:	13294.47 ft
ForceMain Length from Lift Station by Gravity:	2396.77 ft
ForceMain Length not adjacent to Gravity:	1742.4 ft
Total Est. ForceMain Length:	4139.17 ft
Easement Line:	1153.70 ft
SDR 35 Pipe:	10398.37 ft

Attachment B

SHERWOOD FOREST
Twain Harte, CA
Wastewater Pumping Station
Calculation Work Sheet

Date: 3/19/2020
Calculated By: TCL
Job: 17196_05 Sherwood

Legend

Cyan =	Input
Purple =	Ouptut
Orange =	Dropmenu
Red =	Look up Value
CHECK	Check Cell

Abreviations

NO =	Normal Operation
OF =	Overflow
NA =	Not Applicable
∞ =	Infinate

			Variable
Peak Flow to Pump Station:	118.95	gpm	PF
Number of Pumps:	2	Active	N_{act}
	1	Stand-By	N_{std}
Total Pumps	3		N_{all}

Step 1: Compute Wet Well Active Volume

Max Starts per Hour:	6	cyc/hr	C_{hr}
Wet Well Shape:	Cylinder		
~~Wet well length:~~	~~5~~	~~ft~~	~~L_{wet}~~
~~Wet well width:~~	~~3~~	~~ft~~	~~W_{wet}~~
Wet Well Diameter:	72	in	Ø
Wet Well Area:	28.27	ft^2	A_{wet}

Pump Capacity:	59.47535	gpm	Q_{pump}	
Inlet Flow:	59.48	gpm	$Q_{in} = Q_{out}/2$	*Max number of starts occurs when $Q_{in} = Q_{out}/2$*
Outlet Flow (Pump):	118.95	gpm	$Q_{out} = N_{act}\ Q_{pump}$	
Cycle total time:	10	min	$T_{tot} = 60\ min/C_{hr}$	
Cycle fill time:	5	min	$T_{fill} = V_{0\ act}/Q_{in}$	
Cycle empty time:	5	min	$T_{empty} = V_{0\ act}/(Q_{out} - Q_{in})$	
Active Volume of Wet Well:	297.3767	gal	$V_{0\ act} = Q_{in}\ T_{tot}/2$	
Active Volume of Wet Well:	40	ft^3	$V_{act} = V_{0\ act}$ Conversion	
Active Depth of Wet Well:	1.41	ft	$d_{act} = V_{act}/A_{wet}$	OK

Step 2: Design Tank Controls (Approximate)

Wet Well Inlet:			E_{inlet}
	Calc'd	Use	
Alarm:	-	3549.00	E_{alarm}
Lag Pump On:	-	3549.00	E_{lag}
Lead Pump On:	-	3548.00	E_{lead}
Pump(s) off:	-	3546.50	E_{off}
Bottom of Wet Well:	-	3546.00	E_{min}

Recommend 1ft below overflow
Recommend 1ft below alarm

V_{act} =	*1.5*	317.3
		19.88

Step 3: Variable Operations Check

	Normal Operation				Hypothetical Control				
PF x	0.20	0.50	0.75	1.00	1.25	1.38	1.5	1.68	1.75
time from E_{lag} to E_{alarm}	NA	NA	NA	NA	NA	NA	∞	0.00	0.00
time from E_{lead} to E_{lag}	NO	NO	NO	∞	7.11	4.74	3.56	2.63	2.37
(Stand-By) T_{empty}	NA	NA	NA	NA	10.67	21.34	∞	OF	OF
(NO) T_{empty}	3.33	5.33	10.67	∞	NA	NA	NA	NA	NA
T_{fill}	13.34	5.33	3.56	2.67	2.13	1.94	∞	OF	OF
T_{cycle}	16.67	10.67	14.22	∞	12.80	23.28	∞	∞	∞
C_{hr}	3.60	5.62	4.22	< 1	4.69	2.58	< 1	< 1	< 1

Date: 3/19/2020
Calculated By: TCL
Job: 17196_05 Sherwood

Step 4: Friction Head Approximation

Discharge Elevation:	3766.26		E_{final}	*Assumes Tank has a velocity of 0.00*
Static Lift:	219.76	ft	$\Delta_z = E_{final} - E_{off}$	*Assumes Discharge to Atmosphere*
FM Diameter:	4	in	$Ø_{FM}$	
FM Length:	4139.17	ft	L_{FM}	
FM Vel.:	3.04	ft/s	$V_{FM} = Q_{out}$ (Convert)/($Ø_{FM}^2 \pi$ 0.25)	

	K Value	Quantity
Gate Valve	0.1	1
Check Valve	0.65	1
Tee Branch Flow	0.78	1
90° Bend	0.39	3

Σ K Values:	2.70		K	*Value not specific but general*
Minor Losses:	0.39	ft	$h_{minor} = K V^2/2g$	

Using Hazen-Williams

C-Value:	120		C
Major Losses:	50.03	ft	h_{hz} = Hazen-Williams Equation
Est. TDH	**270.31**	ft	$TDH_{hz} = \Delta_z + h_{minor} + h_{hz} + V_{FM}^2/(2g)$

Using Swamee-Jain Equation w/ Darcy Wiesbach

Gravity:	32.17	ft/s²	g	*input swamee*
Kinematic Viscosity:	1.06E-05		ν	*input swamee*
Reynols Number:	9.55E+04		$Re = V Ø_{FM}/\nu$	
Material Roughness:	9.84E-04	ft	*e*	*input swamee*
friction factor:	0.028		f = Swamee-Jain Equation	
Major Losses:	49.24	ft	$h_{sw} = f L V_{FM}^2/(2 g Ø_{FM})$	
Est. TDH:	**269.53**	ft	$TDH_{sw} = \Delta_z + h_{minor} + h_{sw} + V_{FM}^2/(2g)$	

Swamee-Jain

TDH	116.79	psi
α:	706.58	for ft³/s

BLACKWATER
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